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TELEVISION

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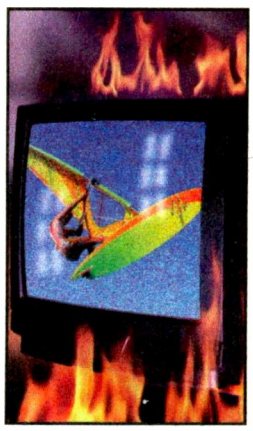
September 2000 Vol. 50, No. 11

Free with this issue – service LEDs. On the cover of this issue are two LEDs, one a 5mm type typically producing 2.2mcd at 20mA, the other a 3mm type delivering 2.5mcd at 20mA.



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Note that we are unable to answer technical queries over the telephone and cannot provide information on spares other than that given in our Spares Guide.

Next issue, dated October, on sale September 20th.

The mourning's over

In recent times, judging by the letters pages, there's been a lot of doom and gloom among *Television* readers. Well, I don't intend making too many changes without first addressing your needs via a reader survey, but one thing I can say is that there'll be no more doom and gloom.

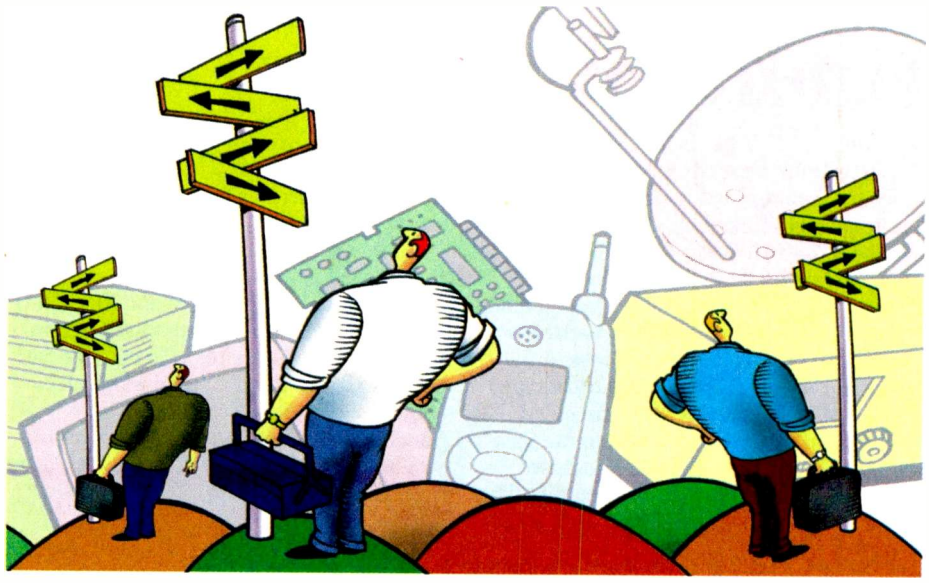
The television repair business is dead. So what do good television repair technicians do? Whinge until they're penniless then throw themselves on the scrap heap? Of course not. They turn their hands to other things.

It may not be viable to mend just tellies any more, but there's plenty of domestic electronic equipment that does need repairing. Clearly, *Television* has been diversifying over the past few years to meet the changing needs of those who used to repair just televisions. It now covers repairs to all kinds of domestic video equipment, surveillance gear, satellite receivers...

Computer upgrading seems an obvious way forward, and one where there's a future. Unlike TV sets, computers are not disposable items. They may not often break down – hardware wise at least – but bits of them become obsolescent on a monthly basis. The potential for repeat business is great.

I've done scores of computer upgrades for people. Most upgrades come with foolproof installation instructions, but there's a lot of people out there that wouldn't dare remove a PC's cover, and the numbers are growing.

Television repairers are at least moderately technically minded so repairing and upgrading computers won't require a great deal of retraining. They will already have the tools and test equipment to make the job easier too. So the plan is to include one computer repair or upgrading article in each issue.



It occurred to me that what's happening in the UK television repair business has already happened in the US. So I have commissioned an article from US former repair man Joe Carr. This article, which you can find on page 646, shows that there clearly is life after repairing televisions.

I believe that there's a growing awareness that personal attention is to be valued – and worth paying extra for. To find a local, reliable person that can repair things and give good advice on technical equipment is becoming a real asset.

But don't get the impression that *Television* – the magazine – won't be about television repair any more! The plan is to expand rather than redirect.

Have your say...

Do you have strong feelings about the state of the industry – or indeed about *Television*? This comment page is to be opened up to you, the readers, so if you have thoughts that you think might benefit others, then put pen to paper now.

Such thoughts might be how you see the future of the domestic repair business, or they may be an enterprising solution to the problems that repair people might be going through.

The only stipulation is that what you write must be generally useful and/or entertaining to people involved with domestic electronic equipment repair. ■

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INDEXES AND BINDERS

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Binders that hold twelve issues of *Television* are available for £6.50 each from Television Binders, 78 Whalley Road, Wilpshire, Blackburn BB1 9LF. Make cheques payable to "Television Binders".

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REED BUSINESS INFORMATION

TELETOPICS

Future of ITV

The future of ITV has been unfolding over the last month. First the government accepted the proposed merger between Carlton Communications and United News & Media following a five-month investigation by the Competition Commission, which recommended that the rule limiting any commercial broadcaster to no more than 25 per cent of total national TV advertising should be dropped. Instead, the Commission recommended that no company should control more than two of ITV's most profitable franchises (Carlton, LWT, Meridian and Central). The Carlton-United merger was then promptly abandoned, as United's Meridian franchise, covering southern England, would have had to be sold.

At this point Granada Media stepped in and reached agreement to buy United's ITV interests (Anglia, HTV and Meridian) for £1·75bn (£500m in cash plus £1·25bn in Granada Media shares). To comply with the new Competition Commission rule, Granada will have to sell the HTV franchise, which could well go to Carlton.

This leaves the UK's ITV services, apart from Border, Grampian, STV and Ulster TV, in the hands of just two groups. There has inevitably been speculation as to whether they might merge. In this connection the Competition Commission has ruled that there can be no further consolidation until ITV's share of total TV advertising falls below 50 per cent. It doesn't foresee this as being likely for at least five years. Meanwhile Granada envisages a move to multi-channel broadcasting, with a package of ITV-branded channels becoming available via SkyDigital, maybe as soon as next year. ITV is not at present available via satellite.

BSkyB's progress

During the year to June 2000 the total net number of subscribers to BSkyB's channels increased by 1·5 million to nine million. Almost one in five (18 per cent) of UK households now subscribes to Sky. At the end of June there were 3·6 million digital and 930,000 analogue DTH subscribers – almost 80 per cent of Sky's DTH subscribers now take the digital service. As a result of this successful transition to digital operation, BSkyB plans to bring forward the date of the analogue service switch-off to August 2001 instead of December 2002. This move could save some £60m in transmission costs but would involve a one-off payment of about £30m for early contract termination. Current analogue subscribers continue to be entitled to the free set-top box promotion.

At July 25th, DTH subscriptions had risen to 3·8 million. Total DTH churn has fallen from 13·4 per cent in 1999 to 10·5 per cent, but the digital churn has increased from 2·1 per cent to 3·5 per cent.

BSkyB's revenues rose from £1·58bn to £1·9bn in the year to June 2000, the pre-tax loss falling from £388·7m to £262·7m. Once again the cost of subsidising free digital set-top boxes was a heavy burden. BSkyB is still focusing on subscriber growth, and expects to have over five million DTH subscribers by the end of the year. But emphasis will also be placed on increasing the revenue obtained from subscribers. Each Sky subscriber generated an average revenue of £287 in the year to end June: digital subscriber revenue was slightly higher at £300 each. Revenues should rise with the addition of commissions from e-commerce generated through Open and new services such as on-line betting.

BSkyB has increased its interest in Open to 80·1 per cent by buying the 35 per cent stake previously held by banking group HSBC and consumer electronics manufacturer Matsushita. BT retains a 19·9 per cent stake in the company. Open is best known for its home-shopping and banking services, which are available to BSkyB's digital subscribers. It also owns the set-top boxes. The new arrangement will give BSkyB greater flexibility in developing its services.

Sky plans to introduce a WML (wireless mark-up language) browser for every set-top box. This will give users access to selected internet content. The Sky text service will use the browser to offer e-commerce services.

The Thomson Scenium range is being increased to include extra-flat widescreen TV sets, TV models with integrated DVD players, rear-projection sets, digital camcorders, a new digital VCR (D-VHS), a VHS VCR, a DVD player and an amplifier-tuner. There's also a range of clip-on frames in seven colours to go with the TV sets, enabling them to be personalised to suit domestic conditions. The improved Thomson Scenium extra-flat CRTs use tension-mask technology to provide a totally flat image without distortion. Different models have either 100Hz Digital Motion Mastering or 100Hz Intelligent Mastering to reduce flicker and increase picture stability.The mini DV camcorder range includes two high-quality models, the VMD9 and VMD20, shown above. The ultra-compact VMD9 can be used to edit films and doubles as a digital camera.

STB shortage

Telewest has been forced to stop signing up new subscribers to its digital cable TV service because of a shortage of set-top boxes, which are obtained from Pace Micro Technology. According to Pace the problem is temporary, caused by a world-wide shortage of flash memory chips. Double ordering, which is common in the semiconductor device distribution industry, can exacerbate shortages.

FTV Cards

Since the beginning of June the issue of free-to-view channel cards for digital satellite TV viewing has been administered by BT Broadcast Services. The phone number for card authorisation remains the same (0870 243 8000). But because of the change it is no longer possible to use the digibox's modem to validate a card. BT has to be contacted to get Sky to send the trigger signal.

Pace's success

In the year to June 3rd Pace Micro Technology sold over two million digital set-top boxes. Turnover increased 106 per cent to £377·6m while pre-tax profits rose by 80 per cent to £27·3m. The main reason for this success was "exceptional growth" in the UK, the "fastest growing market in the world". Gross margins fell however, from 26·5 per cent to 19·7 per cent, because component prices didn't fall as rapidly as Pace had assumed and because of the company's determination to take the largest share of the UK's STB market – last year 92 per cent of Pace's business was done in the UK.

Pace estimates that twenty million digital STBs will be installed worldwide this year, and that the number will have increased to 70-80m annually by 2005. The company is increasing its overseas sales, with contracts to supply a minimum of 750,000 digital STBs to Time Warner Cable, 350,000 to Comcast Cable Communications and 200,000 to BellSouth Entertainment.

The company is developing an integrated hard-disk drive system for video recording in conjunction with NDS, which is owned by News Corporation, and has established technical agreements with a number of other companies including Microsoft. It is developing 'home-networking' technology in conjunction with automation and controls company Invensys. Home networking will interconnect items such as TV sets, PCs, telephones, washing machines and DVD players, with the digital STB providing a link to the outside world via the internet. This will enable utility and service companies (gas, electricity supply, etc.) to provide remote billing, monitoring, fault diagnosis, spares ordering and so on. Nokia and Whirlpool are also engaged in developing home-networking technology.

Hexa-Chain housed video monitors are now available for next-day delivery from Farnell. Designed for use almost anywhere, the TFT LCD monitors combine good screen quality (high brightness and resolution, with sixteen million colours), portability and ruggedness. Versatility in application is a key feature, with auto-switching between PAL and NTSC inputs, a voltage operating range of 10-30V and a temperature operating range of –30°C to +80°C. Fully CE marked, the monitors are available as 5·6in. panel mount or 6·4in. standalone units. Further information on the displays can be found in the Optoelectronics section in Book 2, Semiconductors and Passives, of the latest Farnell catalogue or on-line at www.farnell.com/uk. For sales enquires phone 0870 120 0200.

ONdigital reports

ONdigital reports that it had signed up 774,000 subscribers by the end of June, a rise of fifteen per cent since the last quarter, and says that it is on course to achieve its target of a million subscribers by the end of the year. Profitability will be attained once a subscriber base of three million has been achieved. The churn rate is very low, with just 15,000 customers cancelling contracts.

ONdigital will launch a TV-internet service this autumn, offering full internet access via a home TV system. The service, to be called ONnet, has the unique feature Cross Link (X-Link) which enables web pages to be viewed alongside the main TV picture. The ONnet service will use a 'Net-top' box developed by the French company Netgem. It plugs into the ONdigital set-top box and TV set via a scart connector. ONdigital says there are various ways of linking the Net-top box to a telephone line, including a DIY connection kit. An ONdigital internet portal, developed by BBC Resources and e-business consultancy Rubus, has been set up. ONdigital plans to launch a second-generation set-top box with built-in internet technology next year.

ONdigital has introduced six interactive services this year – digital text, e-mail, interactive advertisements, pay-per-view movies, games and home shopping. The DTT service now offers 53 channels, including 21 that represent 90 per cent of recorded multi-channel viewing. Population coverage has now increased to 70 per cent of households. There are 25 IDTVs on the market, and ONdigital's conditional-access module is expected to be available "soon".

Business news

In the year to April 29th **Dixons** turnover increased by 23 per cent to £3·89bn while pre-tax profits increased 104 per cent to £472·1m. The company's brown good sales increased by 16 per cent. Communications products sales grew "substantially", domestic appliance sales increased by five per cent, but the PC market increased in value by only a small amount, because of a fall in average prices. Sir Stanley Kalms, Dixons Group chairman, mentioned that "older technology" such as VCRs and TV sets had been subject to "significant price deflation".

The company is planning a major revamp of its Dixons format, with supermarket-style check-outs designed to increase sales of basic items and reduce staff costs. It has been testing the new format in four of its larger outlets, in Milton Keynes, Exeter, Cardiff and Ealing, and a further sixty stores will be refurbished before Christmas. There is also to be a redesign for the Currys chain.

Prima International has taken over sole distribution, sales and marketing rights for **Akai** brand products in the UK and Ireland. Akai UK Ltd., which previously distributed Akai products in the UK, has been placed in receivership. According to Prima substantial supplies of spares to support both old products and new have been arranged. Prima International Group Limited's address is Prima House, 4 Elland Road Industrial Park, Elland Way, Leeds LS11 0EY. Phone number is 0113 251 1500, fax 0113 251 1515. For service/spares phone 0113 251 1507. The company intends to relocate to a new purpose-built warehouse and office complex close to the motorway network in Leeds by April 2001.

Thomson Multimedia has reported a 175 per cent increase in first-half net profit to euro 84m on revenues 45 per cent ahead at just over euro 4bn. The major division, consumer products, achieved a euro 22m operating profit compared with a euro 35m loss in the corresponding period of 1999. The company says it shipped as many digital set-top boxes, 3·1m, as in the whole of last year. Its position in the European colour TV market continued to improve, with its share icreasing by 0·3 points to 9·4 per cent. The French government is to cut its stake in the company from 51·7 per cent to below fifty per cent.

The American experience

What can television repair people do now that repairing tellies isn't so viable? The US is a little ahead of us. Much of what is happening here has already happened there, so we asked Joe Carr* to report on how TV repairers there have evolved

What has happened to the business of consumer electronics repair? The brutal truth is that it has gone away – almost.

When I was young, in the 1950s and 1960s, there was a consumer electronics repair shop on almost every corner in the USA. In the valve era, there were an average of 2·4 faults per year on the average American television set. The economy was good, so everyone had a television set.

Many – perhaps most – American families had two or three sets. A shop could make a living just servicing television sets. In fact a number of people just serviced in the home, leaving the bench work for others. They would take the defective set to a 'job shop' that would service it for them.

In the early 1960s I made my living on two products only: car radios and Citizens' Band sets. Car radios in the early to mid-1950s used vibrator-buffer capacitor-OZ4 power supplies that were in constant need of servicing. A car radio would come in about every two or three years for the replacement of that particular combination of faults. And one could count on at least one other fault in the meantime!

But that went away...

The problem was the advent of solid-state equipment. At first, in the 1950s and 60s, the solid-state equipment wasn't noticeably better than the valve equipment. Early germanium transistors leaked or went open-circuit about as often as vacuum tubes had faults, so things were still profitable.

But solid-state got better and better. Today, with high-grade silicon transistors and integrated circuits, the fault rate of television receivers is said to be less than 0·02 per year.

Look at my own case. I've owned four television sets for many, many years without any fault that required servicing. This year, a small 14in. television that I used in the bedroom died – went completely black, like a fuse blew.

I paid only $149.95 for that television set twelve years earlier, so it didn't owe me anything. Even though the problem was probably a blown rectifier and fuse (it went out during a thunderstorm, something that happens a lot in my area) it wasn't worth repairing. Either my own time, or the $65 minimum fee that the local repair shop would charge, was not worth it. So I bought a new Sony television for less than $210.

The problem with the consumer electronics business is that the equipment does not breakdown anymore! As a result, one has to search for a consumer electronics shop, instead of picking the nearest corner and going to it to find a suitable shop.

My area – the northern Virginia suburbs of Washington, D.C. – has about thirty-five general consumer electronics shops, where in the 1950s and 1960s there were two-hundred thirty-five. The rest went out of business. That includes a shop I worked in as late as 1973. The owner retired. He owned the building and the one next to it and found he could make more money leasing the buildings to other businesses than he could in the consumer electronics trade!

Think about that for a minute. In about twenty-five years he went from a business that was good enough to support buying two commercial real-estate properties – with a total of five store fronts – to not being able to make a good living.

So what do US repairers do now?

So what do the American servicers now do for a living? Well some (a few) of them are still in the consumer electronics trade. Some barely make a living, while some do pretty well.

A few are into sales of television and other appliances, but those are few and far between. This is because the discount chains are able to sell television sets at retail for less than the small shop can buy them for from the wholesaler!

So, what is the servicer to do? Let's take a look at a few alternatives that keep one in the business of electronics servicing.

Cable-TV servicing. My local cable company uses contractors to perform about half of its service. This allows them to concentrate on things that matter to them, like providing the cable-TV service. It also makes it possible to deal with storm damage while servicing the individual customer accounts.

The service performed includes new installations, modified installations, service problems with the equipment in the house, and servicing of the distribution modules in the neighbourhoods. When I call the cable-TV company, odds are about 50-50 that a contractor will show up – all properly identified! – rather than a cable company employee. This activity is usually paid for on a per instance rather than a flat rate, although the pay rate is low (meaning you have to operate efficiently to make money!). It's also an activity that may be similar to what you are doing now.

Computer upgrading. In recent years a number of shops have gone into the business of doing computer upgrades. The modern personal computer (PC) is modular, and there are only a few basic configurations – with an almost infinite variety of printed circuit cards that go into them. That's a benefit of the PC being essentially an 'open system'.

Almost anyone with some electronic savvy can get into the trade, although it helps to have the basic knowledge. This basic knowledge can be had from correspondence schools such as International Correspondence Schools (http://www.icslearn.com) and the Cleveland Institute of Electronics (http://www.cie-wc.edu). Of these, I know that ICS operates in the UK, and has a PC repair and upgrade course on offer.

The computer upgrading business is highly competitive right now, and will be for the foreseeable future. But this doesn't mean that

*Joseph J. Carr is a Certified Electronics Technician

you can't make a living upgrading and repairing PCs. Typically, you can sell that user a new motherboard, plus a new hard drive and some memory chips. Often one can sell the plug-in printed circuit boards as well – for example, upgrading the video card.

Medical electronics. If you've been in hospital recently you will be well aware that hospitals are these days packed with electronics and other technology! There are electrocardiograph machines, electroencephalograph machines, bedside monitors, dialysis machines, defibrillators and may other items.

In addition, some doctors' offices have electrocardiograph machines and other medical electronic devices. And that equipment needs repairing from time to time. I was in the trade from 1973 until 1980.

There are several methods by which the medical equipment gets serviced: in-house repair facility, contractors, independents, and manufacturer. The in-house and contractor/independent may be the same in the USA. In the modern health care institution they may not care to mess with a biomedical repair department, so may contract it out.

The personnel are contractors, even though being based inside the hospital, or nearby. In any event, there may be opportunities for you in medical electronics.

There is a full service textbook that may prove useful to you in learning the anatomy and physiology, plus the technology involved. It is *Introduction to Biomedical Equipment Technology*, 4th Edition, by Joseph J. Carr and John M. Brown. Yes, I know I've plugged one of my own books, but it is literally the only book on the market that does the full job! You can buy it from Amazon Books (http://www.amazon.com).

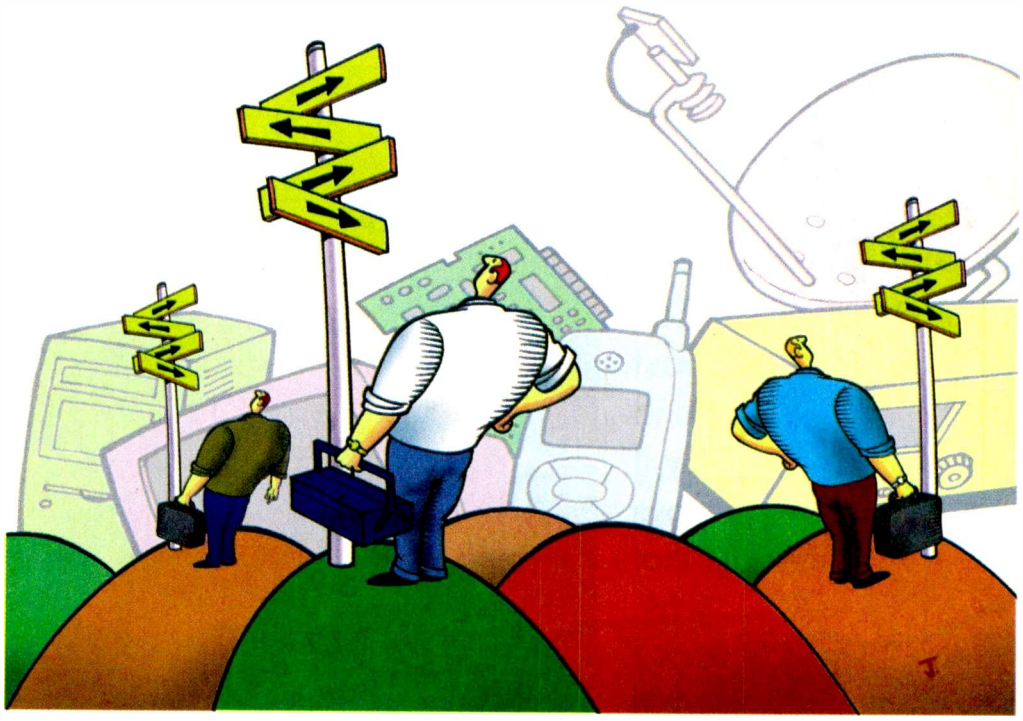
Keep in mind that today's litigious society means you could be sued if a device like a defibrillator fails to work... so get good insurance.

Industrial electronics. The modern factory is usually filled with electronics devices. Nearly everything is computer controlled. Also, there are many sensors and controllers that may or may not be computer controlled.

The upshot is that a service opportunity exists for the right person. Although many factories employ their own electronics talent, many others rely on outside service organisations to do the job. And that service contractor could be you!

Commercial electronics. This area includes many devices that look like television receivers and tape recorders – but the TV sets are closed-circuit. The fact is that this equipment sees more rugged use than the consumer equivalents, and requires some servicing.

Or, alternatively, you could be in the business of renting or leasing the equipment to others, and make servicing secondary to the main business. Last summer, when I was in



UK, I saw at the Heathrow Airport hotel where I was staying a truck that belonged to a company which leased LCD projectors... so it can be done.

Two-way radio repair. In the USA we have numerous shops selling and repairing two-way radio sets. There are fewer than in the consumer electronics trade, but they nonetheless exist. Although the Citizens' Band shop is going the way of consumer electronics shops, shops that sell and service VHF, UHF and microwave two-way radio sets seem to be proliferating.

At one time, you needed a licence from the Federal Communications Commission (FCC) to do any of this work, and you still do for certain categories of work. But there are many areas of servicing that are now open to any qualified person.

Keep in mind that 'two-way radios' includes VHF-FM and SSB HF single-sideband marine radios, aviation radios, as well as the land-mobile radios that everyone thinks about.

Cellular-telephone service. I suspect that the cellular telephone business is similar to the consumer electronics business in that high-quality products don't need servicing all that often, and are often thrown away rather than being fixed. Perhaps it's different in the UK, where cellular and PCS penetration is much greater than in the USA (we have unlimited regular telephone service, rather than metered service, so cellular is in general more expensive).

A friend of mine is in a business that's related to the cellular/PCS trade. He repairs and does the proof of performance tests on the transmitters located in the neighbourhoods. He contracts with cellular companies for the service that he performs. They pay him a flat rate for what he does.

He needs high-quality test equipment of course, such as Hewlett-Packard, Bird Electronics and Marconi signal generators, RF power meters, spectrum analysers, network analysers and frequency meters to do this job, rather than the lower-cost service grade instruments that are used in consumer electronics. The telecommunications revolution in progress is a made-to-order opportunity for you.

Antenna installation. Antenna installation companies install antennas. Period. They do not do other forms of electronic servicing. They operate trucks equipped with ladders, and install all forms of antennas. Included are VHF and UHF television antennas, TVRO antennas, Citizens' Band antennas, towers, tall masts and other forms of antennas and antenna related equipment.

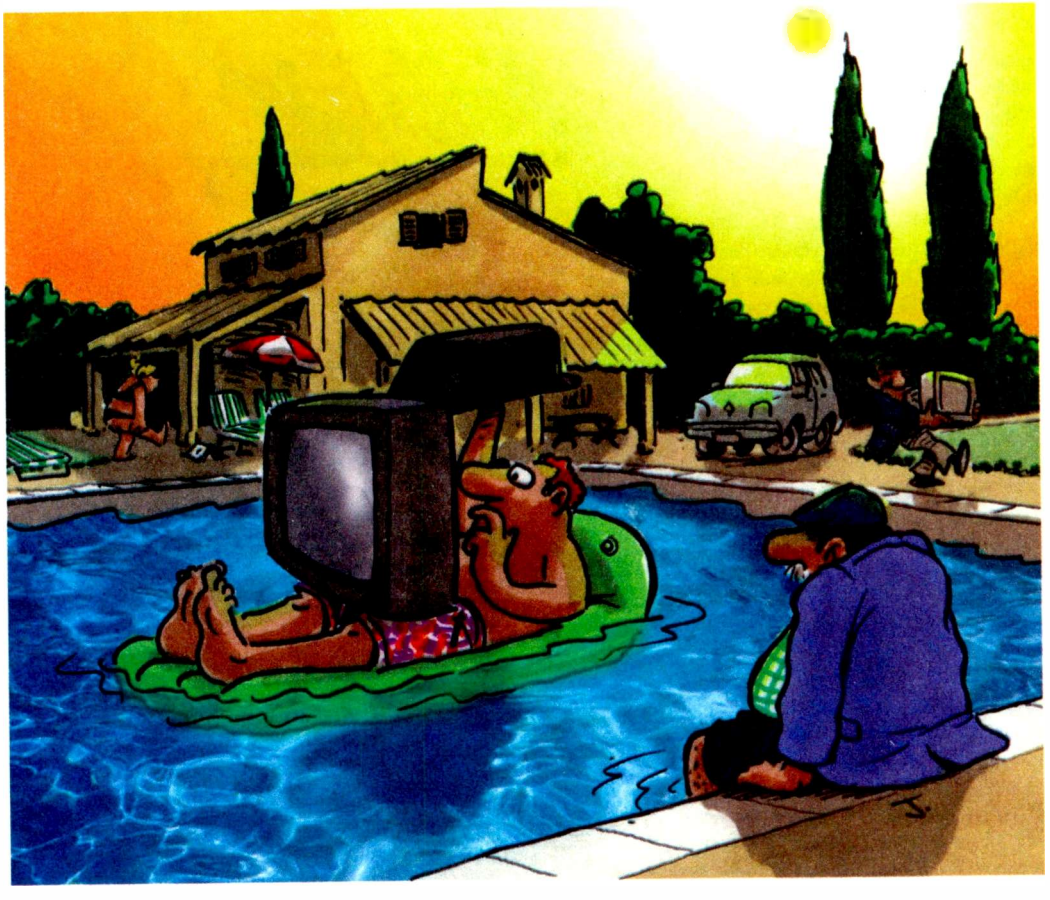
Direct broadcast TV. Television is available from more than just terrestrial broadcasters and cable-TV companies. Direct broadcast satellite-based television services involve TVRO-type installations that operate in higher frequency bands. Typically the dishes are about 18 to 30 inches in diameter. In addition there is a receiver involved.

There are basically two types of service in the USA. First there are companies that sell and service the equipment. They either service only what they sell, or service any other brands as well. Secondly there are companies that contract out to the sellers, servicing and installing the TVRO/DBS equipment.

In summary

There is no point in whining and moaning about the loss of business in the consumer electronics trade. It's a fact of life. We will not be able to go back to older business models. The reality is simple: to make any substantial money in this trade, you will have to adapt to a newer business model. ■

Holiday time, when you can forget all about TV sets and VCRs. Only it doesn't always work out that way. Donald Bullock's troubles started even before he got aboard the plane



WHAT A LIFE

It was time to return to Spain. Green-eyes and I were looking forward to a nice rest, away from TV sets and VCRs and the like.

"I don't want to see any television there" she said, "I just want to loll about in the sun and visit little Spanish restaurants and bars tucked away in sleepy fishing villages."

"But I suppose I'll have to face up to a bit of work" I replied. "There'll be the latest batches of whiskey to check out, and I'll have to make sure that the giant prawns are still up to standard. But no television pests or repairs. If anyone sidles up to me and says he's sorry to bother me but his set isn't quite right, and asks his missus what was on when it went on the blink, there'll be trouble."

The latest issue of *Television* arrived as the boys were preparing to take us to Birmingham airport. I picked it up to read on the plane, then off we went.

The Camcorder

As we were sitting in the departure lounge a fat fellow caught my eye.

"Excyowse me" he smiled, "but I see yoo're reedin a magazine oi like. Good, aynit?" He sat down beside me.

I gave him a watery smile and gazed around the room.

"That what a life column's crap though, aynit? Cor, I'd like to meet that Donald Bullock and tellim wot a prat he is."

I looked at him afresh and noticed a few things I'd missed previously. He had close-set, furtive little eyes, long straggly hair and a red nose. Not a nice fellow at all.

He smiled again. "Oim not in the trayde. They can't 'ang that on me. Oim a skilled man. Troipe dresser. You need skill to be a troipe dresser."

I smiled understandingly, cadged a humbug off Greeneyes and gave it to him.

"Oi 'ad a Samsung camcorder brought in the other day" he continued, "a VP-A20. Owner complained the dew indicator kept cummin on. Well they do, don't they? The dew sensor goes. I mean, I've 'ad it several times loike."

I gave him another watery smile.

"Anywise I did wot I olways do with 'em. Fitted another loading motor assembly."

I looked at him sharply. "A loading motor assembly?" I questioned.

He nodded. "Yow've got no choice but fit the complete unit. Didn't you know that loike?"

I smiled knowingly. "Oh yes, er, yes of course" I said.

He stood up, looked at me and walked off.

Greeneyes caught my eye. "Not a bad start to your 'no TV' holiday" she commented.

In the Plane

In the plane we were sat next to a lumpy looking fellow in a jerkin thing. He too noticed the magazine.

"I pokes about with tellies" he said, "it ent me job. I'm a cleanliness inspector. Come across a telly atopa noshbox the other day. Toshiba 175T9B if I remembers right. 'Ad a picture but a funny un. One minute 'e was tall, like this." He stretched himself and put up his hands, as though I had a gun. "An' the next 'e went down like this." He sort of crumbled, as if shot.

I gave him the fisheye smile. "We call it a field linearity problem" I said.

He ignored that. "Well, I went into the local telly shop and asted the chap what it was. Didn't want to know. After I'd called a few more times 'e gave me a condenser thing. Replace C317 with this un" he said. "I did, and it cured the problem. Here's the old un. Looks all right though, don't 'e?"

He showed me a 4·7µF, 35V electrolytic capacitor.

"Mendin' tellies is easy, ennit?" he added.

I looked at him then slipped the magazine to Greeneyes. "You have this, it

keeps getting me into trouble" I said.

The woman at the other side of Greeneyes smiled sweetly at her. "My husband's like yours" she said, "he's ever so clever."

"That's the first difference" I muttered.

The woman rattled on. "He's got a soldering iron thing and all. Mended our video the other day. It's an Akai. There were speckles over the picture, even on films from up town. We weren't going to go to any of them telly rogues and pay through the nose. Oh no. Did it himself for nothing."

I noticed that Greeneyes' eyes had glazed over. But the lady was now in full flight.

"Well, he said it was earthing spring trouble or something. Took the little printed panel thing off the top of that big round head thing, cleaned the spring and retensioned it with his fingers, then put it back together."

She leant forwards and half closed her eyes. "And do you know, that recorder thing came as good as new. Yes, as good as new. Now a shop would have charged us – I don't know what. A hundred pounds I expect."

When the woman had dozed off, Greeneyes asked if I knew about that one.

"It's a common fault with the Akai VSG770 and the other models in the range" I replied.

Paco's Bar

We arrived in the baking heat of Alicente airport and sloped off to Paco's bar. For once the televison set was silent. In fact it was missing off its high shelf.

Paco, who used to be an electrician, had the chassis half out of the cabinet on one of his dining tables. After pumping my arm and giving Greeneyes a big kiss he pointed to the chassis.

"This I no comprendo" he said. He beckoned me over and used his simple meter to check the set's line output transistor, which he had removed, showing me that it was short-circuit.

"So I buy this one" he continued, showing me the new one he had just fitted. "But the set – he still no work."

It was a Philips set fitted with the AA5 AB chassis.

"Stop" I said, "or you'll have another blown transistor." Then I checked at the back of the connector on the scan coils. Sure enough there were some dry-joints.

"Resolder these and try again, Paco" I said. He did, and the set worked.

"You very clever" beamed Paco. "I tell everybody and you will earn lots of money."

"Paco" I said, "don't breathe a word to anybody. We came here to eat and drink and relax."

Jose's Bar

A while later we arrived at our holiday home and set off for Jose's bar. Jose, who always has the latest Mercedes car, serves delicious prawns with garlic dishes. As we drew up I noticed a TV service van in the car park.

"Ah, justa the chap" cried Jose as we entered, "what do you think of this?"

Miguel, a young trainee TV mechanic, had just loaded the bar's television set into his van. Jose had also got him to have a look at his camcorder, a Panasonic NVM7B. The E-E results were normal, but it would play back only in black and white.

"I no good yet" Miguel told me, "I am new. Can you repair it?" He had partly dismantled the camcorder.

I shook my head. "I'm no good either" I said, as I peered into the chroma section. Then I noticed that there was virtually no solder at the collector of the chroma amplifier transistor Q8006. "Try a drop of solder here" I said.

He did, and it cured the trouble. In no time Greeneyes and I had a dozen giant prawns in garlic on a plate as large as a dustbin lid. Our table sat crowded with drinks.

"You very clever" cried young Miguel. "It is because you are old. Jose's television set, in the van, is another mystery. See this."

He ran to his van and returned with the set. It was a Sony model fitted with the BE2 chassis, which I know fairly well.

"This set too sometimes has no colour" Miguel said, "why I don't know."

The fault is fairly common with this chassis. It's often caused by a dirty trimmer in the colour decoder's reference oscillator stage. I dropped some switch cleaner on to it, twiddled it, then reset it precisely as before.

When Miguel tried the set the colour was back. "You want a job with my firm?" he asked, "I see my boss."

I put my hand on his arm and shook my head emphatically.

"I tell my customers about your skill" cried Jose.

"Not a word to a soul" I replied.

Syd

Greeneyes looked at me when we got back to the villa. "Some holiday" she said. "We've hardly arrived in the country and you've been doing nothing but carry out repairs, and all for nothing. Maybe life would be more peaceful if we went back to England and the shop!"

A knock on the door interrupted us. It was Syd, the old stick who looks after our pool when we're away.

"Good to see you two again" he breezed. "I've got our set in the car. The sound's all right, but the picture's gone all dark and murky. 'Ah' I told my missus, 'don't you worry. Don will fix it in no time when he gets back.' Then I see you draw up in your car. Talk about a bit of good luck! Still, it will help you keep your hand in, so to speak. Don't want to get rusty, do you?! Oh, an' Charlie South's got trouble with his video recorder and old Mrs Fluck's dish has blown down. I'll tell them you're back."

He danced out and returned with his set. It's a Panasonic, one fitted with the U5 chassis. We connected it up and I saw that the picture was as he said, dark and murky.

"You've got no luminance" I said, "no black and white content in the picture, only chroma – colour to you. There are just patches of low-definition colour." I started to dismantle the set.

"Where's this luminance thing gone then?" he asked, looking into the chassis. "It must be there. We ain't had the back off 'im. Never do."

I looked around the colour decoder section for signs of dry-joints, but couldn't see anything obviously wrong. The likelihood, it seemed to me, was that the TDA3562AP decoder chip was faulty. It handles just about everything in this area.

I decided to ask Syd to get himself one, and extracted it so that he could get an identical IC from a village dealer. "Accept only the same make of chip with the identical number on it" I told him. "That's important. A replacement might not cure the fault, but I haven't got much kit here and trying this first might save a lot of hit-and-miss work."

Off he went. He was soon back with an identical replacement. Once I'd fitted it there was a normal picture.

"Good" said Syd, "the missus will be pleased. Oh, by the way, I popped in on Charlie South for you and brought his video recorder along. He was thinking of taking it to the village, but I said 'no, Charlie, let old Don do it. He ain't got nuthin to do out there and is sure to appreciate the chance to do something.' Many folks don't think, Don. They don't know what it is to be bored."

He ran out to his car, leaving me wondering whether a series of perfect murders might really be possible. But I concluded that I didn't have the time, what with so much stuff to repair.

The Orion D4500

The recorder was an Orion D4500. Its deck is used by eight or nine other brands, including Saisho, Matsui, Tatung, Bush, Alba and Amstrad. Its faults were frightening. For a start, it was intermittent mechanically. When it did work, it sometimes failed to load, or it loaded but then wouldn't unload. Even when all these functions were right it wouldn't always fast forward or rewind or both.

The only common factor I could think of was the mode switch. I took it out and cleaned it, then refitted and reset it. This cured all the troubles.

"Well, that's the last job I'm doing this trip" I announced. But Greeneyes didn't hear me. She was deep into an Agatha Christie book. I noticed that its title was Ten Little Niggers.

"I've got a wheeze" I said. "Shall we arrange a little get together for a few of the folks we've encountered of late?" ■

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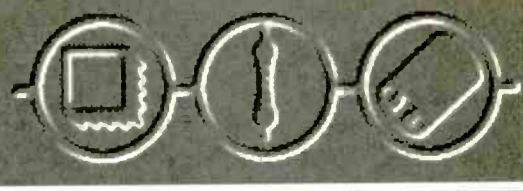

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MODEL	KIT TYPE	ORDER CODE
ALBA		
1452T	PSU	ONWAKIT
1427T	PSU	ONWAKIT
1402	PSU	ONWAKIT
1455T	PSU	ONWAKIT
1456T	PSU	ONWAKIT
1458T	PSU	ONWAKIT
1459T	PSU	ONWAKIT
2002	PSU	ONWAKIT
2009B	PSU	ONWAKIT
2052T	PSU	ONWAKIT
2152T	PSU	ONWAKIT
CTV501	PSU	ONWAKIT
CTV701	PSU	ONWAKIT
CTV840	PSU	ONWAKIT
CTV841	PSU	ONWAKIT
CTV485	PSU	ONWAKIT
AKAI		
CT1417	PSU	ONWAKIT
CT2159U	PSU	ONWAKIT
CT2162UNT	PSU	ONWAKIT
CT2863UNT	PSU	ONWAKIT
GOODMANS		
147TT	PSU	ONWAKIT
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
F16 CHASSIS	FRAME	GOODKIT1
F16 CHASSIS	LINE	GOODKIT1
F16	PSU	GOODKIT1
F16	VIDEO	GOODKIT1
GRUNDIG		
CUC 7350		GRUNDIGKIT1

MODEL	KIT TYPE	ORDER CODE
HINARI		
HIT14RC	PSU	ONWAKIT
JVC		
AV29SX1EK	FIELD O/P KIT	JVCKIT1
AV29SX1EN	FIELD O/P KIT	JVCKIT1
AV29SX1EN1	FIELD O/P KIT	JVCKIT1
AV29SX1PFF	FIELD O/P KIT	JVCKIT1
AV29TSIE1	FIELD O/P 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		GRUNDIGKIT1
21V1T		GRUNDIGKIT1
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
CT28AX1BD	PSU	MITSKIT3
CT28AV1BDS	PSU	MITSKIT3

MODEL	KIT TYPE	ORDER CODE
MITSUBISHI continued		
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
NEI/NIKKAI		
CE25 CHASSIS	PSU	NIKKAIKIT1
C289FTXN	PSU	NIKKAIKIT1
C28F41FXN	PSU	NIKKAIKIT1
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
PHILIPS		
310.10708		PHILKIT3
310.20491		PHILKIT2
310.20496		PHILKIT10
310.31994		PHILKIT6
310.32252		PHILKIT5
310.32253		PHILKIT4
310.32254		PHILKIT9
310.32255		PHILKIT7
310.32262		PHILKIT8
310.62264		PHILKIT1
ANUBIS A	SOPS	PHILKIT2
CP110 CHASSIS	SOPS	PHILKIT8
G90A CHASSIS	SOPS	PHILKIT10
G90B CHASSIS	SOPS	PHILKIT10
G110 CHASSIS	SOPS	PHILKIT3
GR2.1 CHASSIS	SOPS	PHILKIT1

MODEL	KIT TYPE	ORDER CODE
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D-16 CHASSIS	SOPS	PHILKIT6
HSM VIDEO	SOPS	PHILKIT5
JSM VIDEO	SOPS	PHILKIT4
KSM VIDEO	SOPS	PHILKIT9
LSM VIDEO	SOPS	PHILKIT7
SAMSUNG		
CI5944	FRAME OUTPUT	SAMKIT2
CI6844	FRAME OUTPUT	SAMKIT2
VIK310	PSU	SAMSUNGKIT
VIK320	PSU	SAMSUNGKIT
VIK350	PSU	SAMSUNGKIT
VI375	PSU	SAMSUNGKIT
VI395	PSU	SAMSUNGKIT
WINNER 1	PSU	SAMSUNGKIT
SHARP		
51CS03H	POWER / LINE	SHARPKIT1
51CS05H	POWER / LINE	SHARPKIT1
59CS03H	POWER / LINE	SHARPKIT2
59CS05H	POWER / LINE	SHARPKIT2
59CSD8H	POWER / LINE	SHARPKIT2
66CS03H	POWER / LINE	SHARPKIT2
66CS05H	POWER / LINE	SHARPKIT2
66CSD8H	POWER / LINE	SHARPKIT2
THOMSON		
35029400		THOMKIT2
35065920		THORNKIT1
FV70	PSU	THORNKIT1
ICC7 CHASSIS	TDA 8178FS	THOMKIT1
ICC7 CHASSIS	FRAME KIT	THOMKIT3
ICC8 CHASSIS	TDA 8178FS	THOMKIT1
ICC8 CHASSIS	FRAME KIT	THOMKIT3
R3000	PSU	THOMKIT2
R4000	PSU	THOMKIT2

ORDER CODE	PRICE
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GOODKIT1	£ 11.00
JVCKIT1	£ 11.00
MITSKIT1	£ 3.00
MITSKIT2	£ 15.00
MITSKIT3	£ 6.00
NIKKAIKIT1	£ 12.00

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Samsung TV	RCUNI07
Toshiba TV	RCUNI08
Ferguson TV	RCUNI09
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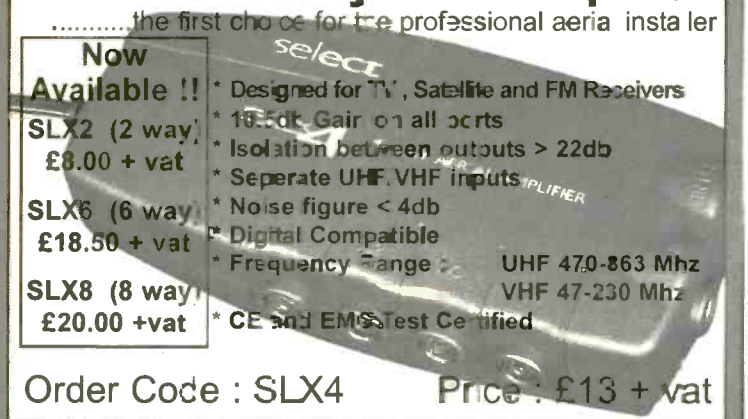

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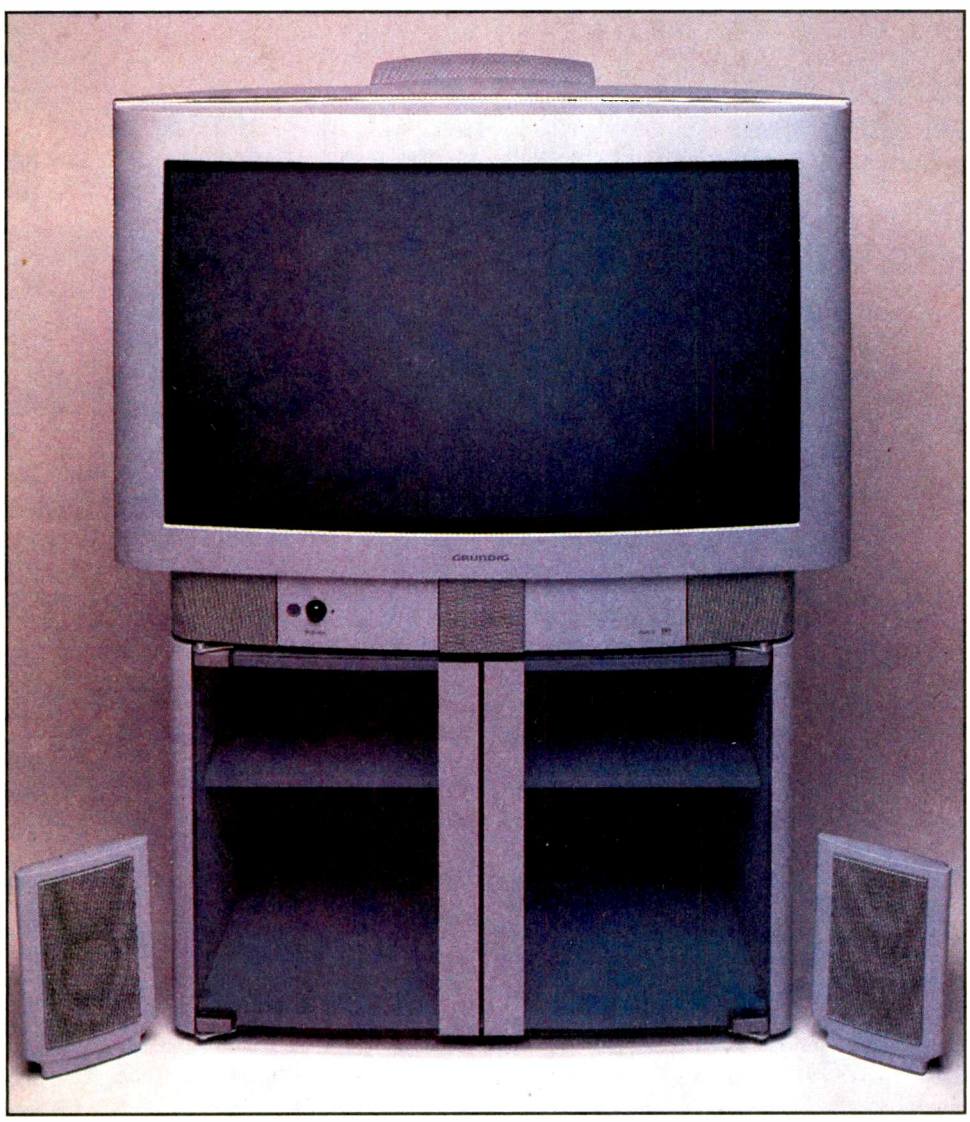
The Grundig Arganto IDTVs

Integrated digital TV receivers have not sold well to date, mainly because set-top boxes are 'free'. They nevertheless represent the way in which TV receiving equipment will evolve. Ian Martin has given a Grundig IDTV a thorough test and reports his findings



The success of digital TV has spawned a second generation of products: the TV set that incorporates a digital satellite or terrestrial receiver, commonly known as an integrated digital TV set (IDTV).

Combined products have not been all that successful in the past. The number of combined TV/VCR units sold remains quite small, and TV sets with an integrated analogue satellite tuner are no longer available. The IDTV is a different matter however. As the future of broadcasting is digital, it's only natural that digital tuners should be integrated within TV sets, indeed before very long it will be necessary.

The technology is still fairly new. Those who bought early IDTVs could end up with something that can't be upgraded. Another point to consider is how well the two separate electronic systems are integrated. While full integration means seamless operation, it may limit the range of features that can be provided or the connectability of units.

The setmakers certainly believe that integration is the way to go. TV sets with an integrated terrestrial digital TV tuner are currently available in the Grundig, Hitachi, Panasonic, Philips and Sony ranges, while LG has a set with an integrated Sky digital receiver. These sets are all of the widescreen type.

Having previously reviewed a first-generation ONdigital set-top box in these pages, I decided that it would be interesting to try out one of the current IDTV sets and see how the features and operation compared. I was lucky enough to obtain from Grundig a loan sample of one of the models in the company's new Arganto range, which consists of four models, two with 28in. and two with 32in CRTs, with either normal stereo or Dolby Pro-Logic surround sound. The set comes with a flat-packed video cabinet, rear channel speakers (Dolby

models), a remote control handset and loopthrough aerial cable.

Features

The set and video cabinet are finished in a pleasant light grey with silver trim, not unlike some well-known Philips models. It has small, front-mounted left and right speakers and a sub-woofer in the top of the back cover. This arrangement is compatible with normal and Dolby sound. A small pop-out front panel houses phono connectors for a video game or camcorder. This panel also houses the only set-mounted controls – the program and channel up/down buttons – and a headphone jack. There's a status LED alongside the main switch: it comes on in red, green or yellow depending on whether the set is in low-power standby, on, or receiving MHEG data respectively. MHEG stands for Multimedia and Hypermedia Experts Group, an ISO standard for interactive digital services that are designed to be host independent.

All set functions are controlled via the remote control handset and an extensive on-screen display system. The handset is a typical Grundig design. It will be familiar to those who use Grundig's satellite receivers and VCRs, and will also control these products. There is no learning or pre-programmed memory for other brands.

All the models in the range have the same tuning abilities: a conventional multiband VHF/UHF/cable tuner plus a UHF digital tuner. The analogue part of the set provides reception of PAL B/G/I signals, with Nicam stereo sound, FLOP/Fastext, PAL/modified-NTSC tape playback and auto/manual picture aspect ratio selection. The set's German parentage means that reception of Zwietone stereo sound and TOPtext are also included.

The digital tuner provides MPEG-2 video decoding with stereo sound and auto/manual aspect ratio selection. It's said to be able to provide full MHEG text and interactive services when these become available. At present only non-MHEG features such as subtitles, the electronic programme guide and program information are in operation.

The set has two rear scart connectors. The first is intended for connection to a VCR, providing normal or S-video inputs, and as a monitor output for the digital tuner. The second one supplies a monitor output and can be used for VCR dubbing: either two standard or two S-VHS VCRs can be connected via on-screen menus.

Also at the rear are two aerial inputs and one output. The aerial is connected to the digital tuner input, then the supplied aerial patch cable is used to route the aerial input from the digital to the analogue tuner. In addition, this panel has a modem socket for interactive services, an RS232 serial data port, and a dual common interface socket for the ONdigital and interactive service modules.

Surround-sound equipped models have a Dolby Pro-Logic decoder and four-channel amplifier that drives the integrated left, right and centre speakers plus two surround sound external speakers. The latter are attached via sprung terminals. If you don't want to connect the rear speakers, set the TV audio to the Dolby 3 mode.

When I worked through the on-screen menus I found that the set also has a built-in ten-event timer for unattended digital recording via the AV1 socket. As the last-selected digital channel remains available at AV1, it's possible to start a VCR manually then watch a different analogue channel.

Other features include a sleep timer, a 'volume equaliser' that's designed to minimise the volume difference between programmes and commercials, and a parental lock that can be set for individual digital channels or the whole set.

Setting Up

Why have three aerial connections? My first thought was that it was to allow RF loopthrough of the analogue and RF-converted digital signals to a VCR, then back to the analogue tuner. This isn't so however, as there is no RF conversion of the digital signals. The reason for the loop is so that the digital tuner receives a 'pure' signal from the aerial. The analogue signals looped through the tuner then travel via the supplied patch cable to any other equipment – VCR, satellite receiver etc. – before returning to the analogue tuner. This means that to record a digital programme scart socket AV1 must be used.

With all the wires connected, what about the viewing card? At the time this was written in June the common interface module to plug into the TV set's common interface slot was not available. Once it is, it will be possible to receive subscription services such as Sky 1 or provide home shopping.

I was happy to find that Grundig has satisfied my preference for products that have a detachable mains lead. Time to switch on.

Tuning

I decided to switch the set on and let it tune in all the available channels automatically. Auto tuning starts with the digital channels and is rather time consuming – it takes a good fifteen minutes to scan and store all the channels. This is slow in comparison with first-generation set-top boxes, and the progress information is minimal. When channels are found, they are stored in the order in which they are found. They are easily edited to give the usual BBC1, BBC2, ITV etc. format however. This is done using the on-screen display 'sort' function. All the free-to-air channels were received.

The subscription channels were also stored, but will remain black until I obtain the common interface module. As there is little reference to this module and nothing about subscription services in the manual, I imagine that many new users will reach for the telephone at this point (we understand that the module is due to be incorporated as standard very shortly – JAR).

Tuning continues with the analogue channels. This takes a further five minutes, with the channels again stored in the order in which they are found. The search covers Bands I and II and cable before moving to Bands IV/V then hyperband. After this you have to manually sort and name the channels as required.

Once you are familiar with the set you can search just the UHF band or manually tune and edit channels. This is preferable. The search/store procedure saved many weak signals from local relay stations. These had to be deleted.

One interesting feature is that the digital and analogue channels are stored in different memory 'banks'. Toggling between the digital and analogue channels is carried out by pressing the yellow text key. It makes picture comparison between analogue and digital channels with the same programme, where available, easy!

Adjustments

There are separate colour, contrast and brightness adjustments for analogue and digital channels. There's also a sharpness adjustment with analogue programmes. In addition colour tint control is provided when replaying modified-NTSC signals.

The screen format can be manually switched between 4:3 (standard), 'Panorama' (a selective horizontally-stretched mode), 16:9 (widescreen) or 'Cinema' (zoomed to fill the screen). Unless the broadcaster transmits the relevant widescreen flag, the default mode for analogue channels is Panorama. So far I have seen only Channel 4 do this. Obviously true anamorphic widescreen images cannot be broadcast: they would appear stretched on normal-format screens. Thus Channel 4's widescreen flag really tells the receiver to display the image in the Cinema mode, reducing the vertical resolution. The BBC appears to be more sensitive to possible viewer displeasure with widescreen display of its analogue service, and tends to transmit partly letterboxed images of 14:9 aspect ratio within the 4:3 aspect ratio screen.

For digital channels the default display mode is also Panorama, with reliance on the broadcaster to transmit the correct flag. The BBC, ITV and Channel 4 seem to transmit a widescreen flag only when the programme is in this format, so the set displays non-widescreen material in the Panorama mode. Only ITV2 appears to transmit the correct flag at all times, with 4:3 material using the centre of the screen, 16:9 material the whole screen and, occasionally, 14:9 images using a compromise. Channel 5 has yet to broadcast in true widescreen format, so every programme is

stretched horizontally unless changed manually. These conditions may have changed by the time this article is published.

Personal preferences play a part: do you want a full screen or do you want the correct aspect ratio? Sometimes this choice is not so easy, and a world of squat, fat people becomes familiar!

Teletext

Analogue text reception in Pan-European, with both UK FLOF/Fastext and German TOPtext available. A decent though unspecified amount of built-in memory makes multipage storage possible.

The manual makes no reference to digital text, though it does mention that new software will be sent over the air automatically. At present, digital teletext is compatible with only Pace and Philips set-top boxes.

Other digital services such as the EPG (electronic programme guide) and subtitles are available.

Connections

It is recommended that connector AV1 is used with a VCR as it provides the digital tuner output. One of the on-screen menus enables the output to be set to feed either a standard VHS or an S-video recorder. Could this be the very first implementation of an S-video output from a digital receiver? The feature is a long-standing omission with all first-generation set-top boxes. AV1 also accepts RGB inputs: presumably the presence of the fast-blanking signal at pin 16 of the connector changes the input configuration from S video to RGB.

A second VCR can be connected to the AV2 connector to prove tape dubbing, even while viewing a different channel.

AV3 on the front panel is interesting. It has auto input detection, which switches the set to display the signal available, but doesn't have an S-video input, so that the best quality from many camcorders cannot be reproduced.

Any AV input can be assigned to wake the set from standby. This feature could be used with a surveillance or baby monitor camera.

Both scart sockets comply with the widescreen 'slow-switch' signal at pin 8. So, using a compatible VCR, it's possible to record and playback video in true anamorphic widescreen. This feature is also useful while viewing the output from a compatible DVD disc, the full resolution being used to fill the screen rather than using the diminished resolution of a letterbox signal.

The Manual

I wouldn't normally mention this, but as well as a number of spelling mistakes the manual contains a badly-worded and incorrect description of the different picture aspect ratios. The differences between widescreen, letterbox etc. modes can be difficult enough to explain to a customer, but the manual gets them totally wrong. I am available to write user manuals!

Nothing is said in the manual about subscription services. The availability of these depends on the availability of ONdigital's common interface module. After waiting over a year without seeing full digital teletext, e-mail and internet services I'm not holding my breath.

Curiously the manual does have a little to say about MHEG, describing it as delivering text and home shopping by "the end of 1999". It fails to mention that the interactive functions require the use of the modem cable and the appropriate CI module.

Performance

The original manufacturer's settings gave a poor result, with excessive contrast causing image blooming. The sharpness (analogue programmes) is backed off too far, putting it at a disadvantage compared to digital reception. Judicious adjustment can produce an excellent picture. It is impossible to get exactly the same results with both digital and analogue channels however.

As the set makes comparison between analogue and digital channels so easy, it was difficult to avoid doing just that. In this respect the set performs as you would expect. Basically, digital pictures are cleaner and smoother than analogue ones, but analogue pictures can have better resolution and sharpness.

As this is a widescreen set, digital is the more attractive option – it presents widescreen programming better. Channels such as BBC Choice, the Learning Channel and News 24 are always widescreen and are not available in analogue form, so I suspect that the digital tuner will be given greater use. But my domestic cable network has four added channels from other sources, and digital currently has no teletext, so I used a mixture of both. It's a shame that you cannot mix analogue and digital programme positions.

Slight ringing was visible with a grey background. This was not video ringing; the cause probably being insufficient line output transformer damping. A good point is that the image exhibits very little preshoot and overshoot, even with enhanced picture sharpness.

Another plus is the picture geometry, which remains excellent whichever aspect ratio is selected – bearing in mind that the Panorama mode is deliberately non-linear in the horizontal plane!

Tuner sensitivity is excellent, though I felt that there is more video noise than I am used to with analogue signals. Maybe I am becoming slowly corrupted by the 'cleanliness' of digital video. But the analogue tuner managed to pull in four channels from Stockland Hill in Cornwall, a trip of nearly a hundred miles over water here. Similarly the digital tuner pulled in an unexpected out-of-region digital multiplex on channel E22: my Pace ONdigital receiver couldn't get this.

Operation

The merging of the digital and analogue receivers was relatively seamless although, as mentioned above, channel mixing would have been nice. I understand that the Grundig TV chassis is manufactured in Germany while the digital tuner comes from Grundig's Welsh factory. Given this lack of common origin, the convergence of the two into one package is remarkable.

Combining the two did result in some limitations. I missed an RF output from the digital tuner. This would be unnecessary however if all TV sets were equipped with a digital tuner.

The digital tuning meter provided more information than that available from first-generation set-top boxes. In most cases it indicated the signal strength, signal quality and available channels, with the multiplex name shown.

Domestic Considerations

Time to apply the cast-iron test. I like technology for the sake of it, while my wife watches TV. She didn't like the widescreen format (it was a "waste of space"). She also thought that the picture took too long to appear. I hadn't noticed this but, when timed, it took a whole twelve seconds – almost long enough to cook diner in today's instant society.

I didn't mean to comment on widescreen TV, which is thought of and thus sold as a benefit of digital TV. I have to admit that I feel I'm missing something with a 4:3 image, but I am a LaserDisc/DVD watcher rather than a TV viewer. I am not yet convinced that 16:9 is the best solution, as it results in an increase in 'real estate' without an increase in absolute picture size.

A 28in. widescreen TV set produces a picture that's only half an inch taller than that produced by a conventional 21in. set. And with a big 4:3 screen you can see a perfectly good 16:9 image in letterbox form. I accept that as more and more widescreen programmes are made and more and more widescreen sets appear my view will doubtless change! These are general points however, not criticisms of this Grundig receiver.

There are a some good points and a few bad ones with the Grundig receiver. The set has S-video output, which means that S-VHS and future D-VHS recorders will be able to record the separated analogue video signals. But there's no S-video camcorder input. DVD enthusiasts will no doubt like the anamorphic playback, but they will miss the facility for a pure NTSC signal input.

When you consider the basic design however the set provides good-quality analogue and digital TV reception, with no real limitations imposed by the fusion of the two units – other than the short-term lack of subscription channels. ■

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1N4936	2SC3425	AN7190K	BC848C	BU406	CD4094	P600A	TAA550B	TDA8138
1N5062	2SC3795A	BA157	BC850C	BU426A	CNX62A	P600J	TAA611CX1	TDA8140
1N5400	2SC3807	BA158	BC858	BU500	CNX82A	P6KE130A	TAA761	TDA8145
1N5401	2SC3885A	BA159	BC858	BU506D	CNX83A	P6KE180A	TBA120U	TDA8170
1N5402	2SC3892A	BA39108	BC858B	BU506DF	CNY17F	R2KL	TBA820M	TDA8171
1N5404	2SC3953	BA3918	BC858C	BU508A	CNY75B	R2M	TBA920	TDA8172
1N5406	2SC3955	BA4558	BC859A	BU508AF	D2VREM	R4050	TC154AP	TDA8175
1N5408	2SC39738	BA5406	BC875	BU508AFI	DCREG	RG2	TDA1013A	TDA8178FS
1N5822	2SC4231	BA5412	BCY59	BU508APH	DTA114ES	RGP10G	TDA1013B	TDA8179S
1N914	2SC4517A	BA6209	BCY71	BU508D	DTC124ES	RGP15G	TDA1018	TDA8180
2N2222A	2SC5129	BA6209N	BD131	BU508DF	DTC144EF	RGP15J	TDA1044	TDA8190
2N3055	2SC5149	BA6219B	BD132	BU508V	DTC144ES	RGP30M	TDA1060	TDA8218
2N3055H	2SC536	BA6247	BD136	BU806	FR605	S2000A	TDA1085C	TDA8350Q
2N3440	2SC945	BA321	BD139	BU807	FX749	S2000A3	TDA1170	TDA8380
2N3773	2SD1138	BAT43	BD140	BU908	H1000L	S2000AF	TDA1170N	TDA8391
2N3904	2SD1207	BAT85	BD234	BU405A	HA13119	S2000N	TDA1170S	TDA9503
2N4401	2SD1292	BAV20	BD241A	BUH515	HA13150	S2056AF	TDA1175	TEA1039
2SA1012	2SD1330	BAV21	BD243	BUH515D	HA13151	SA83035	TDA1519A	TEA2018A
2SA1013	2SD1398	BAX14	BD243C	BUH517	HM6251	SG264A	TDA1521A	TEA2029C
2SA1015	2SD1426	BC107B	BD244C	BUK444500B	IRFBC40	SGSIF344	TDA1524A	TEA2029CV
2SA1015Y	2SD1439	BC108	BD317	BUL54AR	JC501	SL1431	TDA1554Q	TEA2031A
2SA1016	2SD1441	BC108C	BD433	BUT11	KA2206	SR20N	TDA1557Q	TEA2164
2SA1020	2SD1453	BC109B	BD434	BUT11A	KA22066	STA441C	TDA1558Q	TEA2165G
2SA1020Y	2SD1497	BC141	BD435	BUT11AF	KBU602	STK4132II	TDA1675A	TEA2165A
2SA1145	2SD1541	BC182	BD436	BUT12A	KIA6210AH	STK4141II	TDA1904	TDA2260
2SA1302	2SD1545	BC182L	BD437	BUT12AF	KSR1004	STK4142II	TDA2005	TEA2261
2SA562	2SD1546	BC184L	BD438	BUT18AF	LA4282	STK4152II	TDA2006	TEA5101A
2SA673	2SD1548	BC212	BD839	BUT56A	LA4705	STK4192II	TDA2030H	TEA5101B
2SA683	2SD1554	BC212L	BD901	BUW11A	LA6324	STK5332	TDA2030V	TEA5170
2SA684	2SD1555	BC237	BD911	BUW12A	LA7116	STK5342	TDA2050	TIC106D
2SA733	2SD1556	BC237B	BD912	BUX84	LA830	STK5372H	TDA2541	TIC246D
2SA933	2SD1650	BC238	BDW94C	BUZ71A	LA832	STK5481	TDA2577A	TICP106D
2SA940	2SD1651	BC238B	BF199	BUZ77B	LA833	STK7253	TDA2578A	TIP110
2SA950	2SD1761	BC239	BF240	BUZ80	LA7835	STK730-060	TDA2579A	TIP111
2SA952	2SD1815	BC258	BF245A	BUZ90A	LA7837	STK7341011	TDA2581Q	TIP112H
2SA966	2SD1858	BC307	BF258	BUZ90AF	LA7838	STK7348	TDA2593	TIP120
2SA970	2SD1877	BC307B	BF324	BY127	LC7132	STK3907	TDA2611A	TIP2955
2SA984	2SD1878	BC308	BF420	BY133	LED3G	STR10006	TDA2653A	TIP29E
2SB1010	2SD1879	BC309B	BF421	BY184	LN1203N	STR11006	TDA2822M	TIP3055
2SB1143	2SD1884	BC327	BF422	BY227	LM317T	STR50020	TDA3301B	TIP31A
2SB1243	2SD1887	BC238	BF423	BY228	LM324N	STR50103	TDA3505	TIP41C
2SB560	2SD1889	BC337	BF458	BY229	LM339N	STR50103A	TDA3560	TIP42A
2SB649A	2SD2012	BC338	BF459	BY255	LM358N	STR5142M	TDA3561A	TIP42C
2SB688	2SD400	BC368	BF469	BY298	LM381	STR54041	TDA3562A	TIP761A
2SB774	2SD400F	BC369	BF487	BY299	LM386N	STR5412	TDA3565	TIP791A
2SB793	2SD467	BC372	BF494	BY399	LM29381	STR58041	TDA35768	TL072CP
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2SC1815Y	2SD965R	BC548	BF960	BYD33M	MC1310P	STRD6202	TDA3653CQ	UC3842
2SC1846	2SK1118	BC548B	BF970	BYV10-40	MC34063API	STV5730ST	TDA3654	UC3844
2SC2023	2SK135	BC548C	BF981	BYV27200	MCR100-8	STV9379	TDA3654Q	UPC1018C
2SC2120	2SK1507	BC550	BFR90	BYV95B	MJ15003	T6071V	TDA4500	UPC1025H
2SC2229	2SK241	BC550C	BFR90A	BYV95C	MJ2955	T9053V	TDA4503	UPC1032H
2SC2230	2SK30A	BC556A	BFR556A	BYV96D	MJE13005	T9064V	TDA4505E	UPC1365C
2SC2235	2SK526	BC5568	BR100	BYW96E	MJE18004	TA7140P	TDA4505M	UPC1378H
2SC2236	7407	BC557A	BRX49	BYW56	MJE3055T	TA7280P	TDA4510	UPC1394C
2SC2240	7805	BC557B	BSX20	BYW76	MJE340	TA7281P	TDA4600	UPC1488H
2SC2274	7806	BC558B	BT139600	BYW95C	MJF18004	TA7698AP	TDA4600/2/3	UPC1498H
2SC310	7809	BC558C	BT151500R	BYW96E	MJF18006	TA8205AH	TDA4601	UPC574H
2SC2314	7812	BC635	BTA08400S	BYX10	MJF18204	TA8207	TDA4601D	ZTK33B
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In-circuit electrolytic tester

Having explained how measuring the capacitance value of an electrolytic capacitor is pretty useless as a way of finding out whether it is doing its job properly, Cyril Bateman now describes a meter that *will* help you spot duds. What's more, his unique meter allows you to check without any desoldering.

This tester uniquely measures the tanδ of an electrolytic capacitor while it is still mounted on its printed circuit board. Knowing this value allows you to determine whether or not the capacitor needs to be replaced. The tester can also be used to check your stock of unused electrolytic capacitors.

Designed as an easy to use portable hand-held device, the circuit can be housed in a standard OKW plastic case. Powered by four AA cells, it provides acceptable battery life in normal workshop use.

Some protection against accidental connection of a charged capacitor is provided. But as you will appreciate if you have ever shorted a large, charged capacitor, worst-case protection is not possible in a small portable meter.

I have arranged the measuring circuit on two single-sided sub-boards, each approximately 85mm by 70mm, **Fig. 1**. These interconnect via a seven-way, flat, Nomex Flexstrip jumper cable.

On the 'bottom' board is the 100Hz signal generator together with the analogue current and voltage measuring circuits. The 'top' board contains the control and logic circuits which are fundamental to my tanδ meter design, together with a –5v converter and an isolated supply for the display module.

This first article describes control and logic circuits of the 'top' board. The 'bottom' board with the power circuits is the subject of a second article.

Electrolytic capacitors

Aluminium electrolytic capacitors are quite different in their construction and in their failure modes from any other type of capacitor. Usually, the capacitance value of a worn-out aluminium electrolytic capacitor is little changed from its original value. But the capacitor's series resistance and tanδ will be significantly increased. Capacitors measuring a high tanδ are worn out and should be replaced.

In normal use, aluminium electrolytic capacitors are self repairing. Defective areas in the oxide dielectric are replaced by new oxide growth.

Each self-repair consumes oxygen from the electrolyte. Ultimately, when there's no more oxygen available, this self-repairing action becomes the capacitor's wear-out mechanism[1]. Electrolyte conductivity is reduced, increasing the capacitor's equivalent series resistance, or ESR, at all frequencies.

At any chosen frequency, a capacitor's tanδ relates the capacitor's ESR to its capacitance value. Any increase of ESR results in a corresponding, easily identified, increase of tanδ.

This increase in ESR is analogous to inserting a resistor in series with the capacitor. The phase angle between the capacitor's voltage and current waveforms is reduced and the *CR* time constant and impedance of the circuit is increased.

These failure modes, together with in-circuit diagnosis methods, were discussed in the July and August issues of *Television*[2/3].

Why measure tanδ at 100Hz?

To control quality, each aluminium electrolytic capacitor is tested on the production line for tanδ at 100 or 120Hz, depending on the frequency of the maker's mains supply. Any that exceed the specified limits are rejected.

To maximise yields, the measured tanδ of typical new capacitors will be around 50% of this limit value. Many capacitor makers specify high-frequency impedance values, but these are not tested during the capacitor's production, **Table 1**.

The range of 100Hz tanδ measured for new, good capacitors, is extremely small, changing little with capacitance value or voltage ratings[4]. It rises from a low of 0.02 to a high of 0.2 for extremely large, low-voltage parts, **Table 2**.

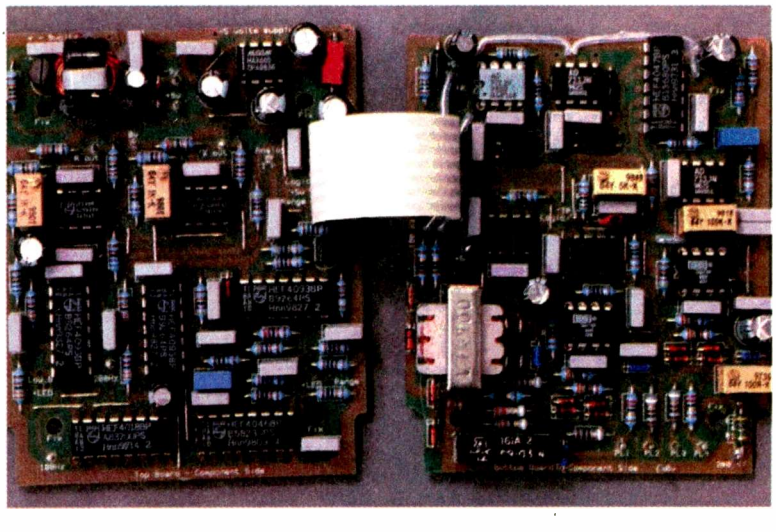

Fig. 1. Complete tanδ meter on two small interconnected boards, needs only a stable +5v supply. The right or 'bottom' board houses the 100Hz generator and the analogue front-end circuits. The left or 'Top' board is is the subject of this first article.

With aluminium electrolytic capacitors, tanδ increases rapidly as the capacitor wears out. It provides a sensitive, easily interpreted measurement. As a general guide, tanδ for typical good board mounted capacitors should be less than 0.1. Capacitors having a tanδ much greater than 0.2 should be replaced.

Good-quality commercial electrolytic capacitance bridges measure tanδ, but these can be expensive and not easily portable. Also, the test voltages they use may turn-on adjacent semiconductor junctions, making them of little use for service and repair technicians.

A meter for measuring the tanδ of a capacitor while it is mounted on its PCB needs to use a low test voltage via four-terminal contact-probes. Ideally, it also needs to be low cost, easily portable and produce a quick unambiguous measured result.

Unable to find such an instrument for sale, I resolved to build one.

How is tanδ measured?

To measure tanδ, you need the ratio of the capacitor's ESR to its capacitive reactance. You don't need to know the true value of either, only their relative values. This simplifies the task.

Accurate measurement of these individual values requires accurate control of the measurement current used and its exact frequency. When equating the ratio, the test current used is common to both parameters, so its value is not needed.

Unfortunately, since an electrolytic capacitor has only two terminals, it is not possible to directly access these resistive and reactive components. Circuit simulation however avoids such constraints.

Simulation

To investigate the effects of increased ESR for the previous article, I used PSpice to simulate a failed aluminium

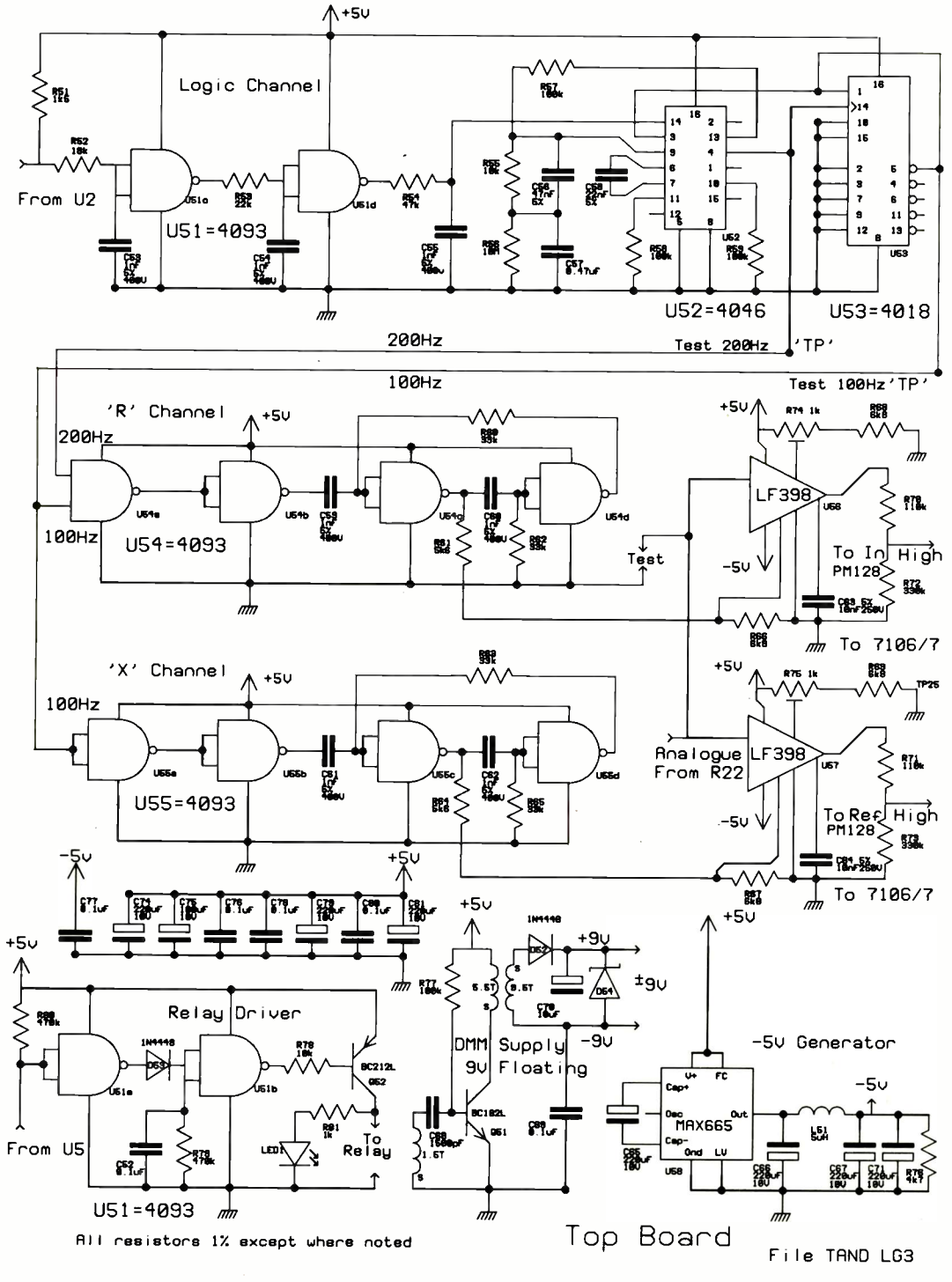

Fig. 2. Complete 'top' board schematic including the logic and control circuits, two LF398 sample and holds, floating 9Vsupply for the display and –5V generator for the analogue circuits.

electrolytic capacitor. In these simulations, ESR and capacitance can be treated as discrete components. Using a series *CR* circuit, I was able to explore the capacitors' internal voltages or currents, together with their relative phases[5].

I plotted the current and voltage waveforms for a variety of capacitor tanδ values. To illustrate a failed capacitor, I modelled a 1000μF capacitor with a tanδ of 0.4, equivalent to an ESR of 0.6366Ω. A low generator source impedance of 2.2Ω was used to identify the phase of the generator current.

Clearly, the phase angle between the voltage developed across the capacitor terminals and the source generator current is not 90°. It varies with capacitor tanδ or ESR and with generator source impedance. Hence it cannot be defined.

Current from the source generator is seen to be exactly in phase with the current passing through the capacitor. It is also exactly in phase with the voltage developed over the capacitor's series resistance or ESR. The voltage developed across the capacitor's reactance remains displaced in time by exactly 2.5ms. This is one quarter cycle, or 90° of phase at 100Hz.

The problem then becomes how to measure these two voltages. The only accessible voltage is that across the capacitor terminals, i.e. its impedance[6].

Measurements of impedance and the capacitor's current/voltage phase angle, could be used to directly calculate tanδ, but accurate phase angle measurement is not easy. Calculating tanδ from measured phase angles is simple using a pocket calculator, but difficult to automate for a portable test instrument[7].

In contrast, the division of two voltages can be provided simply by using a low cost DVM integrated circuit. The common '7106' chip measures your test voltage by comparing it with a fixed reference voltage. It displays the unknown voltage as a ratio of this reference, which is usually set at half the full scale voltage.

With voltage due to ESR applied to its input and the voltage due to reactance used as its reference, a 7106 will ratio these voltages, to display the required tanδ of the capacitor.

Using a PM128-type digital voltmeter module, this is easily arranged by removing two resistors R_2 and R_3, then connecting the reactance-related voltage to the pads that previously linked both resistors. The module now displays the result of dividing the ESR voltage by the reactance voltage.

Implementing the idea

I needed to generate two sampling waveforms, exactly 90° apart, one coinciding exactly with the peak of the generator's output current.

Several options were evaluated. Eventually I decided to double the signal's frequency, then to halve it to ensure an equal mark/space ratio. Applying some decoding logic to both frequencies would then produce the exact 90° phases I needed, **Fig. 2**.

The zero crossings of the test capacitor's current, detected using a comparator and output at TTL level, were used to generate a square wave coincident with this test current. These components are housed on the 'bottom' board so do not appear in this schematic, but they will be included in my next article.

High frequency noise was removed using three *CR* circuits. Output from the comparator was cleaned up using two Schmitt triggers.

The resulting waveform was doubled in frequency using phase comparator 2 of a 4046 phase-locked loop. This doubled frequency output was input to a 4018, configured to divide by two. These components are visible across the top of the schematic circuit, **Fig. 2**.

I obtained two square wave signals, each with equal mark/space ratios. The first is 100Hz and phase locked to the test capacitor's current. The second, at 200Hz, has rising edges coincident with the 100Hz waveform transitions. These signals satisfy the 'in100' and 'in200' waveforms in the simulation and are available at the 100Hz and 200Hz test points, as in **Fig. 3** and the circuit diagram.

These two square waves are decoded using a pair of dual input Nand gates, to identify the 90° and 180° points of the generator's current waveform. The rising edges of these decoded outputs are used to trigger two 80μs monostables which control the sample and hold circuits. The 'R' channel decoding and sampling pulse is produced in IC_{54} while IC_{55} provides the sampling pulse to the 'X' channel, **Fig. 4**.

The timing of these sampling pulses conforms with the 'R_{sample}' and

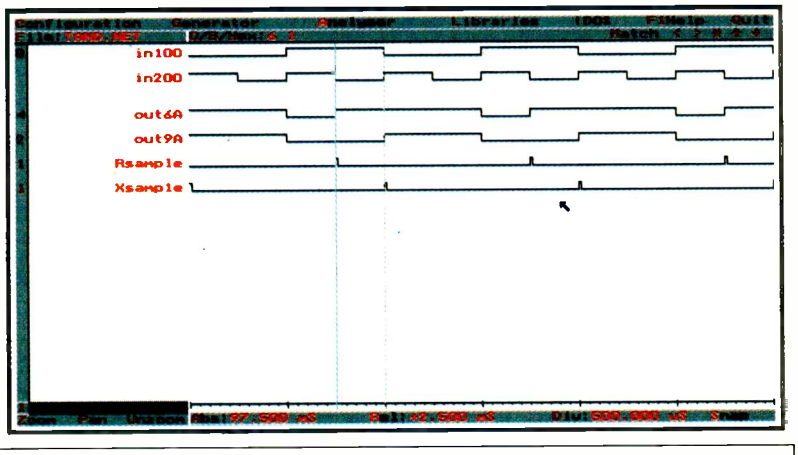

Fig. 3. This Pulsar simulation illustrates the method used to generate the logic control signals, from the original 100Hz test capacitor current and its doubled frequency. These brief sampling pulses are used to control the 'R' and 'X' sample and hold integrated circuits.

Table 1a). Typical impedance values of new stock capacitors measured at 100kHz – low capacitance values.

Capacitor	1μF	2.2μF	4.7μF	10μF	22μF	47μF	100μF
50V bipolar Al.	4.0Ω	3.2Ω	1.4Ω	0.9Ω	0.35Ω	0.3Ω	0.22Ω
63V polar Al.	4.3Ω	3.5Ω	1.8Ω	1.4Ω	0.5Ω	0.4Ω	0.28Ω
450V polar Al.	24Ω	11Ω	5Ω	3.8Ω	1.5Ω	1.0Ω	

Table 1b). Typical impedance values of new stock capacitors measured at 100kHz – high capacitance values.

Capacitor	1000μF	2200μF	4700μF	10 000μF
25V polar Al.	0.090Ω	0.07Ω	0.045Ω	0.022Ω
63V polar Al.	0.050Ω	0.025Ω	0.015Ω	0.010Ω

Table 2a). Typical tanδ values of new stock capacitors measured at 100Hz – low capacitance values.

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

Table 2b). Typical tanδ values of new stock capacitors measured at 100Hz – high capacitance values.

Capacitor	1000μF	2200μF	4700μF	10 000μF
25V polar Al.	0.06	0.075	0.09	0.1
63V polar Al.	0.03	0.05	0.06	0.07

'X_{sample}' waveforms shown in Fig. 3.

The LF398 sample-and-hold integrated circuit requires at least 20µs to acquire a sample. This minimum sample time requires a low value hold capacitor, liable to voltage decay at 100Hz.

Practical experiments using different hold capacitors with test capacitors of varying tanδ, indicated a 10nF hold capacitor with an 80µs sampling time gave the desired result.

The 'R' channel and 'X' channel sampled voltages from the LF398 circuits outputs, are divided in the modified PM128 module, to display the tanδ of the capacitor under test.

And yet to come...

Having devised a method to sample the ESR and capacitive reactance components in the test capacitor voltage waveform, I could now design the 100Hz generator, and the current sensing and voltage measuring circuits needed to complete the tanδ meter design.

These final stages will be detailed in my next article. ■

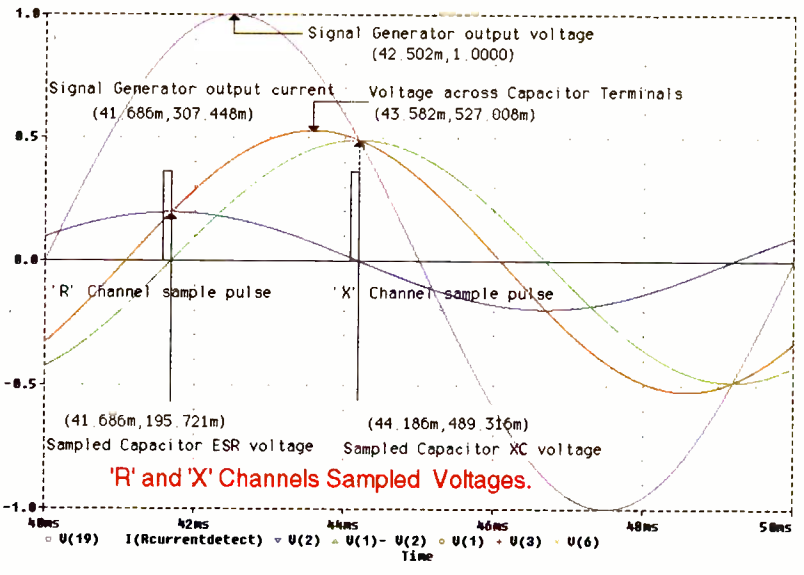

Fig. 4. The sample and hold logic control voltages, superimposed onto the August Television, *Fig. 4 simulation. These logic and decoding circuits, which were essential for my tanδ meter design, occupy over 60% of the measurement circuit's PCB.*

We'll be presenting enough information for you to make your own meter of course, but for those of you interested in a ready-built tanδ meter or a kit, send a stamped, self-addressed envelope to Cyril at Nimrod, New Road, Acle, Norfolk, NR13 3BD, for pricing details – Ed.

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What is DVC?

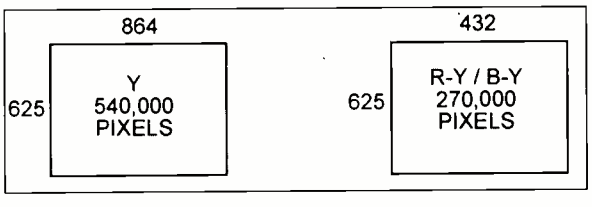
In this latest instalment in his new series Steve Beeching, I.Eng., describes the initial stages of video data processing in a DVC camcorder

The DVC camcorder is nothing like a conventional VHS-C or 8mm camcorder, though the deck is similar to an 8mm unit in overall operation and mechanical arrangement – but very much smaller. There are two rotary head tips, with an azimuth difference of ±20°, mounted on the 21·7mm diameter drum. Since the track pitch is 10μm (6·67μm in the LP mode), one fifth that with VHS, the tips are very thin and delicate. The drum rotates at 9,000 r.p.m., which means that the head switching signal is at 150Hz.

Signal Basics

With broadcast signal-component recording a system known as 4:2:2 is used. This means that there are four luminance samples plus two each (R – Y and B – Y) colour-difference signal samples. NTSC digital video uses 4:1:1, with the luminance signal sampled at 13·5MHz and the two colour-difference signals at 3·375MHz. With PAL digital video 4:2:0 is used. Because of the two-line sequential phase switching with PAL, the colour signal digitisation processing is line-sequential. So a more accurate description would be 4:2:0/4:0:2. Y sampling is at 13·5MHz, the colour-component sampling being at 6·75MHz. A line of R – Y is alternated with a line of B – Y (not unlike Secam).

Fig. 1: Total CCD imager pixel area.



The CCD imager used in a digital camcorder has 600,000 pixels, though only 540,000 are used, see Fig. 1. The rest are masked off and used as a black-level reference. For sampling, the imager's picture area is set at 720 pixels horizontal, 576 lines vertical, see Fig. 2. Each pixel is digitised as an 8-bit word, and there are 25 frames per second.

Y samples are therefore at 720 x 576 x 8 x 25 = 82·944Mbits/sec. This is approximately a horizontal resolution of 700 lines. For the colour components, only alternate pixels are digitised. So the colour samples are at 360 x 576 x 8 x 25 = 41·472Mbits/sec.

The total number of samples is about 124Mbits/sec. This is too much to record, so video compression is used. The complex digital compression reduces the data rate to 25Mbits/sec. Don't confuse this with the recorder's digital data read/write rate of 41·85Mbits/sec – the latter includes the audio and other data added to the signal stream

The serial data is obtained from the active video area of the imager only: syncs and blanking are removed and not restored until the AD converter at the output.

Camera Signal Processing

The pictures obtained from the CCD imager are in analogue form – they are voltage amplitude representations of the light falling on the pixels. These analogue samples are in matrixed form, produced by the green, magenta and yellow filters that are placed in front of the CCD array.

The first step is to matrix these samples to produce the basic luminance (Y) and colour-difference (R – Y and B – Y) signals. There are no other signal components at this stage – no syncs or blanking – just raw video. The timing control of this video is such that syncs and blanking can be easily inserted.

The camera's microcontroller and

SSG (Sync Signal Generator) chips generate syncs for insertion at a later stage, along with timing signals for imager scanning. Other digital timing signals are taken from phase-locked loops that are synchronised with the SSG's master oscillator. All digital clock lines, HD, VD and framing pulses, right up to the digital data being recorded on the tape, come from the SSG circuit and are synchronous.

The next step with the camera signal is to remove the noise and black-level components, leaving only pixels that represent the active signal area. These are subjected to a degree of analogue processing: AGC is applied, and the signal is clamped at black level.

The luminance signal array is 720 (H) by 576 (V) pixels, the array for each colour component being 360 (H) by 288 (V), half that of the luminance signal – in the horizontal direction only alternate pixels are sampled, only alternate lines in the vertical direction. To maintain maximum colour resolution, the horizontal lines are sampled alternately R – Y and B – Y. For example if lines 1, 3, 5 etc. are sampled for R – Y, 2, 4, 6 etc. will be sampled for B – Y. This is also true for the pixels in the horizontal direction. It results in say odd pixel number samples for R – Y and even for B – Y. The two colour-component sample sets together sample the colour component of *all* the pixels.

At this stage the bit rate for the data is:

Y = 720 x 576 x 8 x 25 = 82·944Mbits/sec,
Cr = 360 x 288 x 8 x 25 = 20·736Mbits/sec,
Cb as Cr giving a total of 124·416Mbits/sec.

AD Conversion: Macro Blocks

The pixels to be digitised are assembled in blocks of 64 in an 8 x 8 matrix, i.e. eight pixels horizontally by eight vertically. So for the active part of the picture there are 90 blocks (H) by 72 (V) for the luminance signal and 45 (H) by 36 (V) for the R – Y and B – Y colour components. These are called DCT blocks, see Fig. 3.

An R – Y and a B – Y DCT block are next assembled with four luminance blocks to form a macro block. This may appear to be strange at first, but remember that the colour-component samples are from alternate pixels, so there are twice as many luminance pixels in both the horizontal and vertical direction as there are colour components. Eight pixel samples by eight lines for a colour component covers the same picture area as 16 pixels by 16 lines of luminance samples. They have to be kept together as 4 + 1 + 1 to cover the same video picture area.

Super Blocks

After combining an R – Y and a B – Y DCT block with four luminance DCT blocks to form a macro block, an array of 27 macro blocks is assembled to form a super block consisting of 9 (H) by 3 (V) macro blocks, see Fig. 4. This is done before data compression takes place.

The whole picture can now be arranged as an array of five H by twelve V super blocks, see Fig. 5. Once they have been digitised and the data has been compressed, each row of five super blocks will occupy one video track on the tape. This is how the video picture, once compressed, is recorded on the tape as a frame consisting of twelve tracks – each track has five super blocks.

To summarise, a TV frame consists of twelve vertical sections, each of which occupies a video track on the tape. Each of the twelve vertical sections contains

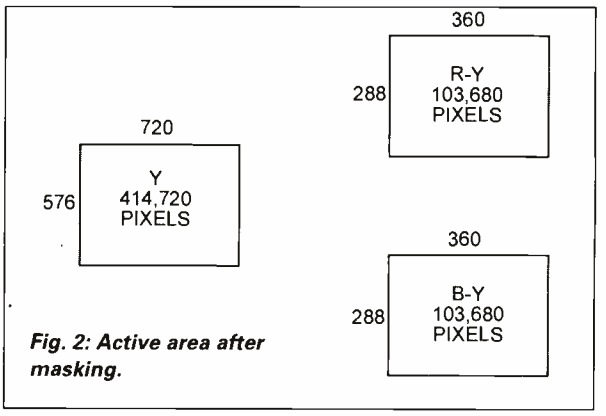


Fig. 2: Active area after masking.

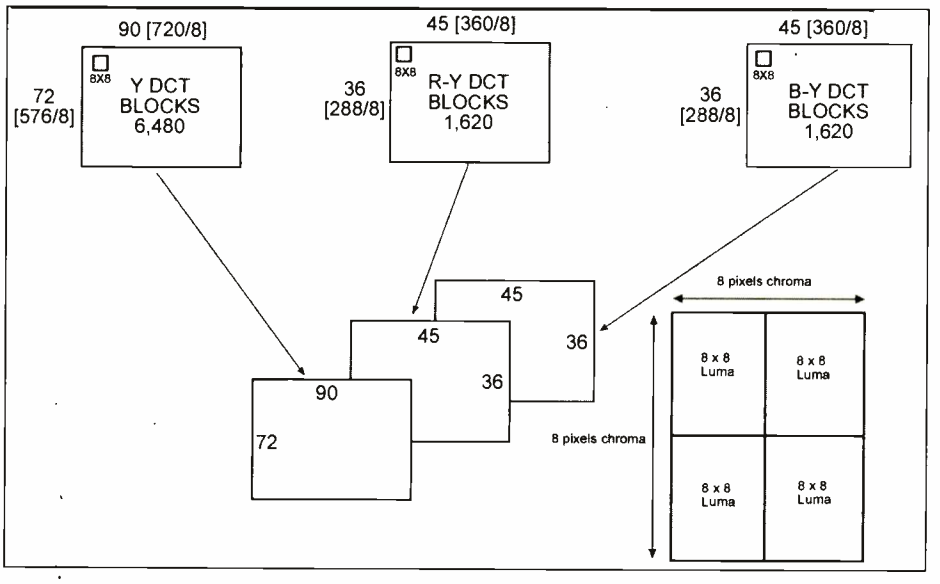


Fig. 3: The macro block arrangement.

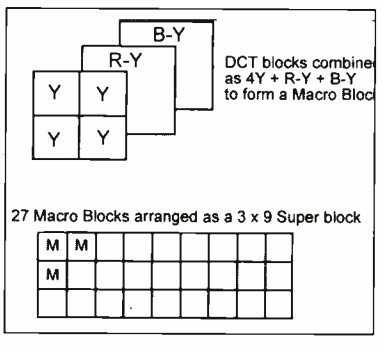


Fig. 4: Creating of super blocks.

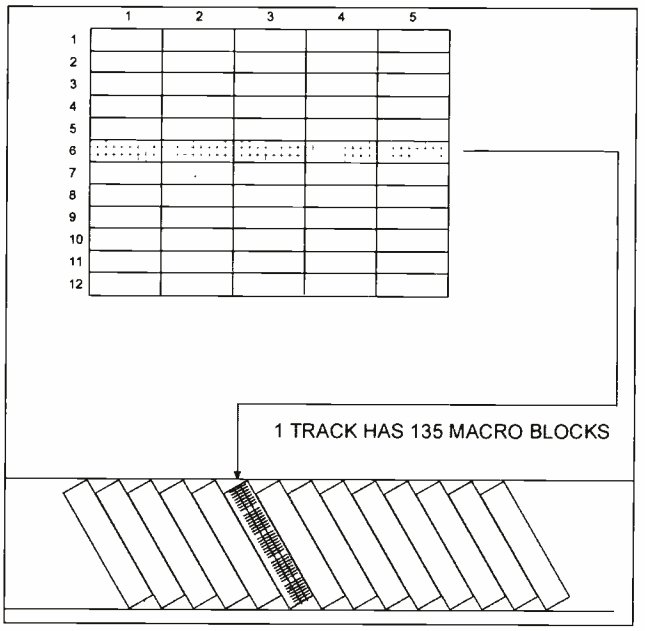


Fig. 5: The picture arranged as super blocks, with five per video track.

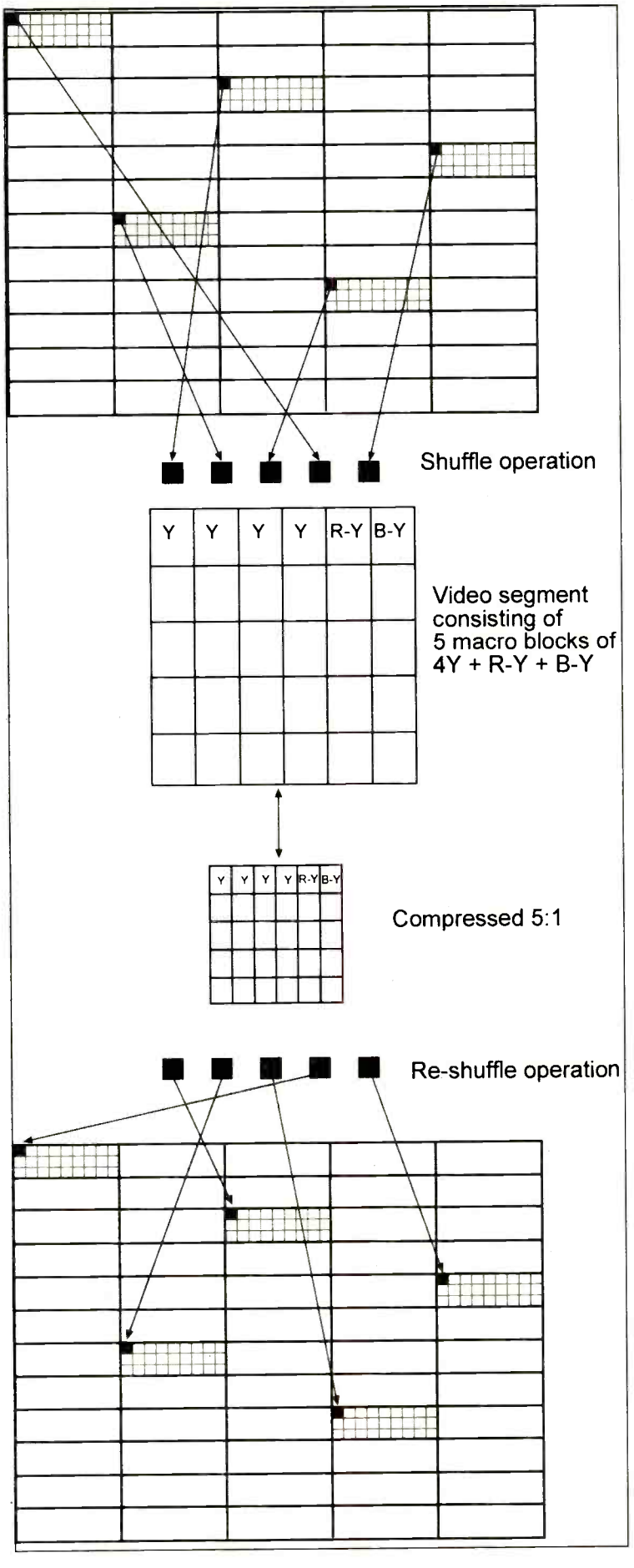


Fig. 6: The data shuffling/reshuffling procedure.

five super blocks and, in turn, 27 macro blocks. Five by 27 gives 135 macro blocks per track.

In the cue and review modes, picture break up can be identified as super blocks, with some macro blocks where the picture breaks up into smaller vertical rectangles.

Super blocks are arranged as a matrix five wide by twelve vertically, corresponding to the twelve video tracks per frame recorded on the tape.

There are 135 macro blocks per track, each block having a data volume that's close to but does not exceed 77bytes. The macro blocks are read out of memory as serial data, with error correction code and tracking data added. Video data is recorded on the tape between gaps G2 and G3, see Fig. 1 last month.

Video Data Compression

One of the problems with digitising a video signal as 8 x 8 DCT blocks is that different parts of the picture contain different data values. In some parts the value is high, in others low. Imagine a seaside scene with a speedboat whizzing along in the sea. At the top of the picture there's just blue sky, while at the bottom there are large areas of yellow sand. In the middle, the speedboat is moving rapidly.

There's no point in digitising large numbers of DCT blocks of blue sky: the data can be reduced by saying "here's a block of blue sky, and the next twenty blocks are the same". In other words, digitise the first block and, as there is no change in subsequent blocks, don't digitise them. Just say they are the same.

In the centre we have the speedboat moving rapidly. Thus the DCT blocks constantly change. Each block has to be digitised, so the data volume in this part of the picture is very high.

As the amount of data space per track is fixed (approximately 83Kbits), large amounts of data could overload the tape with resultant loss. On the other hand too little data is wasteful of tape space. The aim is to achieve a constant data flow.

To spread the data volume out over the whole frame, tape track video segments consist five macro blocks from different parts of the picture. They are then compressed. This is called shuffling, see Fig. 6. Some macro blocks will have small amounts of data, others large

amounts. The aim is to average the data quantities so that, after compression, each video segment meets a fixed criterion for data volume.

The area of tape track allocated to video data can contain a maximum of 83Kbits (83,160 bits). As this is allocated to 135 macro blocks, it works out as 616 bits per macro block or 77 bytes of 8-bit words (616/8 = 77). Recorded data is limited to 77 bytes (616 bits) per macro block. Thus, after compression, a video segment of five macro blocks is limited to a maximum of 5 x 77 = 385 bytes.

Fig. 6 illustrates the shuffling procedure. It is carried out by the shuffle IC and its associated memory. The stored video frame is broken down by a fixed routine that builds video segments by selecting five macro blocks from five different super blocks scattered about the frame.

Compression Calculation

A complete, uncompressed TV frame stored in the shuffle memory consists of 5Mb of data. There are 1,620 macro blocks in a frame, so each block consists of 385 bytes (3,080 bits). Before compression one macro block = 385 bytes while a tape track video segment = 1,925 bytes. After 5:1 compression, one video segment has 1,925/5 = 385 bytes (3,080 bits) while one macro block = 77 bytes (616 bits).

If CD technology was adopted, the 324 sets of video segments would be recorded on to tape in their 'random' format, using cross-interleaved Reed-Solomon error correction (CIRC). This would be fine for normal recording and playback, but not much good for picture search. The 'random' data being played back would exceed the error correction and reshuffling capabilities, rendering picture search impossible.

After compression, the macro blocks in the video segments have to be reshuffled back to their original positions, so that the data is recorded on the tape as a continuous digital video signal in the same way as with an analogue video recording.

During playback the data is read off the tape into the ECC memory, expanded by reversal of the compression process then put into the shuffle memory. Video data is not shuffled/reshuffled during playback as this is not necessary. From the shuffle memory, the video data is read out to a DA converter where the field sequence is re-established and the syncs and blanking are reinserted.

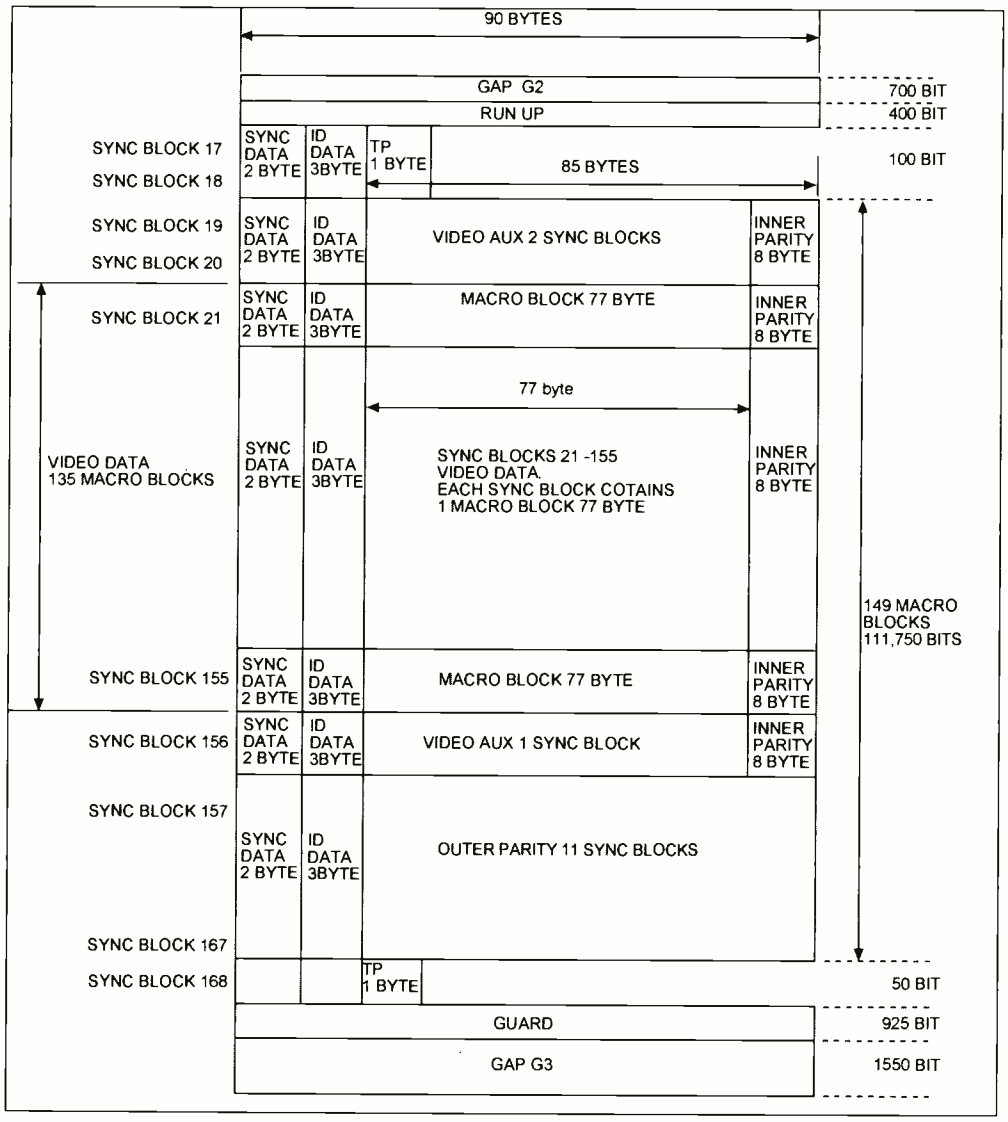


Fig. 7: Map of the tape data.

Tape Video Data Map

Fig. 7 shows a map of the tape data. It's read across and down in the same way as reading a page of text. Each macro block is preceded by sync data and ident data to label the macro block. It's followed by inner parity data for checking bit errors in the macro block. Outer parity data correction is over eleven sync blocks and is a full checksum for bursts of data errors that exceed more than one macro block.

Error correction data is added in such a way that the 8-bit code remains 8-bits. The intra-code of the video data is 85,77 for the inner code and 149,138 for the outer code. This means that the total length for the inner code is 85 bytes (video plus parity), with 77 bytes of video data. The outer code is 149 sync blocks (video aux 2, 135 video data, video aux 1 and 11 parity) with 138 data sync blocks (149 less the 11 parity).

The total data volume for the video data section of the track is 140 sync blocks x 90 bytes x 8 bits x 25/24 (see part 2) = 111,750 bits.

Error correction is also applied to the audio section. It is not applied to the sub-code section, because this section contains time, date and frame count data which doesn't change over twelve tracks. Thus if data should be lost on one track, it can be read on the next track for the time, date or time code. Any single track read during a frame is sufficient. ■

An AF Power Monitor

Ian Rees designed this AF power monitor to provide correct loading for stereo output amplifiers. It enables power output and balance to be seen using a built-in dual VU meter. There is also audible monitoring

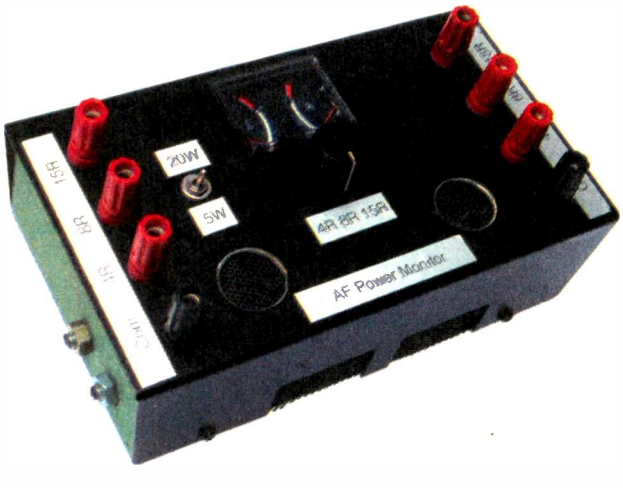
This simple piece of equipment was originally made up some ten years ago, when I was repairing a lot of car radio equipment. It then had a built-in dummy aerial and 12V DC power supply. Nowadays I use it for hi-fi and TV applications, so the original unit was reassessed then rebuilt.

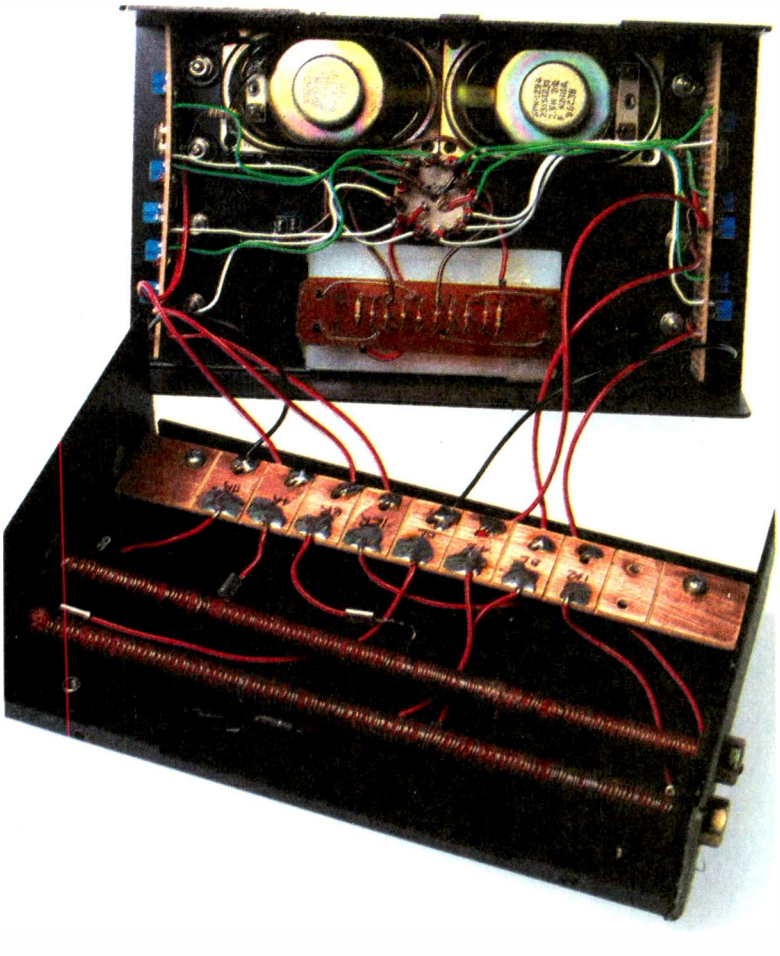
Many modern TV sets have high-power stereo amplifiers and incorporate speakers in the back cover. They are particularly tedious once the back cover has been removed to gain access for servicing. Running a set with its speakers disconnected is not a good idea. This unit provides the solution, with correct loading for the audio outputs and other benefits. Small built-in loudspeakers enable the audio output to be heard and run at high volume without being deafened. The meters provide an indication of power output and balance.

Description

Fig. 1 shows one half of the stereo power monitor unit. The load resistors R1, R2 and R3 were made using 28 SWG Constantan resistance wire (available from Maplin Electronics) cut to length and wound on a former. With hindsight I would have used an electric fire element as the former. My prototype used two pieces of 185mm M8 steel studding sleeved with Sytoflex (woven heat-resistant sleeving) however. The wire was wound on to the sleeving with the thread grooves beneath. Tap washers fitted as cheeks at the ends complete the assembly.

As it's not possible to solder to the wire, it was terminated using Microtemp crimp terminals. If these are not available, the inner screw terminals removed from plastic choc blocks could be used. The wire has a resistance of 1Ω per 238mm:





two lengths 3,570mm long, wound on to the formers, looped and tapped at 4Ω (952mm), 8Ω (1,904mm) and 15Ω (3,570mm) do the job. The Maplin Electronics order code for the wire is BL64U.

I seem to remember that someone somewhere can supply high-power precision load resistors for this type of application. But they were special and expensive. Preferred values could be used, but a certain amount of parallel/series juggling would be required to get close to the values required. I wanted to have accurate loads so that, if I needed to measure an amplifier's output with reasonable accuracy, I could use an external AC meter across them.

The internal AC voltmeter arrangement uses a full-wave bridge rectifier (D1-4) and range multipliers. I used a cheap dual 250μA moving-coil meter of the type found in many early audio amplifiers before the advent of illuminated LED devices. It's a VU meter, scaled in decibels, the sensitivity being 4kΩ per volt at full-scale deflection. Presets are used to set up the ranges because of the losses in the bridge circuit and the fact that the meter is a low-grade device. The meter was obtained from CPC (order code PM11097).

S1 provides selection between a low range of 5W (RMS) and a high of 20W. I didn't feel it necessary to calibrate the meter other than at the FSD points. It does give a good indication of stereo balance, which is very useful.

For your guidance Table 1 lists the AC voltages across the load resistance for a given output power (RMS). This will enable you to select other ranges of your choice. Note that at around 6V AC and below the range resistors will have to be selected by the 'suck it and see' method, as the bridge diodes distort the arithmetic!

A small 8Ω monitor speaker is included across each 4Ω load. Its series resistor R4 attenuates the output to provide an audible but low level. The shunt effect of R4 and the loudspeaker across the load is small enough to ignore.

Distortion at high volumes can be judged by watching the meters and listening to the speakers.

Construction

The photographs show the internal and external construction of my instrument, which is small and compact, being built into an old, stripped-out steel modem case. As I don't run the monitor for any length of time at high power dissipation, heat generated by the loads is not a problem. If sinewave power testing is to be carried out a larger case would be required.

I used plug-in terminals to connect the loads, for two reasons. First, it enabled me to use a cheap (low-current) range switch. And secondly it reminds me to look at what impedance I need to select before I connect up.

A variety of Pressac-style plugs and leads have been made up over a period of time, giving quick connection to a number of common TV chassis as well as the more conventional DIN/phono/jack for hi-fi use.

Calibration

Calibration of the AC voltmeters is carried out before connecting the loads and speakers. I found it easy to feed the required AC voltage from a 20V AC mains transformer via a 5kΩ WW potentiometer wired as a voltage divider. It also works with the transformer fed from a variac. A digital multimeter switched to its AC range enables the datum FSD voltage points (see Table 1) to be set up.

Close S1 and adjust the 5W range presets (one meter only). Open S1 and set up the 20W ranges. Once one meter has been calibrated on all its ranges, the multimeter can be removed. Connect the calibrated meter to the uncalibrated one. Set up the latter to the first – this is important for stereo balance checks.

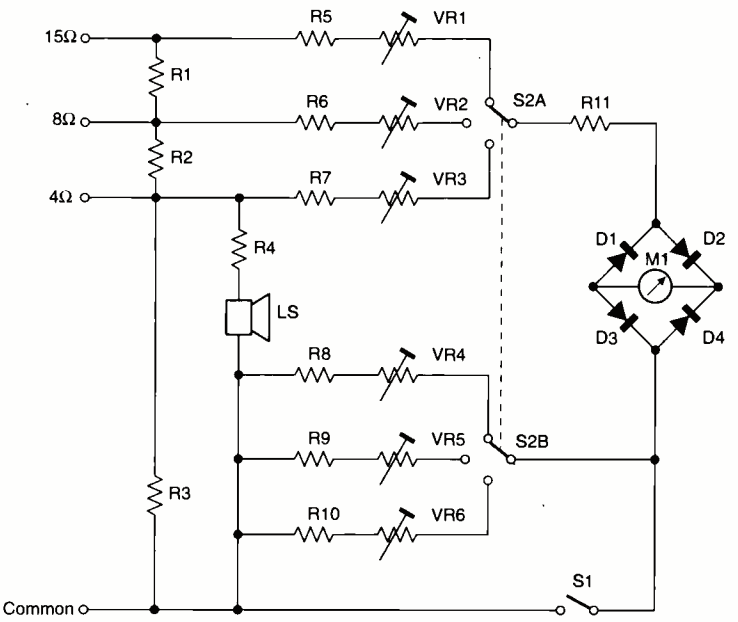


Fig. 1: Circuit diagram (one half of the stereo power monitor).

Table 1: AC voltages at various output powers.

Output power (RMS)	*4Ω load*	*8Ω load*	*15Ω load*
1W	2V	2·83V	3·84V
5W	4·47V	6·33V	8·66V
10W	6·33V	8·94V	12·25V
20W	8·94V	12·65V	17·32V
30W	10·95V	15·49V	21·21V
40W	12·65V	17·89V	25·5V
50W	14·14V	20V	27·39V

Parts list

R1	7Ω WW see text	VR1	22kΩ preset
R2	4Ω WW see text	VR2	10kΩ preset
R3	4Ω WW see text	VR3	1kΩ preset
R4	100Ω 1W	VR4	22kΩ preset
R5	10kΩ	VR5	10kΩ preset
R6	4·7kΩ	VR6	22kΩ preset
R7	470Ω	D1-4	1N4148
R8	18kΩ	M1	Dual 250μA VU meter
R9	18kΩ	LS	8Ω speaker
R10	10kΩ	S1	DP ST toggle
R11	10kΩ	S2	4P 3W rotary

All 0·25W 5% unless otherwise specified

Consumer Electronics Standard EN60065: 1998 will replace the current 1993 version on August 1st 2002. To meet the requirements of the new Standard, significant changes to TV receiver design will be required. Servicing personnel also need to be aware of the changes. Harry Brearley and Mike Powell of the BEAB explain the detail and some implications of the flammability aspects of the new Standard

BEAB Changes

On August 1st 2002 Consumer Electronics Standard EN60065: 1998 (IEC60065: 1998), which has recently started to be used for testing consumer electronic products, will finally replace Standard EN60065: 1993 (IEC65 5th edition with Amendments 1, 2 and 3) in Europe. From that date only equipment designed and tested to the 1998 version will meet the safety requirements of the relevant European Directives in support of the CE declaration.

The new Standard introduces a number of new requirements for equipment conformity. Arguably the most significant of these concern flammability.

Flammability

There were of course flammability requirements in the earlier version of the Standard. TV back covers, PCBs, mains switches and high-voltage components (those working at voltages in excess of 4kV) had to meet a level of flame retardancy defined in the Standard itself.

What has changed with the new version of the Standard is the introduction of concepts such as 'potential ignition sources', 'barriers' to resist the spread of fire and 'fire enclosures'. In addition the measures by which material flammability are defined have been referred to the existing Flammability Standard IEC60707, which means that test methods and the resulting flammability ratings differ from those previously accepted.

Because of the changed flammability ratings, it may not be possible to equate materials that were acceptable with the 1993 Standard with those required by the 1998 Standard. There are catalogues which list PCB and back cover materials that were approved by various testing organisations to the earlier standard. These are now of little use or consolation to designers faced with the task of design to meet the requirements of the new Standard.

Testing to IEC60707 by component and materials manufacturers has to date been very slow to get going, but is likely to accelerate as the European cut-off date of August 2002 approaches. But it looks as if it will be a close run thing.

Almost certainly those domestic audio and video equipment manufacturers that are first in testing their products to the new EN60065: 1998 Standard will face the extra costs of having some materials or components tested to IEC60707. Some relief may be available from the similarity in testing between IEC60707 and the UL Grading system. It's expected that FV0, FV1 and FV2 will be accepted as equivalent to 94V-0, 94V-1 and 94V-2. Amendment 1 to IEC60065: 1998, yet to be published, will probably reinforce this assumption.

Potential Ignition Sources

The concept of a potential ignition source introduces an entirely new consideration when deciding on the position of components and plastic materials such as chassis, connectors, stand-offs, brackets etc. that could act as fuel in the event of fire caused by overheating or arcing. The strict definition given in the Standard is: where a possible fault such as a defective contact or an interruption in an electrical connection, including a conductive pattern on a PCB, can start a fire if, under normal operating conditions, the open-circuit voltage exceeds 50V (peak) AC or DC, and the product of this open-circuit voltage and the measured current through this possible fault exceeds 15VA. The definition is easy to read but rather more difficult to understand, since it requires consideration of normal operation and fault conditions simultaneously!

A potential ignition source can be present only in a circuit that operates at 50V or higher (peak AC or DC), or at a voltage just below 50V that may rise to 50V or more when the circuit load is disconnected. The location is considered to be a potential ignition source if the load current at that point, under normal operating conditions, would exceed 15VA when multiplied by the open-circuit voltage.

Once a potential ignition source has been identified, its distance from combustible components and materials must be considered. The distance must be at least 13mm laterally or downwards, and 50mm

vertically upwards, see Fig. 1. This is not easy to achieve in a compact design of, say, a high-power amplifier or music centre. Even greater separation distances are required in a TV receiver, where voltages exceeding 4kV are present.

Barriers

Where the product is such that these distances cannot be achieved, a 'barrier' which is non-combustible can be used. A separation of only 5mm is then required. The guidance on the positioning of suitable barriers given in Fig. 13 of the Standard (see Fig. 1) will give rise to a great deal of discussion when applied to an actual product, since barriers have to be mounted rigidly. The diagrams in Fig. 13 by no means cater for every conceivable circumstance, and only after test laboratories have had considerable experience of testing to the new Standard will a uniform European-wide interpretation emerge.

Fire Enclosures

At first sight it might seem that the design of the high-voltage section of a TV receiver will be almost impossible in terms of achieving the required separation between the connections to the line output transformer and adjacent components. It is possible however to use an internal 'fire enclosure' as an alternative to providing impossibly large separation distances. A fire enclosure must meet the FV1 flammability requirements according to IEC60707. It seems likely that manufactures will adopt this route to achieving compliance.

Cabinet

The cabinet and back cover of a piece of consumer electronic equipment, particularly a TV receiver, have to meet flammability requirements whose stringency is determined by the distance from potential ignition sources and their open-circuit voltage.

Design Change

From the above it is clear that to meet the new flammability requirements significant change will be required in the design of consumer electronic equipment in general and TV sets in particular.

Larger components, such as capacitors whose volume exceeds 1,750mm^2, will have to meet flammability requirements, some for the first time, others to a more onerous standard.

Plastic mouldings used for mounting PCBs will have to ensure that the board is at least 13mm away from the cabinet – otherwise the cabinet itself will have to meet the requirements for FH 3-40mm/minute slow-burning performance. There was no previous flammability requirement for the cabinet, only for the back cover.

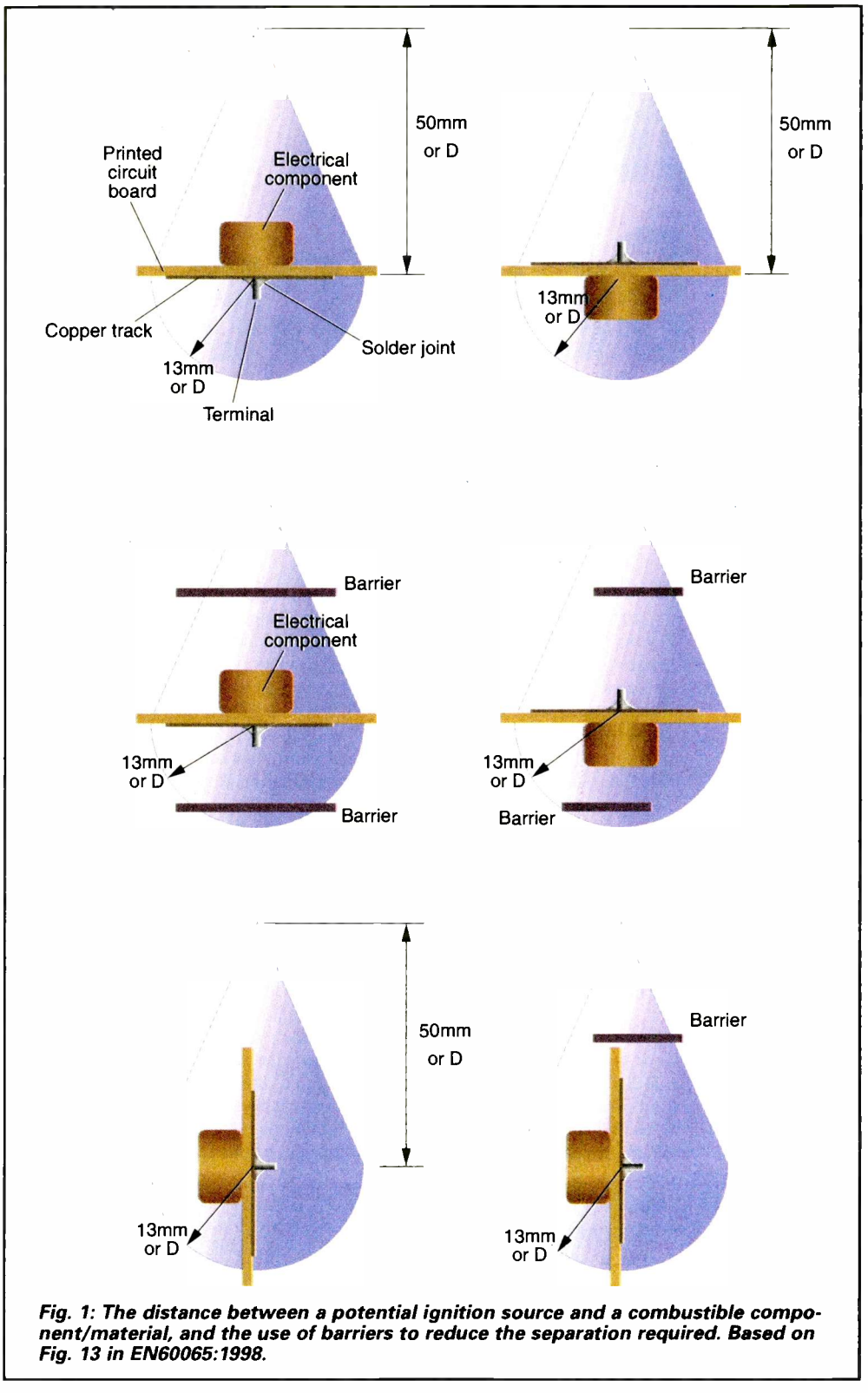


Fig. 1: The distance between a potential ignition source and a combustible component/material, and the use of barriers to reduce the separation required. Based on Fig. 13 in EN60065:1998.

In Summary

The introduction of the flammability requirement in EN60065: 1998/ IEC60065: 1998 imposes additional design considerations on manufacturers. It also involves a challenging assessment role for test laboratories and approval authorities.

Agreed interpretations of the Standard will take some time to emerge and, with very few products, components and materials so far being tested to the new Standard, it seems likely that there will be a headlong rush as the August 1st 2002 deadline draws closer ■

RETRA Service 2000

The fourth RETRA Service Conference was held at Solihull last month. Many ideas highly relevant to today's difficult circumstances came up. Eugene Trundle was there to report for us

The annual service conference staged by RETRA has become the main event of the year for those involved in brown goods after-sales care. This year's meeting certainly produced much of interest to technicians, service managers and proprietors.

RETRA's current president John Hutchinson opened the conference with an account of the grossly inadequate reimbursement payments made by some manufacturers for labour during the warranty period, and reaffirmed RETRA's determination to increase them. Negotiations on this contentious subject continue.

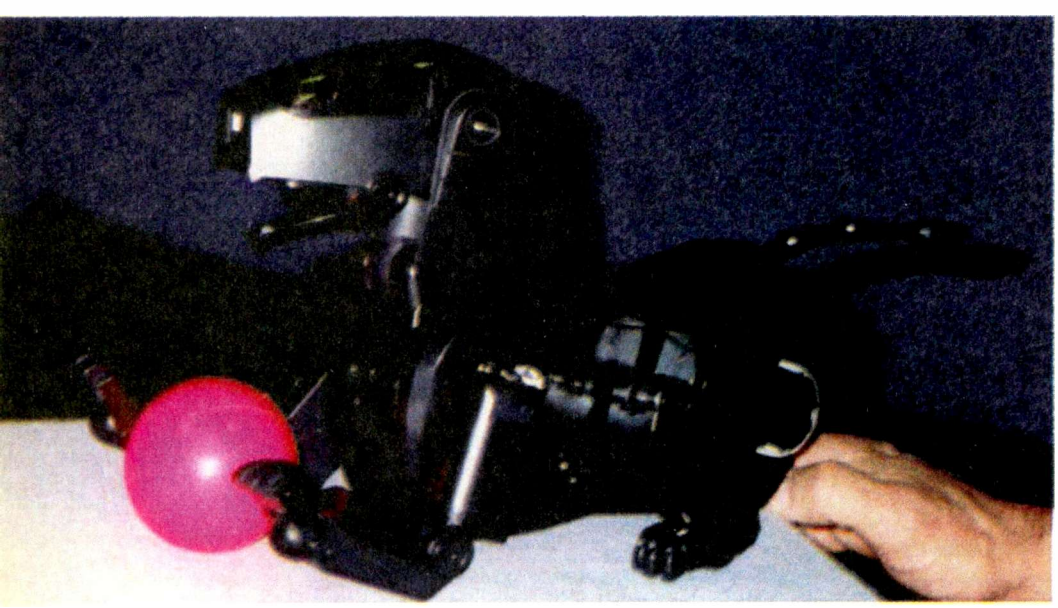
Service Registration

The first presentation, by dealer Brian McPherson, concerned the registration of service shops. He proposed a scheme that would be exclusive to RETRA members. Like similar ones in the building, gas and aerial industries, it would offer the public a defined standard of service, workmanship, facility, safety and responsibility.

Participating dealers would have to qualify by conforming to the standards set out in RETRA's health and safety manual, and by submitting to an initial and ongoing assessments by a RETRA-appointed inspector. The cost is estimated at £100+, plus expenses, and a registration fee of £50 initially so long as everything is in order. In return, the dealer would get point-of-sale material, national promotion, shop-window logos, certification and a conciliation service.

The aim of the scheme would be to raise industry standards, create a new strategy in the war against 'cowboys', and also provide a positive status to help in gaining contractual work and recognition by manufacturers. The standards and system could form the basis of future legislation that might be brought in by the British or European government. The consumer lobby is currently very strong, and similar schemes are in operation in Australasia, France and Germany.

RETRA will carry out a test run over the next six months, and hopes for a full launch of the scheme shortly after that.



Sony's robot dog Oliver Aibo accompanied Steve Deighton, national service manager for the Sony Consumer Products Group, during his presentation.

Selling Repairs

Martin Lamb of TW Electronics provided some new ideas on promoting business and gaining customers' confidence. He pointed out that speed and efficiency are important to a customer, plus 'value-added' services like cabinet cleaning, collection, delivery and provision of loan equipment. The customer's image of a service shop can be greatly improved by offering fixed-price tariffs, e.g. £35 for any VCR repair, and a one-year guarantee on parts. People's throw-away-and-replace mentality must be changed, declared Mr Lamb: why not sell them the new box *and* repair the old one?

Martin Lamb has found that contract work can be a steady and lucrative earner. He advocated establishing links with local businesses and organisations – not only dealers without service facilities but also hospitals, hotels and retirement homes. They all want quick and expert service, and cost may be a secondary consideration. It's also worth approaching those, such as tyre companies and takeaway food shops, that have TV sets in public areas.

He recommended that publicity, charges and the level of service provided should be adapted to the area in which a firm operates, changing tack as necessary. What's suitable in Tunbridge Wells may not be appropriate in Glasgow or Weybridge. Quoting J.F.Kennedy, Martin Lamb's final exhortation was that "the only thing worse than wrong action is no action".

Workshop Safety

The Health and Safety Executive was represented by Chris Davies, who pointed out that the HSE's long-term objective, far more important than establishing and overseeing compliance with minimum standards, is to reduce deaths, serious illnesses and working time lost through sickness. Also to achieve this by a "best practice" philosophy adopted by everybody involved, in the process revitalising attitudes to workshop safety.

In our particular sphere the current priorities are: to research and define the effects of solder fumes from rosin-based and other fluxing agents; to study manual handling (lifting, slips and falls); to improve electrical testing, especially with respect to shock hazards, e.g. from Class 1 (earthed) oscilloscopes etc.; to prevent access by unauthorised people to work areas; and to encourage working on dead (unplugged) rather than 'live' equipment.

New guides and information sheets are being prepared on TV/audio/PC repair, on white goods servicing and, by the end of the year, on testing control panels. They will be available from the HSE free of charge. The HSE also hopes to produce a set of recommendations on hazard identification and the risk factors with lifting and handling equipment. A system of "health surveillance", in which vulnerable workers and those at risk have regular medical tests, e.g. for the onset of asthma in those regularly exposed to rosin fumes (colophony), may be proposed. We learnt that colophony-free solders are not necessarily hazard-free.

There have been changes in terms of new law. The Health and Safety at Work Act was revised in 1999, and a new green and orange wall poster (£7.50 from HSE) has replaced the old white one. The Working Time regulations have been updated, specifying a maximum of 48 hours per week averaged over seventeen weeks. Further changes, led by Europe, are imminent in a Chemical Agents Directive.

In reply to questions from the floor, Chris Davies confirmed that all this legislation applies equally to employers, employees, the self-employed and one-man-band outfits. He had to concede that the wording of the Acts is very ill defined and open to wide interpretation.

Progress

Steve Deighton, national service manager for the Sony Consumer Products Group, was protected on the podium by robot dog Oliver Aibo. He made the point that every change in technology has been greeted by the trade with alarm and despondency. But changes are now coming so thick and fast that they demand, for our survival, recognition of the situation and a rethink on the part of service people. Digital technology now dominates every area of electronics, and there's no turning back: the future is here and now!

Sony now has eighty people who are directly concerned with service in the UK. Their tasks include dealing with a hundred e-mails a week just for dealer contact details. There are six TLOs on the road to provide dealer and service technician support. Technical documentation is moving rapidly into the realms of CD-ROM and internet communication Bench-top PCs, laptop computers in service vans and on-line training and diagnosis are the way ahead for after-sales support.

Steve Deighton pointed out that communications networks are now being formed within the home and to the whole world by means of FireWire/IEE1394/i-Link and the internet respectively. HAVi has now been embraced by Grundig, Hitachi, JVC, Panasonic, Philips, Sharp, Sony and Thomson, while licensing agreements for Memory Stick (a core technology for Sony) have been made with IBM, Microsoft and twenty five other companies in various fields.

Customer Care

Some of Sony's customer-care themes were echoed by the next speaker, Mark Chatterton, customer care director of Philips. He pointed out that no manufacturer's product is unique and that service, before, during and after a sale, has become the major factor as far as the public is concerned in choosing between brands. Manufacturers are spending more than ever before on 'servicing the customer' and raising people's awareness of the company, the product and the dealer. Moving in fact much closer to the American approach, which is much more honed and focused than ours. In the future era of two-year guarantees and increased consumer expectations, it will be vital to keep the product with the user and tailor the level of service to product class and customer, for example by providing a next-day successful response to service calls relating to high-end products such as projection and plasma-screen TV sets.

Turning to the practicalities of servicing, Mark Chatterton made the point that equipment is becoming both more reliable and more difficult for dealers to repair – especially for those with a low throughput. The advantage of production-line repair systems was illustrated by a central service facility in Germany: it can repair low-cost units profitably at £9 apiece. Philips' target is for an 85 per cent first-time hit-rate for dealer repairs. This is not currently being achieved, especially by smaller workshops. Service cost has risen 140 per cent over the last twenty years while shelf prices in shops have steadily fallen. Like Martin Lamb, Mark Chatterton wants to see a fixed-price tariff for repairs. This would be combined with the "slick" service offered in other industries: he quoted computer company Compaq and carmaker Daewoo as good examples.

Mark Chatterton recognised the difficulties currently faced by the trade. The average age of service technicians is now 54 years, few new recruits are entering the trade and there are few resources for retraining. For its part, Philips has carried out 45 training sessions in the first half of this year.

IT from Hitachi

Ian Downes is Hitachi's technical support and training manager. His presentation focused on practical help for service technicians and the ways in which Hitachi is providing this. The company's free service seminars take place at sixteen locations in the UK, and back up the free-to-dealers internet and CD-ROM service manual and fault databases. The company hopes to have training material available on CD-ROMs later this year.

With the aid of a portable computer, Ian Downes demonstrated the use of current electronic service manuals and the advantages they offer, and described the impressive security-coded auto-diagnosis system built into current and future Hitachi TV sets. This includes an interface for a PC, with the ability to download new operating software or move existing software into a service-exchange chassis's memory. There's indication of fault history, which is useful for intermittent-fault diagnosis, and you can 'grass' on specific IC faults via the I^2C bus. The data link is 'red' pin 15 of the scart socket, and is available only in the service mode.

By such means and with the module kit now available for large-screen TV sets it should be possible to eliminate the need to remove heavy, bulky sets from customers' homes for service and repair.

Money from Service

Perhaps the most entertaining and thought-provoking presentation was made by *Television* contributor Colin Guy, who had for on-stage company a working 9in. Bush TV22 – a 405-line set dating from 1950. Colin now trades from a converted garage in a rural area, and has in the past undertaken the roles of boatbuilder, plumber and housebuilder. He intends to stay in the trade, offering a largely fixed-price repair service for everything from computers to vacuum cleaners, power tools, lawnmowers and car radios. VCRs, CD players, musical instruments, rolling-road brake testers and aerial rigging also come within his sphere of activity, and one revealing photo showed him doing a bit of surreptitious drain-rodding!

Colin Guy's successful business is based on versatility, low overheads and low charges, using inexpensive components from companies such as Express TV, König and Philex.

Colin J. Guy, a regular Television contributor, spoke on the need to increase the range of service activities. He intends to stay in the trade.

He pointed out that vacuum cleaners now cost more than VCRs, and ninety per cent of their problems are caused by clogging: he will cheerfully unbung them at £20 a go – as well as repair Black and Decker drills, fit a laser unit to an Aiwa CD player for £45 all up and a video head drum (trade price £7.45) to an ancient Panasonic VCR for the modest price of £30. He thrives on customers reeling from three-figure repair quotes and equipment-condemnations by dealers in his area, and on such customers as the dear old lady who went back to her Philips G8, ably serviced by him, after failing to get on with her new Matsui widescreen set with its tiny zapper keys and often-wasted screen area.

Colin's method of working would clearly not suit all service businesses, but he seems to have a better lifestyle and greater sanity than many of his counterparts in more conventional employment!

Digital Radio

Ben Chapman of the BBC gave a rundown on the current state of DAB (digital audio broadcasting) in the UK. Coverage, from 29 Band III transmitter sites, now reaches over sixty per cent of the population. He provided a brief account of DAB technology (it uses 1,500-carrier COFDM and has much in common with terrestrial digital TV broadcasting), and listed the many advantages it has over conventional radio systems. These include no interference, crystal-clear sound, a wide dynamic range, no need for retuning, and free-to-air services. Value-added features, current and future, include new channels, some part-time; data and GSM navigational services; 'vision radio'; and broadcast website facilities.

DAB receivers come in three main forms: car radios; home/hi-fi outfits (one sells at north of £2,000!); and adaptor cards for PCs. The message from Ben Chapman and the BBC is that here is a 'best-kept secret' product and service that's ripe for promotion and skilled selling, with discerning customers being educated about this future-proofed, 21st-century technology. Many of them are not even aware that it exists, or of what it can do for them.

Commercial Support

Several trade sponsors helped to make the service conference possible. The **Alban** stand featured the Promax GV series of pattern generators and the new 'intelligent' terrestrial digital TV reception tester. **GHS** highlighted Aswo and König pre-programmed remote-control units and disk-based service data. **EEG**, which provides distance-learning courses, showed its educational 'modules'.

Euras ran on-screen demonstrations of its latest CD-ROM fault database, which now includes 65,000 repair tips and 80,000 circuit diagrams. In addition to its normal product lines the **SEME** stand featured a new venture for the company: finished goods in the form of LG equipment, general electrical appliances and graded products at attractive prices. **Servisol** displayed a new range of Soldermop products and aerosols, some of them static-dissipative. **Sony** demonstrated its diagnostic and Assist (CD-ROM) software. In addition to providing a speaker **TW Electronics** helped to support the event.

In Conclusion

An excellent meeting that was sharply focused on real-life service people. It provided a very good insight into the current situation. Well done RETRA – and see you next year! ■

The conference was supported by a number of firms including Servisol, whose busy stand is shown below.

LETTERS

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

e-mail jackie.lowe@rbi.co.uk using subject heading 'Television Letters'.

Output coupling capacitors

In the Audio Faults section, June issue, Adrian Spriddell described a problem with a Tascam DAT recorder: the output coupling electrolytic capacitors had been damaged. He surmised that the most likely cause of the problem had been the user connecting a power amplifier's output to the DAT machine's output.

I have come across this problem with a number of DAT and compact cassette machines that have been employed in the sound systems industry, and for a while couldn't understand why the problem was so common. A friend of mine, who is a senior engineer at AMS Neve, was able to elaborate on it however. He has also had to deal with the problem.

He suspects that in the majority of cases the output coupling capacitors are damaged when the machine is connected to the XLR (balanced) input of a sound desk and the phantom power, which is required by electret microphones, is switched on. The voltage rating of the capacitors is generally only about 16V, so the application of a 48V supply is enough to cause overheating. The voltage across the capacitors is developed because there is normally a resistor of about 100kΩ value connected from each output to earth.

The difficulty is that the phantom power needs to be present where electret microphones are employed, and it's not possible to isolate individual XLR inputs. The simple answer that was suggested is to fit replacement capacitors with a voltage rating of about 63V. I was also advised to fit the capacitors with the positive side connected to the output terminal because, where phantom power is present, the polarity will be positive at this point. Where the power is not present, the capacitor polarity will have no significant effect on the circuit or system performance.

Joe Cieszynski,
Bolton, Lancs.

Reception problems

A lot of my customers in this part of the New Forest have trouble receiving the analogue transmissions from Rowridge because of trees. The trees around here seem to have the knack of absorbing a single channel from our set of four. This is probably because the tops of some trees look like arrays of Yagis. No amount of fiddling with aerials and amplifiers, not to mention ever-higher masts, seems to resolve our problems completely as the trees grow each year. Channel 5 is on the north side of a local power station chimney, about 43° off-line from the IOW: very few people can pick this up, with its power down by a factor of 1,000. Digital terrestrial for our post code is not on (or should I say not ON?!).

When we moved here in 1985 Rowridge didn't even broadcast stereo FM. We're fortunate however: we chose our house for amateur radio (myself and my wife are G3PIY and G3SGL) and it's on a hill. We get superb analogue TV pictures, but I've noticed that there is now often patterning which seems to vary with the weather conditions. Do I detect a conflict between increased power (i.e. coverage) for digital terrestrial TV and the quality of analogue TV reception? Digital is not as good as analogue (assuming that the source material on analogue isn't already digital!). If analogue quality is to suffer in order to achieve 'full' digital coverage, to the extent that digital looks jolly good after all, then I think we will all have been conned.

If my customers haven't got decent analogue reception because of ghosting, fading and multi-path effects, how on earth can digital succeed? It's one thing moaning about picture quality while not missing the plot, something completely different when you get a blank screen with the legend "no signal" and you miss the end of the film. Presumably the answer is to increase the power, install booster stations and chop down the New Forest? In the meantime, will our poor analogue reception get worse? Suggestions that the changeover from analogue to digital be brought forward look ominous.

I've heard the odd comment about VCRs, but this aspect of the matter seems to get the 'head in the sand' treatment. Will we get black boxes with twin front ends, one for the TV set and the other for the VCR, or triple front ends to include the kid's TV, etc.? It'll be the end of "I'm going upstairs to watch Coronation Street" or whatever.

I can also envisage the call "Is that Allan? Now we've got digital tele in the lounge the set in the kitchen/bedroom doesn't work any more. Can I bring it round?" Or "The video's stopped working and the man next door thinks it's the lead, have you got one?" Me, "it's not the lead, they turned the transmitter off last night".

Thankfully the lines that join my retirement date and the big turn-off seem to be conjoining, so why should I worry?!

Allan Isaacs,
Thorney Hill, New Forest.

A lighter moment

The lady who phoned said she had a snowy picture. When I called I found that the 24in. Sony set displayed very snowy pictures except for Sky, which was clear. Doing the usual checks, I asked if there were any other TV sets in the bungalow. I was shown an ageing Hitachi set in the bedroom: it was connected to the wall via a flylead, and also produced snowy pictures.

"Have you an amplifier?" I asked, after checking that the aerial was still on the roof (a few years ago I was caught out when I called an aerial contractor to repair an aerial that wasn't there!). She said there was one, so I asked whether she had a set of steps I could borrow to take a look in the loft. I was directed to the spare room, where the steps were in the middle beneath a shade. She'd been trying to take it down, but couldn't budge it. Could I remove it before I used the

Corrections

The circuit diagram (Fig. 2) in the **TV Protection Test Set** feature (August issue) did not show the direction of rotation of the threshold controls. Clockwise rotation of RV1 should move the slider towards R7. Clockwise rotation of RV2 should move the slider towards R16 and D7. This may be helpful in setting up the unit.

The first item in **Help Wanted** last month (Video 2000 enthusiast) contained an error in the phone/fax number, which should have been given as 01489 576 597.

steps? She hated the shade, so it didn't matter if it was damaged. I obliged and found, as usual, that the ring was stuck solid. But the rose was still free, so I removed the bulb socket plus wire from the ceiling rose, popped down to the local DIY shop, bought a bulb socket complete with wire, returned and fitted it. When I checked the light to see whether it worked there was a shout from the living room. "That's a lovely picture now!" she called.

The penny dropped after a second or so, as I looked at a lovely, clear BBC1 picture on the Hitachi set. The amplifier had been wired into the lighting circuit. As the lady had tried to remove the shade, she had twisted the wires in the socket. They'd snapped, disconnecting the amplifier!

Over the years I've replaced valves to produce results, but never a light bulb! Or was there a radio back in the steam days with a pygmy bulb in the AC circuit, or am I getting past it?!

R.F. Hughes, Greenfields TV, Holbeach, Lincs.

Broadcasting Pressures

A few months ago I wrote concerning digital terrestrial TV frequency allocations. I asked whether anyone knew how adequate coverage would be achieved before the analogue switch-off and, if so, could they write and let us know?

More recent news that LITV frequency allocations are on hold, and that the vestigial sidebands of some analogue transmitters have been truncated, confirm my misgivings. The original four-channel UHF plan has now fallen victim to the demands of Ch. 5, DTTV and RSL stations. At present there's insufficient spectrum space. When only DTTV exists, the government hopes that there will be some unused spectrum space to sell off. But suppose ONdigital seeks more multiplexes so that it can compete better with Sky. That wouldn't leave much spectrum space for sale.

The cost of upgrading the terrestrial infrastructure must be enormous. To what advantage? Satellite TV has long been established in parallel with terrestrial transmissions. The two readily coexist: furthermore, the change from analogue to digital satellite transmission appears to be a much tidier process, without the conflict of frequencies that's occurring on the ground. Some commentators believe that established analogue relay stations will disappear, necessitating a change to satellite reception.

To adapt a well-known advertising slogan, "satellites reach the parts that other transmissions cannot reach". It's true of my situation in the southern Isle of Wight. There's no mains gas; no DTTV (though the transmitter is only four and a half miles away); we have reasonable analogue reception, but no Ch. 5 and a very weak signal from the local RSL station. There's no hope of cable TV arriving in the foreseeable future. So, if you want more channels (including Ch. 5) in this area you need Sky.

Does the future logically lie with satellite broadcasting? Satellites are expensive, and so are their launch vehicles, but with one hit they can achieve a consumer base of millions. Current domestic satellite receiver boxes do not offer multiple-choice outputs for several TVs, but I'm sure that when this need becomes obvious it will be met. It's difficult to visualise the future of truly portable TV sets, especially as ONdigital is now having to state up-front that aerial upgrades may be needed. Is the set-top aerial doomed at last?

There's an on-going problem with terrestrial TV, both analogue and digital. It started with the introduction of Ch. 5, and has since been exacerbated by the need to squeeze in DTTV and RSL stations. Have commercial pressures undermined technical integrity to the detriment of all concerned? I hope not, but only time will tell.

Keith Cummins, Chale Green, Isle of Wight.

Help Wanted

The help wanted column is intended to assist readers who require a part, circuit etc. that's not generally available. Requests are published at the discretion of the editor. Send them to the editorial department – do not write to or phone the advertisement department about this feature.

Wanted: Manual or circuit diagram for the Telequipment oscilloscope Model DM53A. Robert Parish, 279 Meggeson Avenue, Townhill Park, Southampton SO18 2HE. Phone 023 805 521 916.

Wanted: Customer control panel for the Pye Model CT450 (Philips G11 chassis). N. Dobson, 19 Romney Drive, Carrville, Durham DH1 1LS. Phone 0191 386 5387.

Wanted: Reel motor for the Panasonic Model NV7200 VCR. The part no. is VEM0145. Anthony Tabone, 13 Lynette Street, Nunawading, Victoria 3131, Australia. E-mail: tanenu@optusnet.com.au

Wanted: A Quad FM3 tuner for spares or possible repair. Please phone Mike on 01758 613 790.

For disposal: Telequipment Serviscope Model S51A, with manual and probe. Needs attention. Price £25. Must be collected. F. Nedza, 40 Brynhyfryd, Glynneath, Neath, West Glamorgan SA11 5BA. Phone 01639 720 429.

Wanted: Old video items as follows. Remote control kit and service manual for the Philips Model VR2020; remote control unit for the Ferguson 3V23; service and/or user manual for the Sony C7; a Philips 2434 or similar final-generation V2000 machine. Also WHY in terms of these older machines and spares. Phone Steve Rowley on 01889 578 416 or e-mail stever@ljl.co.uk

Wanted: User instructions for the Ferguson Model 14M2 CTV. Raymond Myers, 64 East Road, Langford, Biggleswade, Beds SG18 9QN. Phone 01462 700 256.

Wanted: A working main board for the Panasonic Model TX24W1 (Alpha 2W chassis). Phone Keith Sargeant on 07944 855 579 or e-mail keithsargeant@hotmail.com

Wanted: User instruction manual for the Sharp Model DV5132H CTV. Joe Thomas, 21 Firs Close, Folkestone, Kent CT19 4HZ. Phone 01303 277 864.

For sale: Having given up repairing TV sets and VCRs I have for sale, at £3 each plus postage, a selection of service manuals. I also have a 500W 1:1 240V isolating transformer at £15. Please phone David Forfar on 01695 735 132 for details or e-mail d.a.forfar@uclan.ac.uk

Wanted: Sony SLF1 portable Betamax VCR plus matching tuner-timer unit TT-F1. Must be in mint condition and good working order. A.C. Griffin, 89 The Ridgeway, Sedgley, West Midlands DY3 3UN. Phone 01902 880 063.

Wanted: A Siemens SDA20561 chip (circuit reference IC1001) for the Sharp portable CTV Model 37AM-34H. It's a 40-pin microcontroller chip. A working one on a PCB from a scrap set would do. Please phone D.J. Bolt on 01473 780 833 (Ipswich, Suffolk) or e-mail boltdj@aol.com

Wanted: Circuit diagram and/or service manual for the Cossor valve voltmeter Model 1044K. Photocopy OK. William Jackson, 4 Beaumaris Avenue, Mill Hill, Blackburn, Lancs BB2 4TW. Phone 01254 208 183.

For disposal: An RGD console TV Model B2351T. The set is complete and original, cabinet fair. I think it dates from 1948/50. Best offer secures. Phone Steve Harris on 01905 455 803 (Worcester) or e-mail steve@videotek.co.uk

Wanted: Spare parts for the JVC GRS707 camcorder or a complete machine, in any condition. Phone D. Hodgkinson on 01843 231 512 (Margate, Kent) or e-mail hedgehog@turbo48.fsnet.co.uk

Wanted: RGB drive panel for the Grundig Super Colour Model B8681, series M4026RK (CUC740 chassis), or parts to repair the board. Phone Frances Marcus on 0207 681 9624 (office, London NW7) or e-mail francesmarcus@hotmail.com

Wanted: A LOPT for the Finalndia Model C59HZ6 (Salora M chassis) and a clock-timer flap for the Amstrad VCR9000. Phone Les Mawdsley on 0151 426 4152 (Mersyside).

John Edwards' CASEBOOK

Aiwa HVGX150K

The front panel display was OK, also E-E operation, but the VCR wouldn't accept a cassette. While checking around in the power supply to look for clues I found that there was no voltage across C9, because fuse F3 was open-circuit. With a new fuse installed and the machine plugged in there was 21V across C9. Nice one I thought. But when I tried to insert a cassette the machine wasn't having it.

I checked for any sign of voltage movement across the loading motor while attempting to insert a cassette. There was a fluctuation of a couple of volts, so I disconnected the wires to the motor and checked again. A healthy 12V was present at one of the wire ends. As a final check, I connected a loading motor from a scrap chassis to the wires. It spun beautifully.

A well-known distributor quoted me over £30 plus VAT for a new loading motor. Add to this my miserly £15 labour charge and the result was a customer who wasn't too pleased. He reminded me that a large retail store nearby was selling new VCRs at little more. Oh dear, here we go again. He asked me to get it going any way I could, provided the cost didn't exceed £30. My immediate reaction was to hand it back, but that doesn't put food on the table.

Another distributor told me that there was a pattern motor at £6 plus VAT. So I ordered one, thinking that I would at least make a small profit. You can imagine my feelings the next day when I opened the box to find a completely different motor. No way would it fit the chassis I had. When I phoned to query the point, the distributor insisted that it was the correct motor.

A fellow engineer called and saw me rotating the motor this way and that to see how I could make it fit. He gave me a funny look, smiled then said "wrong motor mate". He did however tell me that the motor I required was also used in the Amstrad VX1000Y deck. So I took a chance and ordered one – for £15 plus VAT.

On arrival next day it turned out to be the correct motor. But I had forgotten the post, packing and handling charge. Oh well, if all went smoothly from now on I would show a profit of £9. Wow! That's the life!

Fitting the motor was painless, and the mechanism then willingly accepted a cassette. My heart stopped for a moment when the playback picture consisted of nothing but snow. Luckily a quick head clean cured that.

Toshiba 2112DB

There were four flyback lines at the top of the picture. They were quickly removed by replacing capacitors C331 (1µF) and C333 (100µF) in the field timebase. A few more jobs like this and I would soon be in profit again!

Mitsubishi Euro 12 Chassis

The power supply chirped three times then shut down. This suggested a line output stage fault, and a quick check showed that the 2SD1878 output transistor was short-circuit. When I fitted a replacement and switched on the set came to life with a perfect picture and no signs of stress.

I've heard it said that an unstable HT supply can cause destruction of the field chip and/or line output transistor in these sets. So I also replaced the chopper transistor's 47µF base drive coupling capacitor C956.

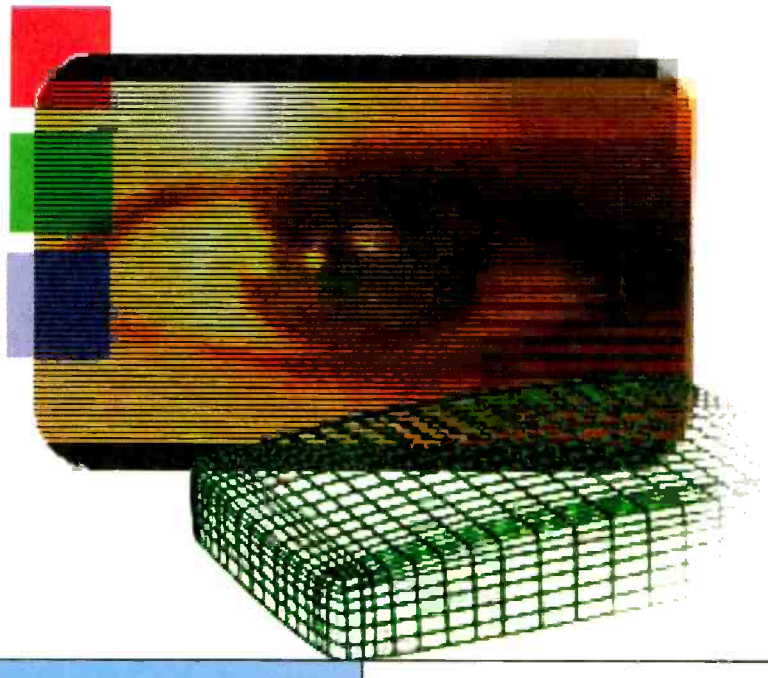
Philips 14GR1221 (GR1-AX chassis)

The power supply had shut down and I wasn't getting anywhere with cold checks. So I unsoldered the connection to the gate of the protection thyristor THY6641 and slowly (very slowly) powered up via the variac, monitoring the voltage at pin 6 (HT) of the line output transformer. At the correct 95V there was just a low-frequency 'growl' from the loudspeaker. By instinct I checked the voltages at the other pins of the LOPT. My suspicions were confirmed by a 95V reading at pin 1, which should provide a pulse feed for the 160V supply rectifier. When I desoldered the transformer and carried out resistance checks I found that there was a primary-to-secondary winding short between pins 1, 6 and 10.

A new transformer was obtained and fitted. Then, after reconnecting the gate of the protection thryistor, I switched on. The HT was correct, but there was no line output stage operation. A discoloured inductor, L5224, was the clue this time – it's in the supply to the line driver stage. I thought it too good to be true when I found that I had a good one in a scrap chassis. The set burst into life once it had been fitted.

Bush 2514 (Indiana 100 chassis)

I had to replace a number of components before I could get correct power supply operation with this set: R800 (820kΩ), which is in parallel with the mains bridge rectifier's reservoir capacitor; R809 (270kΩ) in the feed to pin 4 of the TDA4601D chopper control chip; C819 (100µF, 10V) which smooths the reference output at pin 1 of this IC; C820 (1µF, 100V) which is the reservoir capacitor for the feedback regulation; and the chopper transistor's base drive coupling capacitor C810 (100µF, 16V).



TV FAULT FINDING

Reports from
Glyn Dickinson
Geoff Butcher
Pete Gurney, LCGI
Colin J. Guy
Paul Smith
Bob McClelland
Michael Dranfield
Chris Watton and
Michael Maurice

Grundig G1000 Chassis

This set was ticking quietly to itself. Easy! Replace the line output transistor and resolder the dry-joints. But not this time: the set still tripped. When the supply to the line output stage was disconnected there was a slower trip. So that was no help and the stage was reconnected. Suddenly the set came on, with a large hum bar on the screen. The mains bridge rectifier's reservoir capacitor C104 was open-circuit. **G.D.**

Panasonic TX21S1 etc (Z5 chassis)

We've had a few of these sets in with mysterious complaints about thick lines occasionally appearing on the screen. The cause of the fault is the tuner, which is identifiable by the extra group of five pins at the end. We usually find that it can be repaired by resoldering the earthing strips and the tuner casing to the PCB inside the case. **G.D.**

Amstrad STV2100N

This odd-looking set has a built-in satellite receiver, but the chassis looked familiar. The symptom was a varying red tint over the picture. A check at the CRT's red cathode showed that the voltage was low and could be varied, but the red content of the picture was all over the place.

The red output waveform from the colour decoder IC was strange. I was about to condemn the chip when I saw some of the dreaded black gunge! Correct colouring was restored when it had been scraped away. To be on the safe side I spent the next fifteen minutes happily scraping and cleaning the rest of the chassis, as the corrosive glue was doing its worst. **G.D.**

Matsui 1482

The picture was grainy and someone had already changed the tuner. Of course you never know whether there might have been an unaccepted estimate – the customer always denies that the set has been anywhere else. To be sure, I fitted another tuner. The results were the same, though the AGC was working normally. Odd. More by luck than judgement, I next replaced the SAWF. This brought back a good picture with the original tuner refitted. **G.D.**

Bush 2167NTX

There's no accounting for taste, as witnessed by this sky blue 21in. set with matching remote control unit! It was dead, with the BUZ90 chopper transistor short-circuit. The cause of this is usually the 220kΩ resistor in a control chip feed line. We replace it, also its neighbouring 330kΩ friend, using hi-stab components. The odd thing is that the original components appear to be hi-stab ones, though they seem to last less well than standard carbon resistors! **G.D.**

Ferguson ICC5 Chassis

This set was brought in because of a nice, easy fault – a dry-joint in the colour decoder circuit. But when I replaced the back it started to trip: three times then dead. Disconnecting the supply to the line output stage restored the HT voltage, but isolating the various secondary supplies derived from the LOPT didn't. EHT generation and field timebase operation could be heard during the brief powering up. Time to be brave!

I disabled the trip by shorting TL17 collector-to-emitter. This brought back the picture. It didn't take long to find that DL25, the ZPD10 zener diode that monitors the 13V supply, was open-circuit.

Note that for normal operation TL17 must be on, so disconnecting the monitoring lines as a test doesn't work. **G.D.**

Ferguson FG20CB22U

This is an unusual televideo unit. The report said that it switched itself off after

ten minutes. Unusually, it did exactly that! The power supply would shut down completely, then reset after a further few minutes. Since the fault was obviously heat-dependent I decided to replace all four electrolytic capacitors on the primary side of the power supply, using high-temperature components. This cured the fault. **G.D.**

Hitachi CL2864TA

This set was dead except for a flashing red light. The cause was found to be D704 (BY228) on the line output sub-panel – it was short-circuit. After restoring normal operation by fitting a replacement I noticed a slight hum from the bass speaker. It varied in intensity with the picture content but was not affected by the volume setting. The level was very low, and I was not sure whether or not it was caused by a fault. When the set was switched on from cold next day however there was also a pronounced picture size bounce and jumpy sync. Replacing C916, C942 and C957 in the power supply cured both the picture disturbance and the hum. On test the capacitors were found to be only slightly sub-standard. **G.B.**

Hitachi C2508

The complaint with this set was "intermittently dead and making a strange noise when it did work". At switch on the set sprang to life, but made a loud screeching noise which indicated that something was amiss in the power supply. As a matter of routine, I replaced all the electrolytic capacitors in the chopper circuit – many showed signs of leakage. But the fault was still present when I switched on again.

Voltage checks revealed that there was only approximately 260V across the mains bridge rectifier's reservoir capacitor. When this capacitor was removed for test it was found to be virtually open-circuit. A 150µF, 400V replacement restored normal operation with no noise. It amazes me that the power supply could run at all with effectively no mains reservoir capacitor. **P.G.**

Bush 1433

This cheap 14in. portable produced a blank raster with reduced width and height. It was obviously a low HT fault, and a check at the output from the HT rectifier diode D809 produced a reading of 89V. While checking this voltage I noticed that the nearby HT reservoir capacitor was hot to touch. There was no electrolyte leakage, but a replacement (47µF, 160V) cured the fault. **P.G.**

Amstrad STV20

This combined TV/satellite model has proved to be quite reliable. The satellite section is the PCB of the SRD400 without the power supply components. One I had in recently was reluctant to come out of standby. Its power supply stopped momentarily when an attempt was made to switch on, and as a result the microcontroller chip reset. The cause was traced to R1997 (2·2MΩ), which was open-circuit.

Another one emitted a loud whistle from the power supply all the time. The cause was the STK73907 power supply chip IC1901. **C.J.G.**

Nokia FX3725 (Mono Plus chassis)

The customer complained that this set made a noise when in standby. In fact when standby was selected the picture and sound were muted but the timebases continued to run. The cause was traced to VO37, a surface-mounted pnp transistor. It was leaky. **C.J.G.**

Panasonic TX25AD1DP (Euro 2 chassis)

There was a most peculiar fault with this set. Part of every letter or numeral in the teletext display, but not graphic characters, was missing. As a result text parts of the display were virtually unreadable, though larger characters built from graphics looked correct. The picture was fine.

I initially tried replacing the TPU3040 text processor chip IC1701, but this made no difference. The fault was cured by replacing the VDP3108A video processor chip IC1601. Fortunately I'd allowed for this possibility when I gave the customer a quote. At least the chassis has 'proper' chips, not surface-mounted ones! **C.J.G.**

Ferguson 59P7 (ICC5 chassis)

This set tripped randomly. Tapping the PCB anywhere, or even thumping the bench, would instigate the fault. After much resoldering I discovered that the cause was the degaussing posistor. **C.J.G.**

Philips 52ZY3535 (Anubis B AA chassis)

This set was dead with a short-circuit chopper transistor. I replaced it, also the CNR50 optocoupler IC7514, and couldn't find any other faulty components on the primary side of the circuit (there aren't many). But when power was applied the FET immediately turned to a piece of wire again. More careful testing revealed that the control chip (IC7500) was the cause of the trouble. All was well once these three items had been replaced. **C.J.G.**

Mitsubishi CT25A5STX (Euro 12 chassis)

The power supply blew up again after a rebuild – don't you just hate it when this happens?! I found that the 3V zener diode ZD908 was short-circuit. It's in series with the chopper transistor's emitter, along with two 0·25Ω resistors (all in parallel), and is easily missed during initial testing. **C.J.G.**

Ferguson 51K7 (ICC5 chassis)

There was no remote-control operation with this set, even with a known good handset. Pulses were arriving at the microcontroller chip, and they appeared to be OK. So, after checking the clock and reset pulses, I replaced first the microcontroller chip and then the EEPROM, using substitutes from a working set. Neither made any difference.

After scratching my head for a while I decided to swap over the IR receiver modules. This proved that the cause of the trouble lay here. A new SL466 IC was tried, but again there was no difference. Careful comparison of the two modules revealed that the faulty one had a 10µF electrolytic capacitor fitted in position C950 whereas the good one had a link fitted here. Carrying out this 'modification' cured the trouble. Any ideas about this, anyone? The faulty set and module showed no signs of having been recently tampered with, and the customer said it had just stopped working properly one day. **C.J.G.**

Samsung CI5079T

The complaint with this set was intermittent variation in width. I found that the cause was the SMR40200 IC in the power supply. **C.J.G.**

Sharp 59CS03H (CS chassis)

This should have been an easy one: the BUH515 line output transistor Q601 was short-circuit because of a dry-joint at the scan coil connector. After resoldering, fitting a new transistor and replacing the usual capacitors the set started up but died again soon afterwards. The new transistor was short-circuit, this time because of a print break between its collector and C601 (probably caused when removing Q601).

As I didn't have another BUH515 in stock I tried the equivalent BU2508A. The set would then work only with the scan coils disconnected. Normal operation was restored when the correct transistor had been fitted. **P.S.**

Samsung CI348Z (P54S chassis)

The power supply in this 14in. portable produced an HT output of only 40V. A

blast of heat directed at the power supply soon brought the set back to life. C813 (100µF, 25V), which couples the drive pulses to the base of the chopper transistor, was found to have fallen in value to just 5µF. C813 lives under R802, a 5W resistor, so I was not surprised to find that it was faulty.

For good measure I also replaced C808, C811 (both 100µF, 25V) and C812 (1µF, 50V) which all showed slight deterioration. After that the HT was correct at 125V. **P.S.**

Philips 25PT632A/05 (GR2.4AA chassis)

The customer said that after he had stood on the remote-control unit the screen went green then blanked out. The first thing I noticed when I checked the CRT base PCB was that R3374 and R3434 (both 1·5kΩ) were burnt to a crisp. The former is in series with the tube's green cathode while the latter is in series with the green control grid. Further meter checks revealed that R3431 (180Ω safety) and R3372 (270Ω) were open-circuit, also that Tr7364 (BF422), the npn transistor in the complementary-symmetry green output stage, was leaky.

The reason for all this damage was an internal leak in the CRT, with the green gun reading 3kΩ to chassis. A quick blast with the rejuvenator cured this, and replacement of the faulty components restored a good picture. All we then had to do was to convince the customer that the remote-control unit hadn't caused the fault! **P.S.**

Grundig ST55-725 (CUC7350 chassis)

The complaint with this set was intermittent or delayed start up. The cause was traced to C60031 (100µF, 35V) which had fallen in value. It's the reservoir capacitor for the supply to the UC3842N/AN chopper control chip (pin 7). **B.McC.**

Sharp 66CS03H

The cause of intermittent failure of the BUH515 line output transistor, which usually blew from cold at switch on, was traced to C604 (330µF, 10V). It generates a small negative bias for the emitter of the line driver transistor.

To prove the point, connect C604 to a digital capacitance meter and spray it with freezer. With a faulty component, the capacitance will fall off dramatically. The replacement has to be rated at 105°C with a low ESR. **M.Dr.**

Toshiba 1400TB

This set's field scanning was non-linear. The usual cause of this is C317 (2·2µF, 50V) in the feedback circuit to the field output chip. On this occasion C317 was OK however. A scope check at pin 31 (ramp generator) of the TA8659AN colour decoder/timebase generator chip showed that the ramp was curved – it should have a steep, linear rise. The cause was C303 (2·2µF, 50V). It's not near the field stage however: you'll find it behind the 4·433MHz subcarrier crystal.

If, after replacing the tube and scan coils, you find that the chopper transformer has started to make a loud, buzzing noise, try connecting a 330Ω. 0·5W resistor in parallel with R814. **M.Dr.**

Samsung CI3312Z

This set's volume was stuck at maximum: the on-screen display turned up and down but the volume didn't. The cause was traced to R615 (8·2kΩ) in the DC volume control network. It was open-circuit. **M.Dr.**

Sharp DV5935 (BCTV-A chassis)

If you find that R632 and R619 (both 39Ω, safety) in the line scan coupling network have burnt up, replace them along with the coupling capacitor C619 (0·56µF, 250V) and resolder L603. It may also be necessary to replace the 2SD1546 line output transistor.

These sets also suffer from dry-joints on the scan coils PCB. It's wise to attend to this whenever a set comes in for servicing. **M.Dr.**

Thomson 32WS83KP (ICC19 chassis)

This widescreen set was reported to be dead but was actually tripping. The power supply would make an attempt to start, with a flash of the red LED in the power button. A scope check at the base of the chopper transistor revealed DC pulses at a frequency of about 1Hz, so I assumed that the power supply was in the overload condition.

When pin 6 of the LOPT was disconnected the power supply produced an HT output (Usys) of about 95V. As the line output transistor and the associated EW modulator diodes checked OK, I next disconnected pin 5 of the LOPT. This is the feed for the 198V supply to the RGB output stages. With this pin disconnected the set came to life. The cause of the trouble was the TEA5101B RGB output chip IB01 on the CRT base panel. **C.W.**

Sony KV2766UB

There was intermittent remote-control operation with this set. Power supply trouble was the cause, the 6V supply being low at about 3·8V. C655 (220µF) was the culprit. **C.W.**

Salora M Chassis

It's quite common with these sets for the Aquadag band fixings to crack and fall off. Usually the one at the top right-hand side breaks. When this happens the band drops into the power supply, with a bang: it always seems to link the chopper transistor's heatsink and the line output stage heatsink. This of course connects the primary to the secondary side of the power supply.

If you are lucky, all you will need are some BY133 diodes for the bridge rectifier and a fuse. If you are unlucky, the LF0070 hybrid chopper control chip and the chopper transistor will also have failed.

It's a good idea to put a cable tie on the band whenever you see one of these sets, as the parts can be very expensive. **C.W.**

ITT Digi 3 Chassis

If the reference oscillator is unlocked when cold, replace the MCU2600 clock generator IC. **C.W.**

Fidelity CTV3228

Quite a few of these sets suffer from a tuning problem. They appear to tune correctly, then you find that every preset has the same station as the last one tuned in. A dry-jointed memory chip (IC302) is the cause.

Line collapse is often caused by the scan coupling capacitor C620 (0·47µF, 250V) going open-circuit. When this happens, check R711 (3·3Ω) on the EW subpanel. **C.W.**

Ferguson 51J7 (TX99 chassis)

There was no picture or sound though the programme numbers came up. A scope check showed that there was a video output from the IF strip when a local station was tuned in. But there were no analogue control voltages (brightness, colour, contrast and volume). Checks at the M494B1 microcontroller chip showed that there were no PWM outputs from the control pins. A new M494B1 chip restored normal operation once the stations and analogue settings had been stored. **M.M.**

Mitsubishi CT25B2STX

Nicam dropout with a crackling noise from the speakers in these and other sets that use the same chassis is caused by dry-joints in the IF module – just as with earlier chassis. **M.M.**

Sony KVX21TU (AE1 chassis)

This set was dead with the mains fuse blown and the 2SD1548LB chopper transistor Q602 short-circuit. Nothing unusual about that, but while fitting a new transistor I noticed that D608 in the snubber network had a small crack in it. A check showed that it was short-circuit. Sony supply type RU-3AM as the replacement.

The more common fault in the snubber network is a dry-joint at the 220Ω, 10W resistor R614. **M.M.** ■

BOOK TO BUY

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

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

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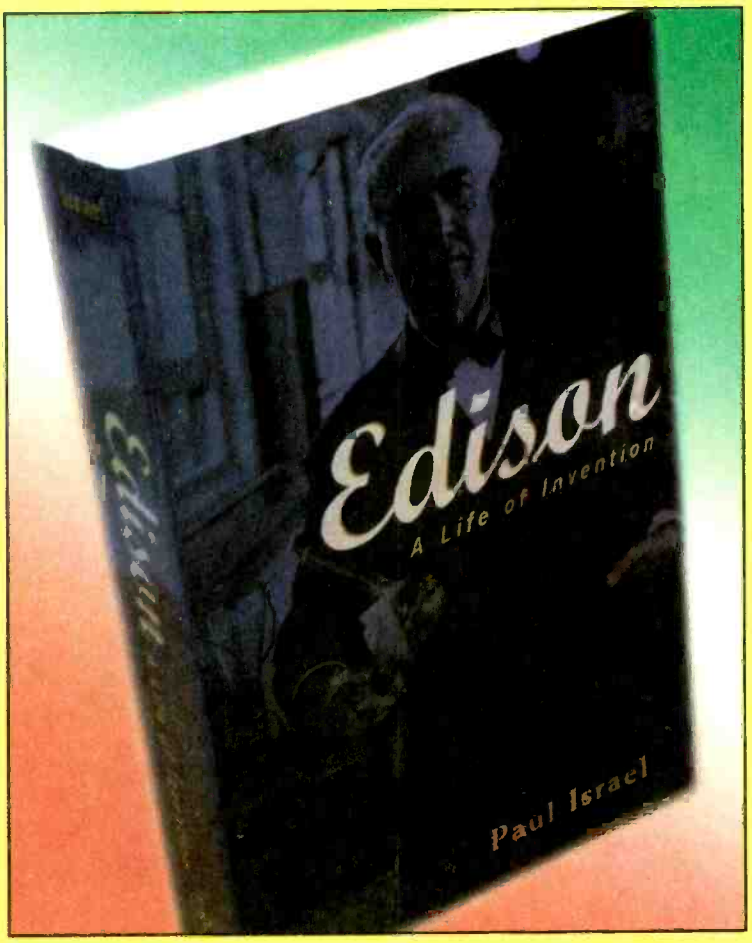

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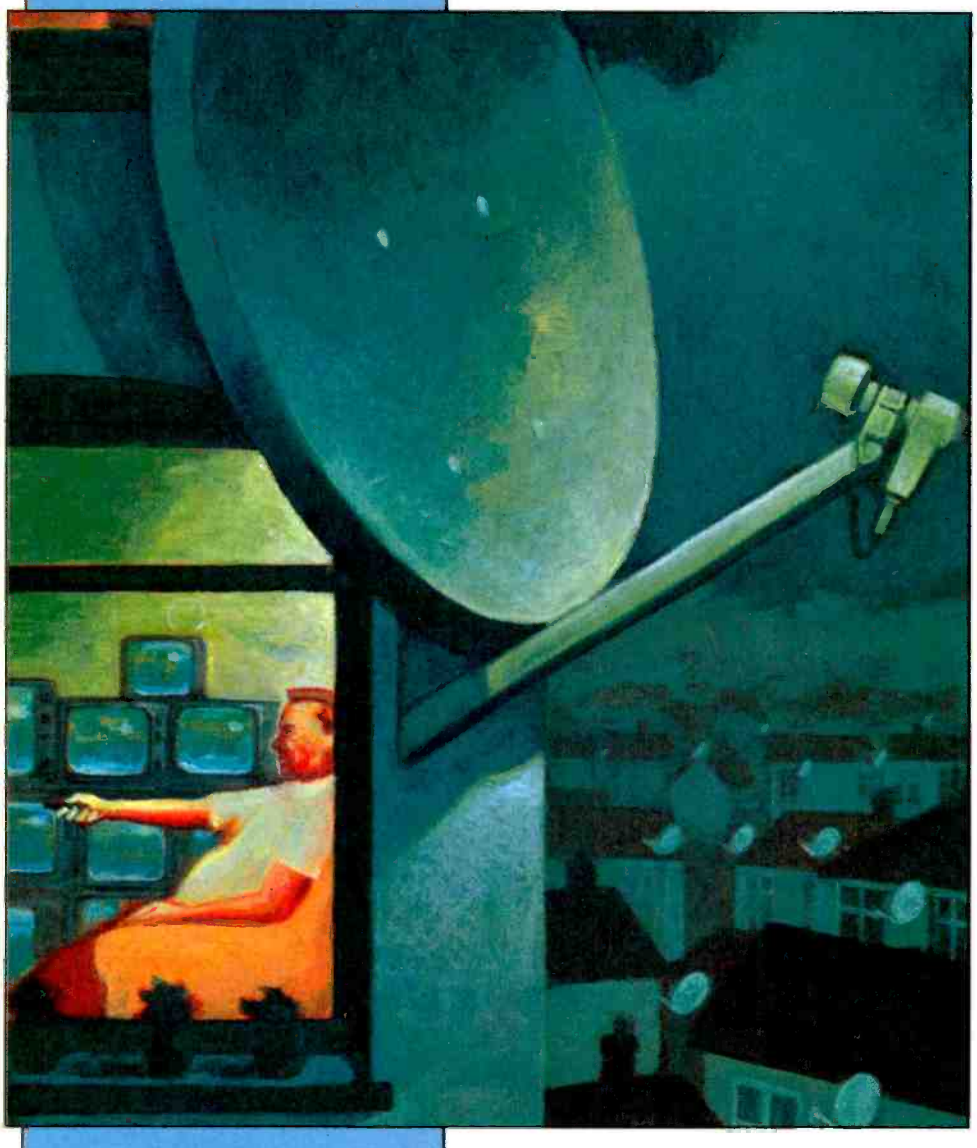


SATELLITE NOTEBOOK

Reports from
Hugh Cocks
Christopher Holland
and
Pete Haylor

Digital Woes

I've had two Nokia digital receivers recently with the following problem: the subscription viewing card refused to produce pictures on any channel. They were fitted with different types of conditional access module (CAM).

The first receiver was a Nokia 9800 that was used for the reception of Norwegian TV International from Intelsat 707 at 1°W. It changed channels normally, but wouldn't produce a picture even with channels transmitted in the clear. Removal of mains power, even for a considerable period of time, produced no change when the receiver was powered up again. The receiver's AGC-based signal-strength indicator showed that a signal was present, but the receiver refused to produce any channels in the Electronic Programme Guide menu.

I put the receiver into the 'reinstall' mode. This wipes out all existing channels and starts afresh. Doing so can help with a number of problems, ranging from a receiver that refuses to show certain channels to occasional lack of sound with others! It was of no help on this occasion.

The LNB produced normal signals with a MAC receiver that was also used for reception from the Scandinavian satellite. I nevertheless changed it, as there was the possibility of excessive phase noise being present in the frequency down-conversion process, causing lack of digital signals. It made no difference.

By now I was beginning to suspect a receiver problem. As a last resort I disconnected it from the mains supply, removed the Norwegian CONAX CAM that slots into the front of the receiver and the viewing card that fits inside the CAM, then repowered the receiver. It immediately displayed non-encrypted channels and asked for its CAM and card to be inserted on the Norwegian channel. I powered down the receiver and inserted the CAM and card. This restored normal operation with the Norwegian channel.

As yet there hasn't been a repeat performance by the receiver, so I think we can put it down to a 'power surge' problem.

Shortly afterwards I had a similar problem with an earlier Nokia Model 9600 and its Viaccess CAM. It was being used for reception of Swiss TV from the HotBird slot at 13°E (the later Nokia 9800 has Viaccess decoding facilities built in). No pictures were produced, though the receiver locked to the signal all right – indicated by the small rectangle to the right of the station name extending to its full height when changing channels. Powering down the receiver then rebooting it didn't help. Normal results were obtained after removing the CAM and repeating the procedure described above.

CAM removal can be tricky with the 9600 as there is nothing to 'pull' on – the CAM assembly is flush with the front panel. In stubborn cases it's necessary to remove the top so that the CAM can be pulled from its slot. Fortunately this problem has been resolved with the 9800: when a large grey button to the right of the CAM slot is pushed the CAM comes out slightly, enabling it to be extracted. **H.C.**

Pace MSS200

This receiver had been purchased by its owner second-hand. It refused to change polarisation, sending about 17V to the LNB at all times. There was therefore no reception of horizontally-polarised signals. The receiver looked to be in fair condition internally considering that it was about five years old.

Before getting too involved with the LNB supply circuitry I decided to select the installation menu then the LNB option. This revealed that positioner polarisation (option three in the LNB menu) was set to on. When I selected the off option I found that the LNB voltage changed over as normal.

Some years ago Pace produced a matching dish positioner box, and satellite polarisation skew could be altered via a magnetic or mechanical polariser. This was done from the positioner unit rather than by supply voltage switching from the receiver. If this facility was required, option three in the LNB menu switched it on when the positioner was connected. **H.C.**

SkyDigital Additions

The channels in Table 1 have been added to the SkyDigital package since those listed in the April and July issues. The transponder number is shown in brackets after the frequency, while the EPG number is shown in brackets after the channel name.

Astra 2B is due to be launched shortly. It will be co-sited with 2A, which currently transmits all the SkyDigital programming, at 28·2°E. Astra 1D remains co-sited with 2A for the moment, being used as a backup for 2A in case of problems. **C.H.**

LNB Adjustment

The customer had an 80cm dish with two LNBs, one for reception from 19·2°E, the other for reception from 13°E. This had worked all right for several years with analogue signals. Then a Humax receiver was connected for digital reception from 13°E. It wouldn't work at all.

I checked that the receiver was connected up correctly and that there were signals from 13°E. All OK. The receiver was then cleared of all the programming carried out by the customer and a new set-up was tried. Even the Italian free channels couldn't be found. As I had my Digisat meter with me I tried at the dish. The reading for horizontal signals was 4. By twisting the LNB a few degrees the reading rose to 94, with the reading for vertical signals in the eighties. Back down at the receiver I found that a locked picture was now being displayed.

The LNBs had been set up for best results with analogue signals, using a spectrum analyser. **P.H.**

Dish Refit

There was a call to refit a dish that had fallen from the T & K support which was at roof height. I was dreading the job, especially as it was a new customer. But when I got there he had dismantled the dish from its brackets and checked that it was still straight. The top bracket had pulled the centre of the brick completely out of the wall – it was fitted to the second course from the roof.

The dish was a Lenson Heath with two LNBs, one for 19·2° and the other for 13°E. I installed the dish in the garden, on a pole that the customer had fitted in concrete, and set it up using a spectrum analyser. But as he was going to use a digital receiver I tried setting up with my Digisat meter for optimum signal from both satellites.

The customer intended to run the cables under the path in tubing. So I did a temporary cable run. There were no problems when a digital receiver was tried, and the analogue receiver also gave good results with both satellites. **P.H.** ■

Table 1: New SkyDigital channels.

Frequency (GHz)	*Pol.*	*Channel*
11·876 (9)	H	Discovery Kids and Wings (556)
12·032 (17)	H	ITN News*, Lashkara Channel (691)
12·051 (18)	V	Boomerang (603)†
12·110 (21)	H	Channel Health (193)†, Red Hot Films (983), Red Hot Euro (984), UCB Europe (940)‡, UCB Cross Rythms (941)‡
12·266 (29)	H	Kiss (450), Private Blue (980)
12·324 (32)	V	Medical Channel (902), Costcutter Radio‡, One Word (942)‡
12·480 (40)	V	SkyNews Active (501)†

*EPG number not yet available (transmissions due to start in August).
†Boomerang (cartoons), Channel Health and SkyNews Active are unencrypted. SkyNews is still transmitted in parallel at 12·070GHz (transponder 19), with horizontal polarisation, but 501 in the EPG selects the new frequency (12·480GHz V).
‡Radio station, unencrypted. Costcutter is a supermarket radio feed not listed in the EPG.

SATELLITE WORKSHOP

JACK ARMSTRONG

Amstrad DRX100 Digibox

Joan has run a local coffee shop since her husband died five years ago. She's a nice old girl, but very forgetful. Last week I had a phone call from her to complain.

"You haven't been to look at my Sky yet!"

"Sorry, flower. I didn't know I was supposed to. When did you ask?"

"Well, er, I think it was yesterday."

"Yesterday was Sunday."

"Saturday then."

"I was away all day Saturday."

"Well, I'm sure I phoned you, but never mind. When can you come?"

"Is the kettle on?"

"Yes, erm, I think so."

"I'm on my way."

The cup of coffee was waiting when I arrived. At least Joan had remembered that! Her problem was that the Amstrad digibox in the sitting room wouldn't let her book any Pay Per View movies. It had worked perfectly for a year, but was now being unhelpful. I used the remote control unit to gain access to the on-screen menu, by pressing services then 4 and 7 for 'system test'. The message said "line busy".

"Have you left your telephone handset off the hook?" I didn't wait for a reply but went into the back room and picked up the handset. The normal dialling tone was present. Back to the digibox, which still thought the line was busy. I took it back to the workshop to investigate.

Unlike other digiboxes, the DRX100 doesn't have an internal modem circuit. Instead it employs a Mitel MH88435 'data access arrangement', which is a hybrid circuit on a ceramic board.

It's not easy to desolder this ceramic PCB without the right tools. It was a struggle even with my Weller desoldering station. You could of course snip the pins then remove each one individually, but you would look a fool if the DAA was not the cause of the fault! In this case it was, and a replacement from SatCure (01270 753 311) soon had the receiver working properly.

I don't know why the little hybrid module had failed, and Mitel didn't reply to my e-mail in which I asked whether they would like to investigate the faulty module. As in most parts of the country however we've had a lot of lightning storms recently, and I feel that a nearby strike might have induced a high-voltage surge on the telephone line.

The DRX100 appears to have a VDR, two high-voltage capacitors, two resistors and two diodes connected to the telephone input socket, but without a circuit diagram ("unavailable", would you believe?!) it's not possible to say whether they are likely to give any protection. Since there's only one VDR, I have my doubts (see the excellent article by David Benyon in the August issue). The digibox might well benefit from use of an external protective device such as the combined mains and telephone anti-surge adaptor from SatCure (for details see http://www.satcure.co.uk).

Interestingly, the DRX100 is the only digibox that has an earth connection in the mains lead. I'm not sure whether this makes it more or less prone to damage from surges on the telephone line. I've come across other digiboxes with damage, so there doesn't seem to be much to choose between them.

Although the DRX100 has a mains earth wire in the plug, it's connected to the power supply board via a plug and from there to the steel chassis merely by the clamping force of a single self-tapping screw that holds the soldered copper pad in contact with a metal pillar. Now if you refer to BS-EN60065 Household Appliances (of course you all have a copy, don't you? – a snip at only £99!) you will note that a mains-protective earth is supposed to have its own fixing method. In other words, a bolt used to secure the mains earth wire to chassis should have no other function. It should not, for example, be used to secure a transformer or PCB to the chassis. The reason for this is that should the bolt be removed to replace the item it secures and then not be refitted correctly, the chassis will have no earth connection. The bolt should also have a locking washer, which the DRX100 doesn't have. In addition, clamping to a soldered pad is not a good idea, as solder can 'creep' and loosen the joint.

In this respect I feel that the DRX100 does not meet the exact requirements of BS-EN41003, BS-EN60950 and BS-EN60065. But this is only my personal opinion, and I'm not saying that the unit is in any way unsafe.

Pace MSS200

Analogue satellite TV may be dead, but I still get a few customers who like the foreign channels. Hans Bauermann is one of them. He's a builder by name and a builder by profession. I suspect that every piece of equipment he owns is full of brick dust. His Pace MSS200 satellite receiver was.

"He giffs no zatelleet pic-tures" said Hans, waving his enormous hands in the air like an Italian policeman.

"OK, I'll fix it."

"Ja. See zat you do" replied Hans menacingly. I'm sure he was just being friendly when he poked me with his shovel.

Investigation on the workbench revealed that the receiver wouldn't light up. I replaced C59 (22µF, 35V), C60 and C61 (both 10µF, 35V) in the power supply,

which cured that symptom. I then got very streaky pictures and traced the cause of this one to C233 (220mF), which is next to the Nicky chip.

I finally found that the terrestrial pictures were extremely grainy. Replacing the BFR193 transistor Q1 in the loopthrough circuit in the modulator can fixed that. It's amazing how a receiver can accumulate three different faults in a day.

Hans was extremely pleased when he returned to pay for the repair. I could tell by the affectionate way in which he tapped my head with his hammer and called me "schweinhund".

BT SVS250/260

I had a call from Robert in Wiesbaden, Germany, for help with his BT SVS260 satellite receiver. As you no doubt know, in Europe the audio and video carriers are separated by 505MHz instead of the 6MHz used in the UK. While doesn't affect the scart output, it results in no audio via the UHF connection when a UK satellite receiver is used with a continental TV set.

There's an adjuster in the SVS260's RF modulator to enable the audio carrier frequency to be set. It's a tiny, fragile, black ferrite dust screw core however. You can gain access to it, without need to dismantle the receiver, as follows. Look at the rear. In most versions the RF modulator has a turquoise plastic adjuster slot for setting the UHF output channel. From the exact centre of the turquoise adjuster, measure 18mm vertically downwards towards the test switch and make a mark. From this mark measure 5mm to the right and make another mark. This is the exact location to drill a hole – or use a soldering iron to melt one. For ease of access, make the hole at least 6mm in diameter.

The adjuster is recessed about 8mm deep inside the modulator – about 10mm including the thickness of the rear plastic cover. With everything connected, try unscrewing the adjuster by a turn or two. Do this gently, otherwise it will break. I prefer to use the Maplin trimming tool part no. BR51F, which has a bronze blade. Alternatively you can use a jeweller's screwdriver with a flat blade of 1mm width or take a small plastic knitting needle and carve a 1mm blade with a penknife.

A similar adjustment can be carried out with many satellite receivers that have this type of RF modulator. The **Matsui OP10** uses the same receiver chassis as the BT SVS250/260. ■

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

http://www.ukstay.com/jack

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

Test Case 453

The subject of last month's test case was TechnoCrat's struggle with a Panasonic VCR. By coincidence, the next puzzle to engage the brains and fingers of the workshop worthies was another Panasonic product, this time a TV set, again with many years of trouble-free operation under its belt. It was a TX25T2 (Alpha 2W chassis).

It came in with a dead line output transistor which was short-circuit between all three connections. A replacement was fitted and the set was put on soak test. After a few hours the picture twitched, contracted to a ragged little square and then disappeared. Once more the line output transistor had failed. It's simply not possible to diagnose the cause of a fault like this in the available time window of half a second or less with no prior notice, is it? So preventative measures were taken. The line output stage tuning capacitor was replaced, all the pins of the line output and chopper transformers were resoldered, then a third line output transistor was fitted. With fingers crossed, the set was left running on test. You guessed it! After three hours another line output transistor joined the two in the ashtray. But the cause of the havoc was eventually found – with the aid of a magnifying glass. What was it?

All this banging and splatting had by now had an effect elsewhere. The field scanning was severely reduced, to a couple of inches, and the image within the scan was very distorted. At least it stayed put now that the first fault had been fixed. So attention was turned to the field timebase, where the AN5521 output chip IC451 was running abnormally hot. Its peripheral components were carefully checked, but no problems were found here. A check on the resistance of the field scan coils showed that it was no different from that of the scan coils in an identical set (in the scrap pile). So the conclusion was reached that the chip itself had succumbed. Television Ted ordered a replacement from a component distributor, and there the matter rested for the moment. Ted tuned his attention to a Sony TV with a bright blue picture . . .

Next day the AN5521 chip arrived. It was given to Cathode Ray to fit, and he wielded his solderimg iron to good effect: within ten minutes the set was up and running with the new device. But what's this? The height of the picture was reasonably correct, but the top of the picture was folded over. Ray checked his soldering then consulted Ted. Perhaps there had been further damage to components. They checked by substitution the capacitor and diode that provide the flyback boost voltage – these components are a common cause of problems at the top of the picture. But replacing them didn't cure the fault. There followed in-circuit and substitution tests on most other relevant passive components associated with IC451, all to no avail. An oscilloscope check on the feed to the scan coils revealed a large, narrow spike at a point in the waveform corresponding to the field blanking interval. A check on the supply to the field output chip showed that the voltage was smooth and at the correct level.

After a while it seemed that every relevant component in and around the field scanning circuit had either been checked or substituted. The pair finally tried connecting the drive to the scan coils in the scrap set. The spike was still present, and the picture symptom would have been the same. What was the culprit? For the answer, turn to page 694.

DX and Satellite Reception

Terrestrial DX and satellite TV reception. News about terrestrial transmissions and changes in the satellite belt. The effect of heat on LNB performance and ways of achieving an improvement.

Roger Bunney reports

There was some quite remarkable reception of long-distance TV signals in the UK during the period end-May to early June. Band I is still alive with analogue transmissions! As mid-June approached, the Sporadic E conditions fell right away. Fortunately during the final week SpE propagation was back again. As I write this at the end of the month we have been experiencing SpE reception on a daily basis.

Reception of a number of Arabic signals was reported over May 27-28th, including Jordan ch. E3, Syria chs. E2 and E3, Dubai ch. E2, Iran ch. E2 and an unidentified ch. E4 signal that could have been RTM (Morocco). Double-hop SpE was evident, with many of the Arabic signals coinciding with single-hop signals from the Balkans, including Romania.

The trend of reception mainly along a north-south path continues, with propagation conditions favouring Italy, Spain and Scandinavia. The log for June is as follows:

3/6/00	YLE (Finland) ch. E3; NRK (Norway) E4; SVT (Sweden) E2; LRT (Lithuania) R2; YT-2 (Ukraine) R4.
5/6/00	Unidentified ch. R2 signal.
6/6/00	RTP (Portugal) E3; TVE (Spain) E3, 4.
9/6/00	Ch. R4 signal (see later); RAI (Italy) IA, IB; TVA (Italy) E3.
10/6/00	RAI IA; TVE E2, 3.
11/6/00	RAI IA; TVE E4; SVT E2-4.
12/6/00	LRT R1, 2; SVT E3.
13/6/00	LRT R1, 2; RTLK1 (RTL Club, Hungary) R2; TVE E2-4; RTP E3; JTV (Jordan) E3.
14/6/00	TVA E3; RAI IA, B; TVE E2-4; SVT E2-4.
16/6/00	TVE E2-4; RAI IA, B.
19/6/00	RTLK1 R2; SYT (Syria) E2, 3; RAI IA, B; SVT E3; Unidentified Arabic signal (praying) E2.
20/6/00	RTLK1 R2; RAI IA, B.
22/6/00	SVT E3.
24/6/00	TVA E2; TVE E2-4
25/6/00	TVE E4.
27/6/00	TVA E3; RAI IA, B; TVE E2-4; RTP E3.
28/6/00	DR (Denmark) E3; CRO (HRT – Croatia) E4; NRK E2-4; SVT E2.
29/6/00	TVE E3.
30/6/00	LRT R2.
1/7/00	TVE E2-4; RTP E3; RAI IA, B; TVA E3.

At 1110 CET on June 9th Ryn Muntjewerff (Holland) received, on ch. R4, an unidentified cartoon followed by a regional logo identification. The latter featured an oil tower, suggesting that the source of the signal may have been the oil-bearing regions of SE Russia, around the Caspian Sea.

A letter from Todd Emslie (Sydney) reports that the mid-Winter SpE season has started there. NZ ch. 1 has been received almost daily. Todd's VHF log for March through to early May reveals reception of some really exotic signals, mostly via his Icom R7000 scanner. Examples are 50·11MHz reception from Belize, Nicaragua and Guatemala; reception of TV transmitters in Iran and Dubai, confirmed by offset measurement; and unidentified ch. A2 NTSC signals on April 17th. Reception from China seems to have been common, though Chinese TV audio at 43·25MHz on April 30th was unusual.

Over the past few weeks there has been considerable solar unrest, with flares that produced some quite dramatic results. This might in some way have contributed to recent SpE activity.

A New York facility company identification received via NSS K at 21·5°W (digital signal).

Satellite Reception

The Euro 2000 UEFA football championship provided the major sporting event in June. One German news feed seen on the 20th via the Intrax 14HBR truck and NSS K (21·5°W, SR 5,632, FEC 3/4) referred to "the German players and English hooligans" in discussing the latest events of the day.

Interesting that the BBC live sports feed via Telecom 2C (3°E) at 12·606GHz V was in clear analogue form though with the now rather old SIS (Sound In Syncs) signal transmission system. The SIS feed was used for several days via 2C. For those not familiar with the SIS technique, the audio signal is inserted in digital form during the analogue video sync pulse periods. As a result, when there's sound present the picture 'shakes'. A special sync stabiliser ('EBU descrambler') will lock the image and provide sound.

While the European teams slogged it out, the American version of football was being played out at the NFL Europe League on June 17th, the venue being the World Stadium, Frankfurt. The Berlin Thunder v. Frankfurt Galaxy, with kick-off at 1930 hours, was seen via NSS K in a relay to Fox Sports, USA. Interesting that there was both an analogue feed with commentary at 11·676GHz V and a parallel digital feed at 11·559GHz H (5,632, 3/4). For technical reasons, perhaps coding delays in the equipment (?), the digital feed was about two seconds later than the analogue one.

A more exciting offering via NSS K was the race meeting from South Boston Speedway relayed, on the 10th, via the BT Washington circuit (11·599GHz H, digital). On the 18th Pikes Peak International Raceway provided more thrills and spills for ABC Sports at 11·559GHz H.

Incidentally I noticed a new Dutch facility house a couple of times in June, signing itself "SAIT-VIDEO HOUSE". As with the NSS K sightings just mentioned, the SR was 5,632 and the FEC 3/4. One previously unseen service appeared as "INS", subsequently producing the identification "Instant News Service Bruxelles". No news however, just colour bars! This was at 11·520GHz H.

The Romanian TV service TVR has opened a digital channel multiplex via Eutelsat W2 (16°E). It includes TVR International, TVR-1 and TVR-2. As it's in PowerVu, Romanians outside their homeland are unable to view the programmes. Check out 12·715GHz V (9,814, 2/3). This information is from Stefan Hagehorn (Germany) who also reports that another Lebanese digital channel multiplex has appeared via Arabsat at 26°E. This one's offerings include LBC, MTV Lebanon, Tele Leban and others. It's at 11·785GHz V (27,500, 3/4) in the clear. Lots of strong signals here.

During June Eutelsat II F3 (36°E) stepped off stage with the arrival of the newly-launched SESAT bird. This satellite shuffle occurred on June 11-13th. Prior to that, on the 5th, II F3 carried several important links from Moscow to Europe during President Clinton's visit. His speech was carried in full at 11·678GHz H (service identification "MSC11 Moscow"). The BBC circuit was at 11·600GHz H, with studio shots and an eventual report, update and review (service identification "RTV MOSCOW 4").

From time to time I find that my RSD ODM-300 digital receiver just refuses to lock up despite what appears to be a good signal. The days of APTN feeds via 13°E were a prime example – other enthusiasts' receivers (Nokias etc.) would lock up and display APTN, but the RSD refused. While checking out Telstar 12 (15°W) the other day the signal strength at 11·491GHz H showed 90 per cent on the scale, with parameter lock-up at SR 26,000 and FEC 5/6, but there was no picture or memory lock-up. Any suggestions anyone?

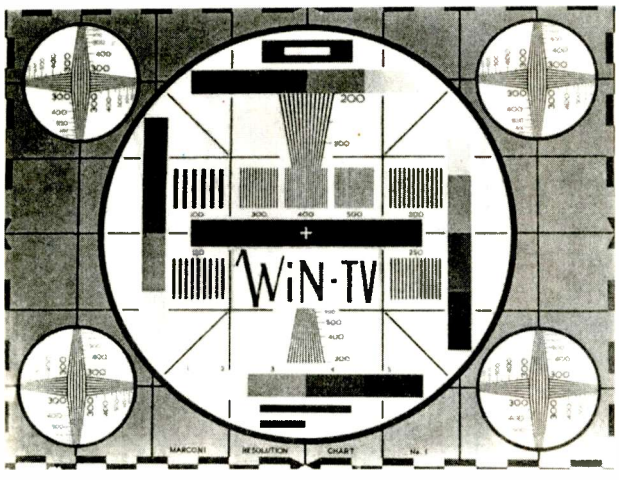
Roy Carman (Dorking) had an unusual experience with Eutelsat W4 (36°E) on June 28th. Noting activity at 12·684GHz H, he discovered that two signals were present: Studio Europa with SR 2,500 and FEC 2/3, and an East European programme, Channel 11, with SR 3,255 and FEC 2/3. I tapped in the frequency and received absolutely nothing!

There's a Channel Master offset dish, possibly 1·8m, on the studio roof (Radcliffe Road side) at Meridian TV, Southampton. A couple of recent reports suggest that Meridian is taking OB feeds from Intelsat 801 at 31·5°W. When I viewed the dish it was indeed pointing towards the SSW. Colour bars with the inlaid identification "Meridian TV" have been seen in the clear at 10·988GHz V (SR 5,632, FEC 3/4). This is a commonly-used ITV patch for OB and sports hookups. BT has also been seen at about 10·955/10·963/10·978GHz V. Even "MTV live aus Berlin" appeared one day at 10·963GHz V (SR 6,111, FEC 3/4). The 10·995GHz slot is often used for live Sky Sports feeds. So it's worth checking here for weekend/evening sports.

Local test signal from NTL, Crawley Court, received via Eutelsat W2 at 16° E (digital signal).

Terrestrial News

UK: EMAP Digital Radio Ltd. has applied for the franchise to run the



The 1972 Marconi test card used by WIN-TV, Wollongong, NSW. Picture courtesy Robert Copeman, Melbourne.

digital radio multiplex serving the central Lancashire region. Only one application was received for this licence. EMAP will provide an eight-programme service using the Pendle Forest and Winter Hill transmitter sites and, later, a transmitter at the Blackpool Tower.

Ian Menzies (Aberdeen) reports that oil company Shell has been mooring a 63,000-tonne tanker, the Norrisia, off the Bridge of Don. It reflects local TV signals, causing considerable interference to reception by those living nearby, particularly at high tide and as the ship's position moves in the tidal flow. The 263m long ship is being used to ferry oil from the North Sea fields back to the mainland, and is at times moored in the bay. Shell Oil UK is taking the matter seriously, and is in discussions with the local harbour board with a view to obtaining an alternative anchorage. Makes a change from the local gasometer moving up and down!

France: TF1 Digital is shortly to provide more DTT channels, including a news channel, Odyssee (travel/nature), Eurosport and the inevitable shopping channel. In addition TF1 Digital will take over the TFX entertainment channel and the Brittany region channel TV Breizh. Youth, documentary and soap channels are promised.

Denmark: Several new local UHF TV transmitters are now in operation. Check the following during the next tropospheric opening:

TV Danmark Haderslev	ch. E23
TV Danmark Naestved	ch. E38
TV Danmark Vest	ch. E43
TV Danmark Sydfyn	ch. E43
TV Danmark Sonderborg	ch. E51
TV Danmark Sydsjaelland	ch. E54
TV Danmark Midtjylland	ch. E57.

Latvia: LTV-1 is to move from ch. R2 to ch. R43 at a future date.

Bulgaria: The Bulgarian TV authority is to license a further six commercial stations – the idea is to minimise the activities of pirate TV operators. News Corporation Bulgaria will be the country's first national commercial TV station: it's due to open early next year.

USA: Cable company Comcast (Maryland) is offering an amnesty to those who use 'pirate boxes' to tap off programmes from the main cable network. After June 30th offenders will be prosecuted.

Orbital News

The expansion of Eutelsat continues. Yet another satellite (no. 7) is to join the Hot Bird group at 13°E in early summer 2002. Its forty Ku-band transponders will provide coverage of Europe and the Middle East, with two steerable spot beams providing the coverage outside the main European area. Over a six-week period Eutelsat launched SESAT (April 17th) and W4 (May 24th), then took over Telecom 2D at 8°W on June 8th, increasing its fleet to seventeen active satellites. Eutelsat has also formed a trading agreement with the Scandinavian group Telia to provide a DTH digital TV and multimedia service via the W3 satellite at 7°E. The vintage Eutelsat I F5 bird, which has been slumbering at 4°E, is to be 'de-orbited': all life as we know it on the craft has ceased.

Analogue transmissions of The Racing Channel and Sky Cinema at 19°E are to cease at the end of August, leaving these channels available in digital form only via 28°E.

The BBC has developed a new method of using Immarsat phone capacity to feed video inserts to the studio base – it's being used by BBC News. In the past stills have been sent via Immarsat, also moving video (using MPEG-1 compression it has taken ten minutes to transmit thirty seconds of moving pictures). The new method sends pictures live at 64kbits/sec, and has been used to transmit pictures in real time from Sierra Leone. The bandwidth limitation means that movement has to be kept to a minimum – it's suitable for interviews for example. Terrestrial transmission via ISDN line using the technique provides greater flexibility, running at up to 128kbits/sec.

Satellite enthusiasts have in recent months lost access to the news distribution circuits via Eutelsat W3 (7°E) because of the use of the MPEG 4:2:2 standard. No suitable receiver is at present available – there are only professional models that cost thousands of pounds. It seems however that the German firm Telemann is considering a 'fair price' model that would be produced in Korea and could be available by the end of the year.

Finally a US video called Spin is devoted to goofs and unrehearsed asides that were obviously not intended to be broadcast but were nevertheless seen via live satellite links. The compilation has been made by sat-zapper Brian Springer of Buffalo, NY state.

The LNB

The LNB is perhaps the most significant item in a satellite receiving system. Sitting at the focal point of the dish, it's subject to freezing, snow, rain and heat. The latter can be simply a matter of the local weather, or the more dramatic situation when the sun is focused on the LNB during an equinox. Despite the wide temperature and dampness range experienced, LNB performance is generally fairly stable. Variations are masked by the receiver's AFC system and, for Sky reception, the very strong downlink signals. But when you are trying to receive a much weaker signal you may experience sparklies (with an analogue signal) or pixelation (with a digital signal).

The subject of improving the low-signal performance of LNBs was discussed in the June issue of the *SatFACTS* trade magazine (New Zealand), using heat-pump techniques and much simpler, practical methods. An LNB consumes current, which of course generates heat. Band-switched LNBs usually incorporate a voltage stabiliser, which also generates heat. This heat is additional to the thermal noise produced by the active circuitry, so the result is a degraded noise performance. There may be an additional heat noise of only 0·1dB to add to the electronic noise: but when this 0·1dB is added to an LNB noise figure of say 0·6dB the result is the same as that of reducing the size of the dish. The effect may not show with Astra or Hot Bird, but will certainly show up with say a marginal signal from Intelsat at 66°E, particularly when there are rain-fade problems as

well, i.e. more noise.

One possibility discussed was to fit a Peltier pn-junction heat-conductor device, a sort of powered heat pump that's mounted on the LNB's outer casing. I've never seen such a device in the UK, and there are powering complications. In the early Sixties heat pumps were used with parametric amplifiers, involving liquid hydrogen and other methods to reduce thermal noise and improve the signal-to-noise performance, so the technique isn't new. But there are simpler ways of achieving cooler working.

Switch to hi-band (Telecom) operation, which will apply 18V to the LNB. After half an hour check the casing for a hot spot, which will indicate that a voltage stabiliser is at work. Most LNBs, other than those produced by Swedish Microwave, are of rectangular construction. It should be simple to find a heatsink that can be added to the casing with a plastic tie to hold it firmly over the hot spot, thus removing heat from the case and reducing the LNB's internal temperature. Maplin Electronics has a wide range of finned, ribbed and other heatsinks. Use tightly-locked plasic tie(s), not a screw-up jubilee clip.

One obvious point is that a small LNB is likely to run warmer than a larger one with metal mass.

The simplest way of providing LNB protection is to use a white (reflective) cover. A slide-on plastic tube – check the liquid containers in your local supermarket – will provide total weather protection for the LNB and the sensitive F output socket against rain and snow and will reflect incident solar heat. A few holes underneath will provide an air flow to avoid condensation build-up. This method of protection will leave the LNB in an as-new condition for years. Don't fit a dark cover over an LNB as this will absorb heat and result in an internal temperature rise.

During the equinoxes in late March/early April and late September/early October solar heat may be focused on the feedhorn. Most feed tubes should have a cap that will withstand the concentrated heat and protect the LNB. But a few years ago the blue plastic feed cap on my Chaparral LNB totally melted. A replacement polythene cap from a domestic bottle was fitted instead and has since withstood many equinox thrashings. Drill a couple of small holes to prevent condensation.

Bob Cooper of *SatFACTS* mentioned that a P3 quality analogue signal from an uncooled LNB could be raised to P5 quality with cooling. In digital terms, using a 1m dish for Ku-band reception, the effect of cooling produced an improvement from signal lock lost to no pixelation, dropouts or picture freezing. This was equivalent to using perhaps a 1·8m instead of a 1m dish. Bob was talking about active cooling techniques, but picture improvement with marginal signals can be achieved at minimal cost and little effort using passive cooling techniques as outlined above.

VCR CLINIC

Reports from
Ian Bowden
Denis Foley
John Coombes
John Edwards
P.J. Roberts and
Michael Maurice

Panasonic NVHD640

The complaint was that this machine cut out when it went into rewind or review. When I checked it there were no problems for many hours. Then I noticed that there was loss of reel drive shortly after going into the review mode. Watching the large mode cam as the mechanism changed from play to review, I saw that when the fault occurred the cam didn't move as far in the clockwise direction as it should have done before moving back anti-clockwise.

I had a look at the mode switch, which in these Z mechanism machines is soldered to the main PCB. When I unsoldered it one end leg that had been bent over during production fell off.

Once a new mode switch had been fitted the machine worked perfectly. Either the mode switch had been faulty or the leg had separated as a result of slight switch movement when driven by the mechanism. This is the first Panasonic deck I've come across in which the switch isn't screwed securely to the mechanism. **I.B.**

Hitachi VTM620E

There was no playback audio. No hum or buzz was produced when the audio head leads were touched, but there was hum when I probed around pins 21 and 23 of the audio record/playback chip IC401. These pins are after the playback equalising amplifier section. A DC check at the IC's input pin 15 produced a reading of about 0V instead of the correct 2·3V. The cause was the 560pF capacitor C480, which produced a resistance reading of about 100Ω. It had been corroded by leakage from C402, a 1µF, 50V electrolytic that's mounted next to it on the PCB. A clean up and new capacitors restored the playback sound. **I.B.**

Aiwa HVGX500K

The complaint with this machine was failure to rewind. It worked fine for several hours, but then started to fail fairly frequently, normally when going from play to the review modes. The machine would power off, after which the mains supply had to be disconnected then reconnected to get it going again. It also failed when going from stop to rewind, as reported.

As the fault appeared to be mode related I had a look at the mode switch, which is part of the mechanism connection PCB on the underside of the deck. It looked like new, with no sign of tarnishing of the PCB part or the moving fingers inside the plastic holder. I cleaned it anyway, after which the machine appeared to work all right.

During a soak test however it failed again, just once as before. When I called Aiwa technical I was told that the switch should be replaced even though it looked fine. A new switch cured the problem. **I.B.**

Hitachi VTM640E and VTM622E

If the capstan motor operates in the fast forward and rewind modes but not during playback or record, try replacing C626 and C627 which are both 47µF, 16V electrolytics. They are reference voltage components for the pulse amplifier chip IC602. **D.F.**

Sanyo VHR4350

The cause of damaged tapes can be a faulty mode switch. If not and there's a tape loop when the cassette is ejected, check the brake pads and capstan flywheel. Also replace the brake arm. **J.C.**

Toshiba V726B/V727B

No results can be caused by faulty capacitors. Check CP007 (10µF, 50V) and/or CP008 (100µF, 25V) by replacement.

If the display is dim check CP041 (220µF, 10V) in the power supply. It can go low in value. **J.C.**

Akai VSG745E

Failure to accept tapes can be caused by a misaligned or faulty mode switch. Another possible cause is the arm loading block, which may be broken or bent. Check it by replacement. **J.C.**

Toshiba V204B

Sound variation is a complaint you sometimes get with these machines. The cause is usually worn take-up or supply spools, which cause intermittent tape speed variation. Check by replacing them both. **J.C.**

Hitachi VTM622E

A high-pitched whistle could be heard in the E-E mode, along with normal sound. The off-tape picture appeared when playback was selected, but the E-E sound was still present. So was the whistle. When a finger was placed in close proximity to the case of the LA7295 audio chip IC401 the intensity of the whistle increased.

Scope checks at the output pins of the chip revealed that the audio waveform was riding on an HF oscillation. Normal

sound and mode switching were restored when a new IC had been fitted. **J.E.**

Grundig GV469M

This machine was brought in because it was dead. I inspected the power supply and found that the majority of components were dry-jointed. But the machine still wouldn't come on after attending to the dry-joints. The cause of the trouble was C136 (1µF, 400V). **P.J.R.**

LG N311

There was no record or playback colour. It didn't take long to find the cause – someone had removed the 4·43MHz crystal X301. A replacement restored the colour. You would get the same symptoms with a defective or dry-jointed crystal, so it's worth checking this item. Unfortunately it is not listed in the manual. A suitable replacement is available from CPC however, order code SCC4103. **P.J.R.**

Ferguson FV62LV

This VCR was completely dead with the fuse intact. We don't see many of these Thomson-based machines, so I'm not familiar with the power supply layout. It's a chopper circuit with a load of electrolytic capacitors waiting to dry up and fail. I decided to replace all those on the primary side of the circuit: CP05, CP06 and CP07, all 1µF, 50V, and CP10 which is 10µF, 50V. They are all 105°C types. Once this had been done and several dry-joints had been attended to all was well. **P.J.R.**

Panasonic NVFS90B

There was no RF through to the TV set. The cause was not a loose RF output socket as the customer suggested but dry-joints at the sub-PCB's connector to the motherboard. **M.M.**

Toshiba V804

This VCR had received attention from the local rip-off merchant, who had charged £100 for changing the heads. In fact he had cleaned them and removed the head cleaner. The machine was now jammed, because the supply guide's gear was out of sync with the load bar. Toshiba has a kit that consists of the gear, bar and a split washer. The repair consisted of fitting these items, a new head cleaner and some missing screws. **M.M.**

Hitachi VTM930

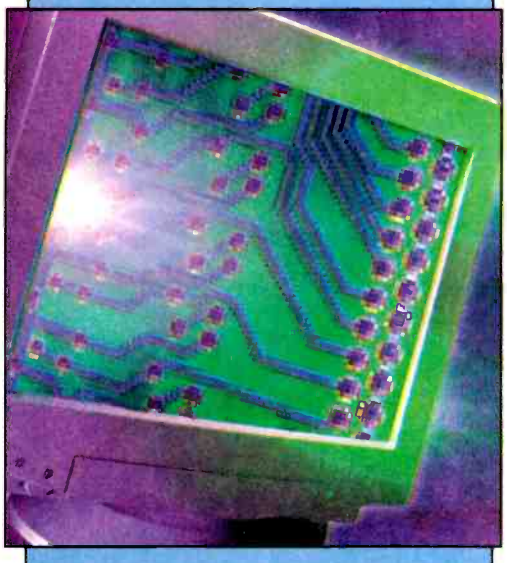
When this machine was powered up the cassette carriage would immediately try to move forward even without a tape. If a cassette was inserted before powering up, the tape would fully lace but no other functions worked – except eject. The BOT sensor doubles as a tape-in sensor. When I removed it I found that one leg was broken near the PCB. Repairing this lead cured the fault. **M.M.**

Mitsubishi HS651V

Very occasionally this machine would leave a loop of tape when the cassette was ejected. The cure was to fit a new mode switch. **M.M.**

JVC HRJ625EK

This machine was jammed. I couldn't see any damage but decided to replace the control cam, control plate and mode switch. Once the deck had been realigned all was well. **M.M.**



MONITORS

Fault reports from Ian Field and Geoff Butcher

IBM Series 028-002

This monitor, which uses an STR54041 chopper chip, came in with a blown mains fuse. Some quick checks failed to reveal any shorts. The degaussing posistor didn't rattle, but I nevertheless broke it open and inspected the thermistor pellets for any signs of flashing over – there have been occasions when a non-rattling posistor has proved to be faulty!

The next place to look was the error-voltage sampling capacitor C614 (10µF, 100V). Its ESR reading was about 0·5Ω, which isn't all that bad for a 10µF, 100V electrolytic. As the condition of the soldering gave no grounds for suspicion, and no other likely causes could be found, I decided that – unless the 110/230V switch had been tampered with (unlikely) – C614 remained the most likely suspect. This was especially the case as the office in which this monitor is used could be cold when it's first switched on in the morning. The capacitor might then give very different readings than in the comparative warmth of my workshop.

One way to eliminate this possibility would be to use a non-electrolytic capacitor as a replacement. I found a 10µF, 100V polycarbonate capacitor in the bits box, but it was huge! A better solution was to use three 3·3µF, 100V polypropylene capacitors in parallel, giving 9·9µF, 100V. This was smaller than the single 10µF capacitor. So I fitted these and gave the monitor an extensive soak test that included repeated switching off and on, both when cold and after a long period of operation. This proved that all was now well. I also added an MOV varistor across the mains input connector. It should stop or be visibly damaged by any mains transient likely to cause fuse failure. In the event of the monitor coming back, at least I will have eliminated two possible causes of failure.

As a regular reader of *Television*, I am aware of the perplexing difficulties that can be caused by the STR range of five-pin chopper chips. I have sometimes found that these ICs behave unpredictably, but in the majority of cases the chip either fails destructively or the cause of fuse blowing lies elsewhere. In most cases a replacement error-sensing capacitor, with an ESR-shunt polycarbonate or Mylar capacitor of value between 0·47-1µF, will result in a monitor repair which stays that way. Normally I wouldn't bother about adding a mains input varistor. But I did need a favour from this customer! **I.F.**

Compaq V70 (Model 621)

This looks like a Samsung chassis, a make that doesn't usually give me much trouble. This particular one often does however! The symptom was a jagged display only an inch wide. I found that the BU2522AF line output transistor had failed, but as there was some scan, albeit very little, this was the last component I checked.

As is common with recent 17in. monitors, the line output and EHT are generated separately, so the fault in the line scan stage didn't affect generation of the EHT. It seems that the scan B+ regulator has no reservoir capacitor, which enables it to augment the scan waveform. It also appears that the B+ PWM inductor doubles up as the inductive load for the scan output transistor. This would explain how the monitor managed to produce some scan despite the dead-short line output transistor!

When this chassis is dismantled for servicing, the bottom of the on/off button is in contact with the bench surface. As a result you may get the impression that the monitor has died! The solution is to slacken the single screw that holds the pushbutton switch. This will prevent inadvertent operation of the switch. It's obviously important to remember to retighten the screw before casing up. **I.F.**

Jean 29J56N/JD156N

This is another of those monitors that only rarely has a badge on the front. One example I came across had the Acer badge, but I've no idea whether that proves anything! The LED came on but there was no display on the CRT. When I opened the monitor up I saw that the tube's heaters were alight, which confirmed that the power supply was working. As I moved the chassis slightly to gain better access to the line output side the EHT burst into life and a display appeared on the screen. The cause of the trouble was easy to see once the print side of the PCB was examined. Several of the line output transformer's pins had conspicuously fractured solder joints. The rest of the soldering looked much better, but it never hurts to make sure! **I.F.**

Elonex MN009/1

Every so often one of these monitors is easier to repair than figure out what it is! This was the first one in about three months that wasn't either an MN024 or MN034 – with only a handful of either of these having the same chassis. This time

the chassis was of Philips manufacture, but with no indication of the chassis family. The monitor came in because it was dead. As I turned it over to see which type of PCB locking catch was used, I immediately noticed that the soldering around the three-terminal regulator IC7106 was poor. As the rest of the soldering appeared to be OK, I attended to IC7106 then gave the monitor a try. It worked! **I.F.**

Compaq PC, PSU series PS2022

This monitor wouldn't start. Few customers take up the offer of switch-mode power supply repair these days, since generic PC power supplies are so cheap. But this power supply is not an off-the-shelf item. It would have had to be ordered – at a price! The cause of the fault was simple enough. The resistors (both 62kΩ, 2W) across the two mains reservoir electrolytics were open-circuit. One of them provides the start-up supply for the UC3844 chopper control chip. **I.F.**

Daytek DT1436M4

When I checked this monitor it was dead with quiet power-supply pulsing. It had also been meddled with: there were quite a few screws missing, the convergence locking ring was hanging around the neck of the CRT and, as I discovered when I got the monitor to operate, the LOPT presets had been got at!

The 2SC4924 line output transistor was short-circuit, with no obvious sign of a cause. The B+ regulator is of the flyback type, which is unlikely to have been responsible – though this was not impossible. It had not been damaged by the short-circuit line output transistor.

The replacement transistor lasted all of two hours! A closer inspection of the line drive circuit revealed that the feed to the output transistor includes an electrolytic capacitor (C420, 47µF, 50V) to enhance the falling edge of the drive pulse. Although this capacitor had a 'clean' appearance and produced an acceptable ESR reading, I decided to replace it with a very-low ESR type and, in addition, fitted a couple of 0·47µF, 63V ceramic capacitors in parallel to make the base drive coupling beyond reproach. As an added precaution I also replaced the flyback tuning capacitor C421 (5·6nF, 1·6kV). I'd already examined the soldering and given quite a few joints fresh solder, but gave the main PCB another go for luck!

When a monitor has this given this sort of trouble I subject it to a period of switching on and off, both from cold and after running up to working temperature. I also activate the DPMS shutdown, both by unplugging the signal cable and rebooting the PC. Provided it survives this, I give the monitor an extended soak test – preferably a full day plus overnight. There was no further trouble.

According to a note moulded in the bottom of the cabinet this monitor is manufactured by Orion Electric Co. Ltd., Korea. **I.F.**

Hyundai HL5864

The complaint was "narrow picture with the front buttons having no effect". I had a hunch that the chassis would have an EW driver transistor bolted on to the aluminium heatsink surrounding the LOPT, and that it would be dry-jointed. The transistor turned out to be Q312, and it was dry-jointed. So was the LOPT – a sharp tug would have had it out!

After a quick go round, resoldering any dry-joints I could find, width control had been restored. But while bench testing I noticed some random flashes across the screen. When I removed the screening from the CRT base panel I found that the soldering here was just as bad! **I.F.**

Research Machines (RM) 29J56G

There was no display and the power light was flashing. I found that the BU2520DF line output transistor was short-circuit, apparently because of dry-joints at the pins of the LOPT. After replacing it and resoldering the transformer however the EHT was very low and the power supply was still pulsing.

I eventually found that L805 had developed shorted turns. There didn't seem to be much chance of getting a replacement, but it was a fairly straightforward job to rewind it with 112 turns of 0·5mm enamelled-copper wire. This gave an inductance of 880µH and a *Q* of 9. Normal operation was restored once the coil had been refitted. **G.B.**

Digital PCXBV-PC

There was no sign of life other than an illuminated power light. I checked the line output transistor to see if it was short-circuit, but it was OK. The line output transformer was short-circuit between the winding connected to pins 4, 5 and 6 and the winding connected to pins 1 and 2 however. The original transformer was an AT2090/51. I replaced it with the compatible HR type HR7792, after which the monitor worked normally.

The chassis used in this monitor is the **Philips** CM1800. You will encounter the same monitor as the **Elonex** MN04, **RM** G1566AS/200 and the **Philips** 4CM8274 amongst others. **G.B.**

Tiny M7F21TY

This monitor produced a display that had a bright green cast with flyback lines. The cause was traced to Q1152 (BF423) in the green output stage. It was leaky. **G.B.**

Philips 17C1321 (107S)

At first sight it looked as if this was going to be a tough one: in the lowest VGA mode there was severe tearing, with alternate lines displaced horizontally. Even the on-screen menus were almost unreadable. I had visions of having to spend a long time with a scope and the service manual trying to track down the cause. But in the end it turned out to be a non-fault! The manufacturer had provided a user control, via the on-screen menus, to enable horizontal and/or vertical jitter to be applied.

The setting for the lowest VGA mode was wildly wrong. Simple readjustment via the front-panel controls cleared the fault. It didn't help that the menus themselves were 'scrambled'.

The setting icon is on line 5 of the menu, next to the degaussing icon. **G.B.**

XIOD CXR15E

This monitor was dead though the power supply was ticking faintly. I found that the 2SC5207A line output transistor had gone short-circuit because of a dry-joint at C409. A BU2520AF proved to be a satisfactory replacement. **G.B.**

Philips 1710/4CM6099

The customer said this monitor just went dead. When it was tested on the bench there was power but no screen display. A display did in fact appear when the screening can on the CRT's base panel was removed, but then vanished again. I suspected a dry-joint at first. The actual cause of the fault however was C2610 (33µF, 250V) which smooths the HT supply to the RGB output stages. It was virtually open-circuit. **G.B.**

Opus CM1414EN

The EHT came up, went high then the monitor cut off. I found that C424 (33µF, 160V), which filters the HT supply to the line output transformer, was open-circuit. **G.B.**

WEB SERVICE

Amstrad
http://www.amstrad.co.uk

http://web.ukonline.co.uk/clifflawson

Amstrad now has its own official web site covering current products. For information on older products the Cliff Lawson web site is essential viewing.

All Tech Tips
http://www.skyeinteractive.net/techtips/

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

Anatekcorp
http://www.anatekcorp.com/

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

A.R.D. Electronics Plc
http:/www.ardelectronics.com

A.R.D.'s Website details all the information you need to know about this new and exciting electronic component distributor. It shows how to: open an account (credit or cash), obtain a trade catalogue and place orders (both online and direct)

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

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

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

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

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

Darren Meldrum's Home Page
http://www.meldrum.co.uk/mhp/index2.html

This excellent site is dedicated to television especially the bits in-between – the announcements, idents and, for the nostalgic among you, the Test Cards. It also contains some useful links to other sites (as do many other sites).

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.

Electronic Repair Tips
http://elmswood.guernsey.net/index.html

Here's growing source of free repair tips shared by visitors to the site. You can search by manufacturer or type of equipment. A short description of the fault is given and you can click for further details. However, my only criticism is that when you click to go back from a fault you seem to lose your original results list.

ICHE
http://www.iche.com

See Bill's problem page which is a forum for enginers and technicians to post their problems, tips, advice etc to. All submissions are at Bill's discretion.

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

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

Newsgroups
uk.tech.broadcast

uk.tech.digital-tv

uk.tech.tv.sky

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

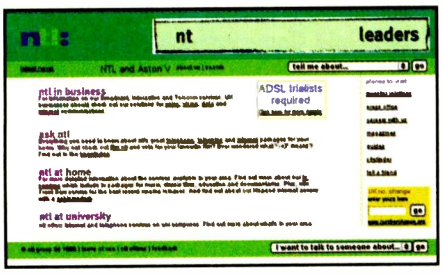
Newnes
http://www.newnespress.com

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

NTL

http://www.ntl.co.uk

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



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

M.C.E.S.

http://www.mces.co,uk

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

Pace

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

The Pace site has a product finder. On servicing, there is a restricted access area for Pace retailers and service partners. If you are a member of the trade and you deal with Pace products you can apply for access by following the instructions. The free access area contains some useful Frequently Asked

Questions and links to other useful sites such as the Lyngemark Satellite Chart at http://www.lyngsat.com.

Philips

http://www.philips.com

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

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

Sky digital repairs

http://www.horizonsatellites.co.uk

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

Servicing Advice

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

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

Satcure

http://www.netcentral.co.uk

Packed with frequently asked questions (FAQ) about common faults and cures for faulty satellite receivers and decoders. Repair kits, upgrade kits, spare parts, surplus components plus links to other satellite information sites.

Also audiophile components, electronic hobby kits, dolls house and model railway electrical stuff, a beginners' electronics course and lots of other information that will keep you occupied for days! The entire web site is also available on CD for just a £5 note.

Taxan

http://www.taxan.com

http://www.valuevision.co.uk

Look here for information on Taxan monitors and their new Valuevision range, with information on servicing, spares and latest software drivers.

Texas Instruments

http://www.ti.com

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

Timecast

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

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

Transmitter Alignment Programme

http://www.tvtap.mcmail.com

This site contains the timetable of work on the TV Transmitter Adjustment Programme or TAP. The programme's aim was reported earlier in Teletopics, but briefly it is to maintain existing analogue services as work progresses on digital television UK "to fulfil official regulatory licence requirements". When transmitters are being worked on there are local messages.

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.

UK Electrical Direct

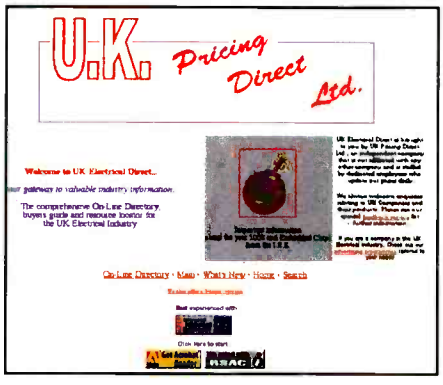
http://www.uked.com

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).



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 sophisticated 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 even provides a "chat room" where you can talk via your keyboard to others "in the room".

AUDIO FAULTS

Reports from
P.J. Roberts
Paul Smith and
Russell J. Fletcher

Sony MDS-S38

This MiniDisc unit wouldn't accept a disc, with the display showing 'Eject', the mechanism fully ejected and a grinding noise that came from within. On inspection I found that the mechanics gear LA was loose because the shaft it's mounted on had broken away from the chassis, while gears LB and LC were damaged. As a result, the eject sense switch didn't operate and the syscon wasn't told to stop the loading motor.

Unfortunately the chassis is not available, but a satisfactory repair was achieved by gluing the shaft into place then retaining it with a small screw from below. With this done gears LA, LB and LC were replaced, restoring normal operation.

It's worth replacing switches S681, S685, S686 and S688 as they can cause further problems, and Sony recommends that all four rubber chassis insulators are replaced.

Part nos. are as follows: gear LA 4-979-897-01; gear LB 4-979-898-01; gear LC 4-979-899-01; switches S681/685 1-572-467-61; switches S686/688 1-762-621-21; insulator 4-987-327-01. **P.J.R.**

Sony MZR55N

Even if it was not selected, record would sometimes be activated on inserting a disc in his MiniDisc unit. The unit would also behave as if the disc was blank, starting from track one even when information was already recorded on the disc. On examination I found that if the record switch was operated a few times the unit would behave. The cure was a replacement record switch (S503). Part no. is 1-771-331-51. **P.J.R.**

JVC UX-T100TN

This unit was stuck in standby. As I didn't have a circuit diagram I started off by carrying out some routine voltage checks. I found that IC703, a 6V regulator, had a healthy input but no output. It's on the PCB under the CD player. A new 7806 restored normal operation. **P.S.**

Akai CD-M480

The CD display intermittently showed garbled messages. When this happened no other functions were possible until the unit had been switched off and on to reset it. The cure was to resolder the pins of the CXD1139Q DSP on the top PCB. **P.S.**

Some Quickies

JVC DR-E55L: The problem was no audio output. I found that R017 (10Ω safety) was open-circuit. It's near C060.

Goodmans 2820: There was no left-hand channel output. The cause was a broken land at C331 on the front panel.

JVC CA-E33LBK: No CD, display OK were the symptoms. R703 (10Ω) was open-circuit.

Akai AM-A2: There was no audio output, with the relay not clicking. R60 (3·3kΩ) near IC5 had gone high in value.

JVC DR-E11LBK: There was low volume at maximum setting. C357 (100µF, 10V) was short-circuit. **P.S.**

Denon PMA350SE Amplifier

We have supplied and see a large number of these units, used in the commercial sector as distribution amplifiers. When the user insists on disconnecting all the speakers (via remote switching) and leaves the amplifier running at full tilt, the Zobel network eventually goes up in smoke. The components are on the small PCB that carries the output terminals. All that's normally required is a small amount of rebuild here. **R.J.F.**

Philips CD710

There was a low-level right-channel audio output from this CD player, and one hell of a pulse on moving to the next track or any no-audio deck function (stop, pause, next, previous etc.). The cause was traced to a faulty muting transistor, Tr7361, in the final audio stages. You could obviously get the same fault with the left channel. **R.J.F.**

Beringer Eurodesk

There was an audible buzz and intermittent crackling when phantom power was selected. On checking the voltage at the desk inputs with phantom power selected I got a reading of 73V DC instead of the correct 48V. The cure was to replace the 48V regulator IC in the separate power supply. It has an unusual part number but is an ordinary LM317T. **R.J.F.**

Denon DRW580 Cassette deck

We've had complaints about noise from the mechanism during playback on several occasions with machines in very heavy use. The cause is a worn clutch assembly, part no. 9DF522030.

No output from one channel was caused by the HD14051BP Dolby chip IC303. **R.J.F.**

Denon UCD250

This is the CD player in the D250 system. The fault was no audio output from one channel. I traced the cause to a faulty DAC chip – there is one for each channel in this machine. **R.J.F.**

Answer to Test Case 453

– see page 681 –

Not an easy repair, was it? The cause of the Panasonic TX25T2's spasmodic line output transistor failure was traced to the driver transformer T351 whose pins were, almost invisibly, dry-jointed to the PCB. After careful cleaning and fluxing they were resoldered. Thereafter the line output transistor stayed alive, but as an extra precaution a couple of electrolytic capacitors in the power supply were replaced.

The field scan problem was not resolved until the AN5521 IC from the scrap set had been fitted in the one being repaired. This restored full, linear field scanning – the fault in the scrap set had not been to do with its time-base section. We finally discovered, during a conversation with Panasonic's technical department, that the IC fitted in this position has to be ordered from Panasonic. Just any old AN5521 will not do! We've now added a note on the circuit diagram in the manual to warn us about this.

The business of specially-selected or one-maker only components is a nuisance where the part involved is in general use and a service department handles a wide range of makes and models. How many of you remember Ferguson's TVT range of transistors in their little brown paper bags?!

NEXT MONTH IN TELEVISION

Building and upgrading PCs

The modular nature of modern PCs makes them relatively easy to build or upgrade. Russ Phillips starts a new series that tells you how to go about it. The result may be for your own use or part of an extra service your workshop can provide, i.e. a welcome extra source of income.

Servicing the Sony BE4 chassis

The BE4 chassis started its long production run in 1994. It has been used in a number of 14 and 21in. models. An I^2C bus and microcontroller chip (which may incorporate a teletext decoder) virtually eliminate preset controls but make knowledge of the service mode essential. Giles Pilbrow provides an authoritative servicing guide, including a list of known fault conditions.

A visit to NDS

NDS is a world leader in conditional-access technology and is developing various systems that will increase the range of services available via TV. George Cole reports on a visit to the company's technology centre in Israel.

Storing spares

Time saved by efficient, skilled fault diagnosis can be lost if you have to search for spares to carry out the actual repair. Paul Smith describes an effective spares management system.

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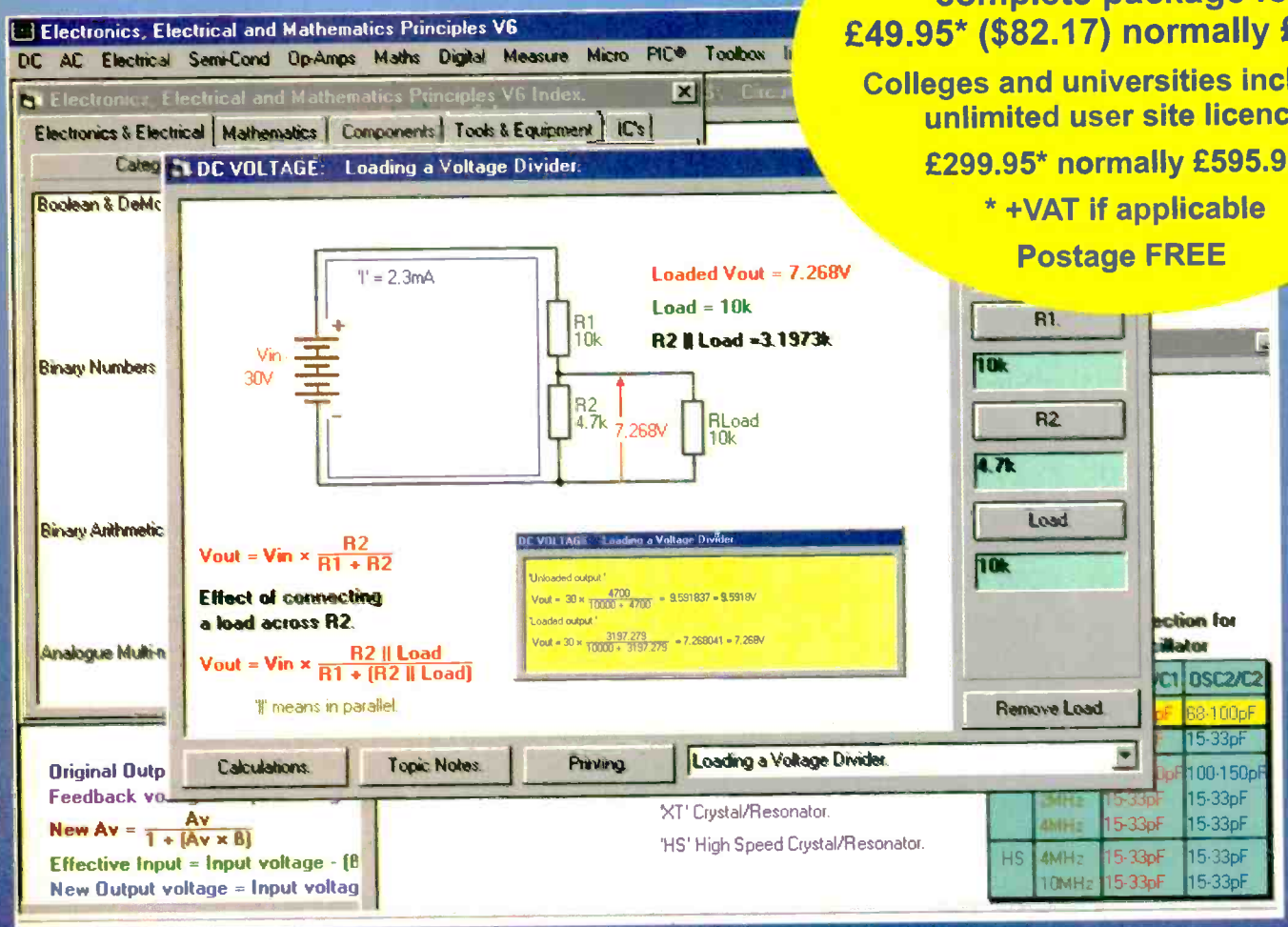

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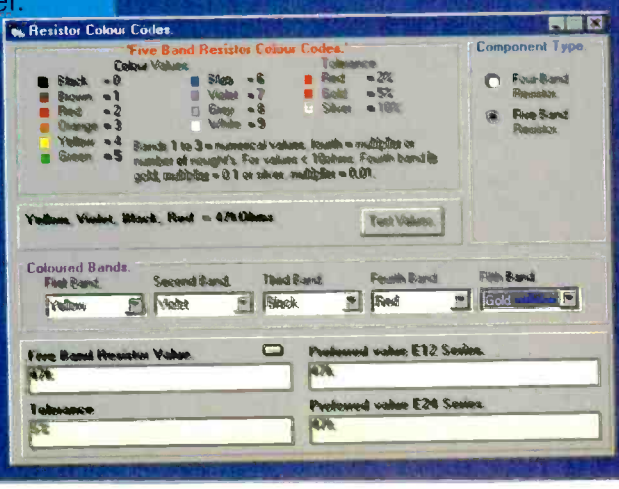

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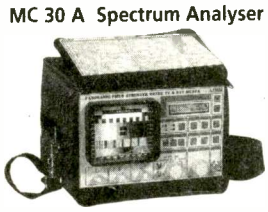

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Technical Specification			
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Inputs(2)	UHF/FM	UHF/FM	
Outputs	6 (+1)	7 (+1)	
Gain UHF	10 (+24)	10 (+24)	
Noise Figure	2.5dB		
Line Power	12Vdc		
Output	89dBµV		

Features
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- Low noise figure
- F connectors
- Fully shielded

Technical Specification				
Reference		8130	8131	8132
Gain (dB)	out 1	23	17	7.5
	out 2	-	15	7.5
	out 3	-	-	12
	out 4	-	-	16
Outputs		1	2	4
Input		1		
Noise Figure		< 3.5dB		

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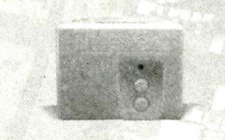

Technical Specification			
Reference	4381	4382	4383
Ampl.band(MHz)	5-380/470-860		
VHF Gain (dB)	26	13	1 3 0 5
UHF Gain (dB)	30	20	23 9 15
Var. gain VHF (dB)	>20	>20	>20
Var. gain UHF(dB)	>15	>15	>15
Max.output level (dBµV)	99	88	90 76 82
Noise Figure (dB)	<2.8dB	<2.8db	<2.8db

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