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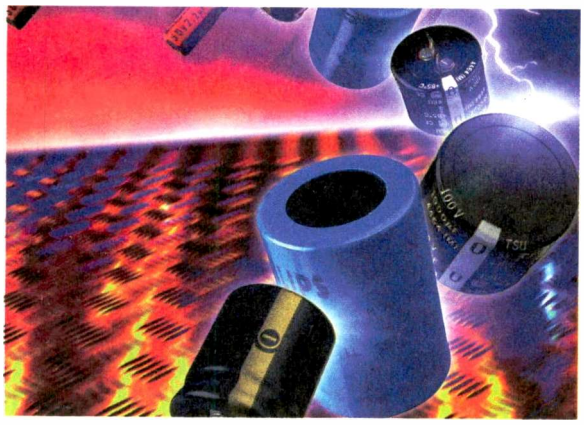

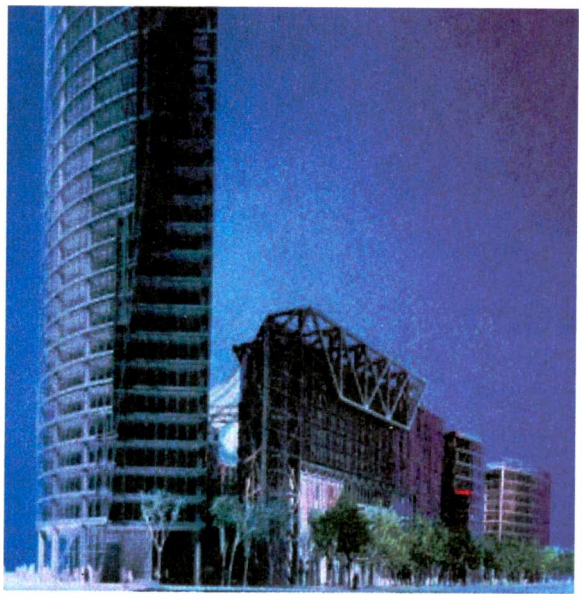

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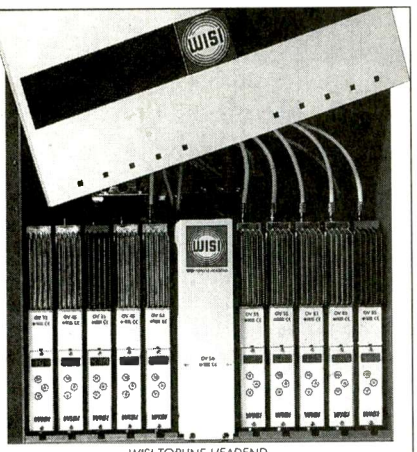

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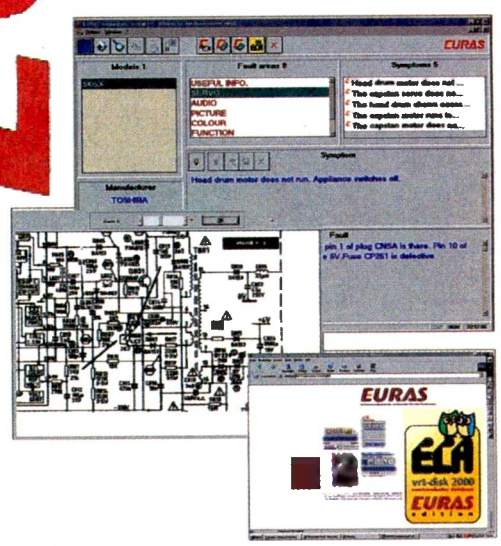

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Viewing Patterns

Just how predominant is the TV set nowadays in people's lives? When we last considered the subject of TV viewing in these pages, in January 1995, a report that gave the average time spent on TV viewing as three and a half hours a day was quoted. This average viewing time had continued with little change for over a decade. At the time we felt it unlikely that this average amount of time devoted to the box was likely to be exceeded. It is after all a fair chunk of the day, and there are many other calls on people's time, from going to work to sleeping at night. It's hard to visualise how people could spend much more time on TV.

Some recent research on the average number of hours devoted to TV viewing suggests that the total has indeed changed very little: a total time of 25 hours a week was quoted. So the multitude of TV innovations in recent years – multi-channel choice, satellite and cable distribution of signals and, more recently, digital and interactive TV – have had little effect on the amount of time spent with the TV set. In fact a highly traditional use of TV is described in one recent report, which said "in many households TV is used as a way of organising the week, with set soaps each day providing a routine for the whole family – for many families television acts as a form of bonding". That doesn't sound very much like the with-it approach to interactive TV use – switching channels, sending e-mails, doing the shopping etc. from the armchair.

There does however seem to be some diversity in the use of TV. The same report points out that a substantial number of people, some 21 per cent, watch TV for much longer periods, over five hours a day. This is 36 hours a week, which is roughly the average working week. Would these perhaps be the young and/or elderly? Apparently not. And if many people watch for substantially longer hours, many others must watch for considerably less time. There is also some regional variation. While almost one in three people in the North West watched TV for more than 36 hours a week, only one in ten did in East Anglia. There doesn't seem to be any obvious explanation for this.

The overall picture however is one of stable viewing habits over the years. It's hardly likely to change to any great extent. Interactivity is the one factor that could make a difference, assuming that this means widening the use of TV rather than taking advantage of extras such as the provision of supplementary information. But such interactivity doesn't quite fit in with family viewing.

Research has shown that most people don't watch television on their own: four out of five say they watch with someone else. The conclusion one tends to draw from this is that activities such as e-mail and home shopping, banking etc. are likely to be assigned to specific relatively short periods during the day or undertaken instead using the family PC. The latter is of course much better suited to the purpose. Lounging around five feet from the screen is hardly the ideal position for clicking about with a mouse and using a keyboard.

Much development over the years has been put into recording systems, which now take in discs and hard drives. So far they have had little impact on total viewing time, providing either programme time shifting or an alternative when the TV on offer is too dreadful. Discs are likely to supersede tape as a simpler approach that provides better results. Tasks such as head cleaning and tracking adjustment could then join convergence in being consigned to the history books. Recording leaves people's total TV viewing time much the same.

This might depress the consumer electronics manufacturers, whose record of innovation has been remarkable. It won't depress those who see excessive TV as a danger to health and so on. Alarm of this sort always seems to be rather overdone. It's all too easy to regard how others choose to spend their time as a total waste! TV has achieved much in extending people's appreciation of the world around them, and is ideal for many educational purposes. A marvellous medium – if it wasn't for those soaps!

A First!

On May 5th SightSound.com offered visitors to its web site the option of downloading the first full-length film to be made especially for the internet, The Quantum Project. The download cost was about £3.

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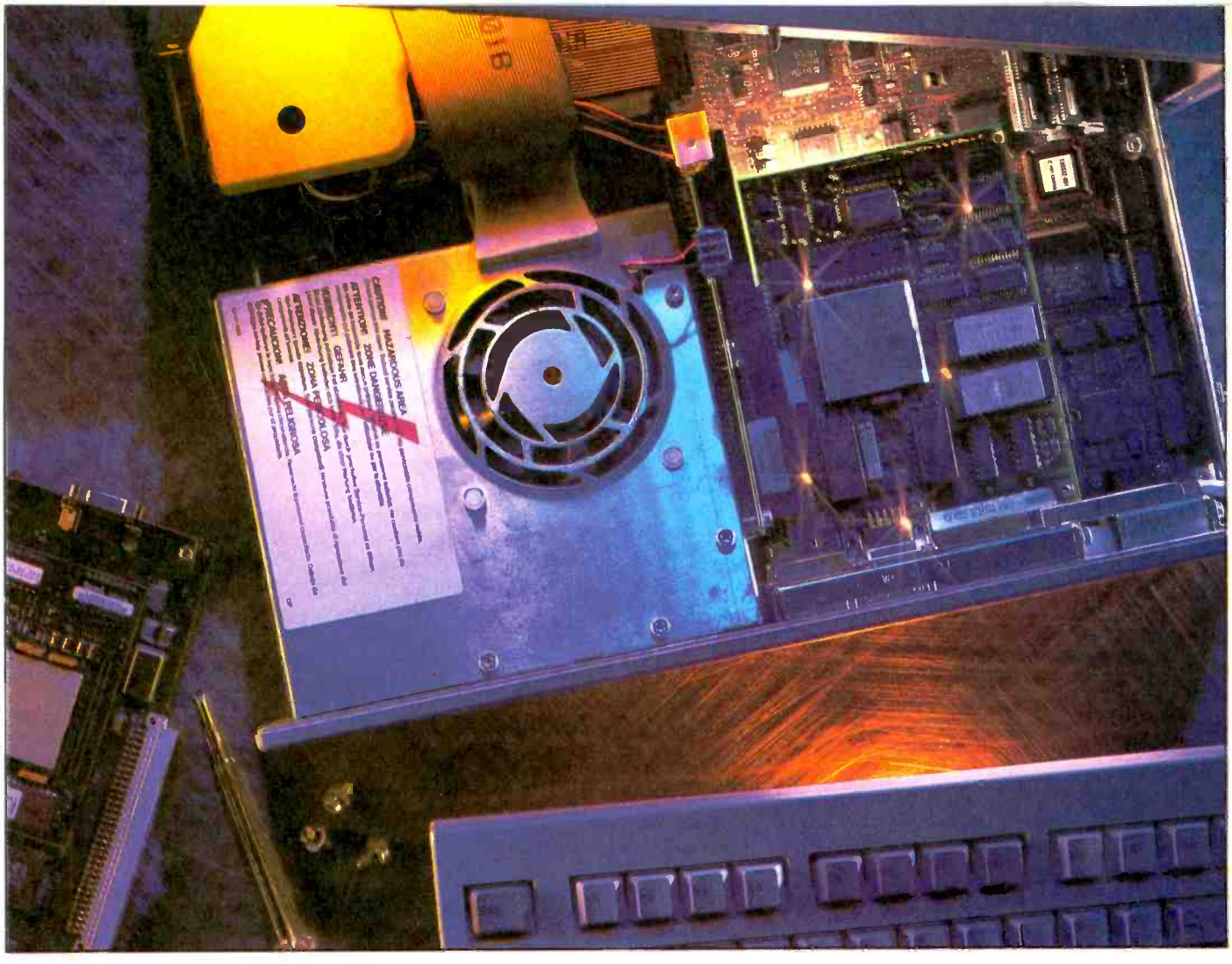

Building a PC

The task involves assembling various items of hardware, carrying out settings and loading software. That might sound simple, but all sorts of problems can arise, as Don MacDougall, B.Sc. discovered

Building a PC is not as difficult as it may appear to those unfamiliar with the subject. Nevertheless many snags can arise, as the following account of my own recent experience of assembling a PC illustrates. I have been involved in radio and TV servicing for over thirty years, and now enjoy an involvement with computers.

Photographic imaging was a requirement, so I needed a fast CPU and plenty of RAM, not to mention lots of space on the hard drive.

Initial Steps

As this was to be a leisurely project I initially ordered only the basic items required to start setting up the PC. These were: a full tower case, including a power supply; a motherboard and CPU; a graphics card; RAM; and a 15in. monitor. These were all ordered by credit card and everything was delivered next day – most efficient.

I unpacked the tower cabinet first then removed the outer case and the plastic fascias that cover the six 5·25in. bays. This is where the first problem arose. The outer case and inner chassis are made of metal, and there's a metal wall behind the bays. Closer examination revealed that cut-outs are marked on each bay. These have to be hammered out or prised loose with a screwdriver. There was a different access problem with the two 3·5in. bays: a large fan blocked any pathway into them. I dismantled the fan and discarded it – this involved at least six screws. The case was now ready to receive the various modules.

The Motherboard

The motherboard I ordered was a Getin 440BX. Except for a layout diagram it came without documentation. All other information was on a CD. I ran this on another PC and printed it out – the information proved to be reasonably comprehensive.

The CPU I had ordered was an Intel Pentium II that runs at 350MHz, so the clock speed switching was set to 350MHz. All other settings were checked and no other alterations had to be made. It was now time to insert the CPU in the slot 1 socket. This led to a problem.

The separately supplied heatsink didn't fit the CPU, and was obviously the wrong one. I informed Technical

Support and was told that a new heatsink would be despatched. Seven days later it still hadn't arrived. A second phone call produced a promise of another heatsink, which arrived two days later. I never received the first one. When it was unpacked this second heatsink looked as if it was meant for a Celeron CPU, and so it proved to be. This time I returned both the heatsink and the CPU, with a request for a replacement CPU with heatsink attached.

A few days later the latest price list arrived from my supplier. The price of my 350 CPU had been reduced by £50, which is quite a sum. Since I was being credited for my return rather than a straight swap, I asked for a 400MHz replacement – the price difference was now only £10. The supplier was happy to oblige, and I got a faster CPU for my trouble. This time the correct heatsink was fitted, and it took only seconds to slot in the CPU. The fan lead was then connected – after consulting the printed manual as there were three fan sockets marked. Two 128MB SDRAM memory blocks were next slotted into the DIMM1 and DIMM2 sockets.

The board was now ready for insertion in the case. No problems here. I laid the case on its side and screwed the board on to six pillars, with its external connectors sitting conveniently at the rear. The twenty-pin power connector was then plugged into the board. After consulting the manual the various leads from the front-case LEDs were connected.

The video card, a Diamond Stealth G640 8MB, was clicked into the AGP socket. The Panasonic monitor, a 15in. multi-sync model, was connected to the video card's output socket. The PC and a separate power lead were connected to the AC mains supply. Finally a Microsoft keyboard and a Logitech mouse were plugged into the rear sockets.

At this point I was ready to test the set-up. When I switched the monitor and PC on both LEDs lit, the PC bleeped and the POST (Power On Self Test) started. The memory check indicated that 256MB was present. The BIOS was entered by clicking the 'delete' buttons for a few seconds. Of the basic BIOS settings only the date needed altering – all the others were correct in accordance with the manual.

I then left the units for half an hour to run in.

Adding Units

I ordered the following units: a Samsung floppy-disc drive, a Western Digital 10GB hard disk drive, a Samsung 32-speed CD-ROM player, an Iomega 100MB internal Zip drive and an internal modem card. They all arrived by parcel post next day.

I fitted the floppy and hard disk drives first. To ensure correct fit, the connector cable for both units has a central locator at both ends. The plugs from the power supply are shaped, again ensuring correct fit. All was going well.

The PC was switched on and the BIOS entered. Auto hard disk drive detect and primary master drive detect were selected. No hard disk drive was detected, so back to the main BIOS settings. The primary hard disk drive was set to auto and LBA, but there was still no hard disk drive detect. At this point the Western Digital handbook was consulted and provided the solution. I had set the jumper on the HDD to Master instead of Single, as I intended to install a second HDD later. Once the jumper was altered the BIOS was able to detect the hard disk drive.

The CD-ROM player was next installed. It was placed on the bottom 5·25in. drive bay, with the 40-pin cable connected to the second IDE controller socket. A slight problem arose here. Because of the direction of curvature of the cable, the first IDE cable was overlapping the second IDE socket, making it almost impossible to fit the second cable. This was resolved by removing cable one, fitting cable two then refitting cable one. With the hard disk drive problem in mind, I set the CD-ROM jumper to single.

The hard disk drive was then formatted and partitioned, which is easily done using the EZ software floppy disk supplied by Western Digital. Pop the EZ floppy disk into its drive and restart the PC, then follow the on-screen instructions. The hard disk drive was partitioned as a single 10GB drive. Windows 98 was installed using a start-up Win98 floppy to gain access to the CD.

The Zip drive was installed in a second 3·5in. bay. The CD player was now set as master and the Zip drive as slave. When the PC was rebooted Windows 98 detected the Zip drive and assigned a drive letter. Everything was going swimmingly. Now for sound.

Adding Sound

A Creative Sound Blaster 128 card was fitted in a vacant motherboard PCI slot. The cable that was supplied with it was connected between the output from the CD player and the sound card's input socket. A pair of reasonably-priced speakers was fitted via a stereo 3·5mm plug to the correct socket at the rear of the sound card.

Windows 98 detected the sound card, and the drivers supplied were installed via the CD player. On rebooting the PC, Windows 98 appeared with its customary musical herald, proving that all was well in the audio department.

The Modem

Time now to fit the modem card, which proved to be a tough job. The rear slot appeared to be slightly out of alignment and had to be widened, using a screwdriver, before the card was finally accepted. As it was now quite late, I left the assembly work for next day.

Work was resumed next morning. Horrors! The PC wouldn't boot up. There was no video at the monitor, and no bleeps were heard. Rebooting didn't help. So the modem seemed to be faulty. Out it came and the PC was switched on again, to no avail. The video card was replaced with an old one and the monitor was checked by substitution. Still no results. Eventually I removed all the cards, leaving just the motherboard and the CPU, but there was still no sign of life.

It looked like a motherboard fault. As I didn't have a substitute, the board and CPU were returned to the supplier for testing. Two days later I received a call to say that everything checked out correctly and the units were being returned. Meanwhile I had the video card and memory chips tested locally. They were OK. When the motherboard and CPU came back and were refitted inside the case there was still no boot up.

The power supply was then checked: all outputs were correct. What next? Since these are all logical devices, a logical solution was needed. Individually the units all worked, but when connected together they didn't. So the fault had to lie in the connecting slots. Each item was pushed into its slot firmly. The CPU gave a very positive click, which suggested that it could not have been firmly in place. Why did everything function from the start but cease after insertion of the modem?

Extended Capabilities

With the PC up and running it was time to extend its capabilities. I ordered a second 10GB hard drive, a SCSI Yamaha CD-Writer and an Adaptec 2920 SCSI card.

After booting up, the installation appeared to be normal – but there was no access to the CD-Writer.

I found that in the system settings the device manager didn't recognise the Adaptec card. After a word with the supplier I was asked to return the SCSI card which would be replaced with the more expensive Adaptec 2940. I was assured that this was compatible with the Yamaha CD-Writer. This took two weeks and, after several phone calls, a special delivery and uplift service was arranged.

At the same time I ordered two more 128MB memory chips to give me a total 518MB of RAM. Unfortunately when the extra memory had been installed the memory test indicated only 384MB. By replacing the chips one at a time I established that one of them was faulty. It was returned and a replacement duly arrived. Full memory was obtained once it had been fitted.

The new SCSI card was then inserted. This time it was correctly detected and a drive letter was assigned. All well and good. I then installed the CD software for the Yamaha drive and attempted to write a new CD. This produced an error message, "no recordable CD attached". Although the unit worked as an ordinary CD player, it wouldn't write on a disc. Unfortunately this occurred over a bank holiday, so I had to wait until the following Tuesday before I could contact my supplier.

Meanwhile I decided to install the modem card, which had been left out after the previous fitting. Being plug-and-play, the PC detected it correctly and the software was duly installed. The RJ-11 lead was then connected to the telephone socket from the modem. My initial ISP was to be Virgin.net. The software disk was automatically detected, and I proceeded with the installation. All went well until the PC attempted to dial through. An error message appeared to the effect that a dialling tone couldn't be detected. The usual squawks were missing. A good few hours were wasted trying to establish the source of the fault. This included checking the connecting leads and sockets and all the software settings. But no success.

Problems

So there were two problems when I next contacted the supplier. As far as the CD-Writer was concerned, it was decided that I had the wrong software and an upgrade would be sent. The modem was to be returned for replacement.

The upgrade software arrived a few days later. When it was installed I received the message "no qualifying copy of this program can be detected". This indicated that I didn't have the original program installed, which I clearly did. All very mystifying. Back to Technical.

I was told that I would be sent the de-luxe version of the software upgrade. This arrived the following morning and produced exactly the same results. After a flurry of phone calls I was sent a completely different CD creator program especially suited to the Yamaha CD-Writer. This finally solved the problem.

But there was no sign of the new modem. I was told that my returned one hadn't been received, so a Post Office search routine was initiated. This involved phone calls to Bristol and Perth. The upshot was that I had to fill in a lost-parcel form. In the meantime I was sent a new modem but charged for it. The lost modem never did turn up, and I was duly compensated by the Post Office.

The new modem performed no better than its predecessor, which indicated that the cause of the problem lay elsewhere. Again many hours were wasted over software settings. Eventually I decided to try a different telephone socket, and fitted an extension cable from it to the PC. Amazingly this produced a dialling tone, enabling an internet connection to be made. Since the phone itself worked correctly, I had assumed that my room phone socket was not faulty. I replaced it, inserted a two-way telephone adaptor and plugged in the phone and the modem. Everything then worked satisfactorily.

Installation was now complete, so the outer case was screwed back on. Performance was up to standard – or was it?

Corrupted Files

Since the main use of the PC was to be for photo manipulation, large graphics files would be stored on the second hard disk. After a session I had saved several files in this location. Trouble arose next day when I tried to access the files. They were corrupted and thus inaccessible. I saved some further files for test purposes, and on rebooting the PC found that they were either corrupted or had disappeared completely. I tried reformatting the drive, but the corruption continued to occur with all files saved.

I ran ScanDisk which confirmed that the drive was faulty. So it was returned and was quickly replaced. Problem solved? Not a bit. The replacement exhibited all the signs and faults of the previous one. The fault had to be in the drive, since my master hard drive was the same model and used the same software.

This time I checked the Western Digital website on the internet. It's a very helpful site. Troubleshooting hard disk drives revealed that certain models with certain serial numbers were indeed faulty and should be returned to Western Digital for replacement. I then downloaded some software from the site on to a floppy disc. This confirmed the model number of my faulty drive. It turned out to be slightly different from my master drive, which was OK. Western Digital suggested that I phone through direct to Amsterdam, which I decided to do. An excellent, well-informed technical engineer confirmed that my drive was faulty and said that they were recalling a lot of faulty stock.

Armed with this knowledge I tackled my supplier, who agreed once again to replace the drive. As the company was out of stock of Western Digital drives I ordered a 13·2GB Seagate hard drive, which had come down in price to that of the original WD drive. When installed it worked well. The case was reassembled and the PC has worked without any problems ever since.

In Conclusion

The project was started in March 1999 and completed in November 1999. Since time was not too important, I was not that concerned about the lengthy procedure. I ended up with the PC specifications I required, which was the main thing. My supplier was excellent throughout in replacing units without quibble. The delays were caused by postal times.

Many of the problems would have been resolved much more quickly had spare boards and hardware been available within a workshop environment. But I gained a great deal of experience in the process, and thoroughly enjoyed tackling the problems as they arose. Like most TV servicemen, I'm used to fault diagnosis down to component level. In comparison these PC 'faults' were easy. My conclusion is that PC repairs should present no real problems for a dedicated electronics technician.

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1N5404	2SC3953	BA3918	BC858C	BU508A	CNY75B	R2M	TBA920	TDA8172
1N5406	2SC3955	BA4558	BC859A	BU508AF	D2VREM	R4050	TC1544AP	TDA8175
1N5408	2SC3973B	BA5406	BC875	BU508AFI	DCREG	RG2	TDA1013A	TDA8178FS
1N5822	2SC4231	BA5412	BCY59	BU508APH	DTA114ES	RGP10G	TDA1013B	TDA8179S
1N914	2SC4517A	BA6209	BCY71	BU508D	DTC124ES	RGP15G	TDA1015	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	BA32L	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	SAB3035	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	SR2KN	TDA1557Q	TEA2164
2SA1020	2SD1453	BC109B	BD434	BUT11A	KA22066	STA441C	TDA1558Q	TEA2164G
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	STK73410II	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	LM2938T	STR58041	TDA3568	TLD72CP
2SB922	2SD669A	BC546A	BF758	BY448	M49481	STR59041	TDA3592A	TL082
2SC1383	2SD718	BC546J	BF759	BY476	M51182L	STR6020	TDA3603P	TLP731
2SC1740	2SD837B	BC547	BF788	BYD14J	M54544L	STR61001	TDA3650	TOP204YAI
2SC1740S	2SD856	BC547A	BF869	BYD33D	M58655P	STRD4429	TDA3653B	U2829B
2SC1815	2SD965	BC547B	BF871	BYD33J	MC13002P	STRD6008X	TDA3653C	U46148
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	BC550B	BFR90	BYV95B	MJ15003	T607IV	TDA4500	UPC1025H
2SC2229	2SK241	BC550C	BFR90A	BYV95C	MJ2955	T9053V	TDA4503	UPC1032H
2SC2230	2SK30A	BC556A	BFR556A	BYV96D	MJE13005	T9054V	TDA4505E	UPC1365C
2SC2235	2SK526	BC556B	BR100	BYV96E	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	ZTK338
2SC2335	78L05	BC636	BTA12600	BYX55600	MN650	TA8210H	TDA4605	ZTX650

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TELETOPICS

Digital cable roll-out

NTL, the UK's largest cable operator, has launched its digital service, initially in Scotland, Wales and Northern Ireland. The company aims to have some 300,000 subscribers for the service by the end of the year. Called NTLPlus, the service offers digital TV and telephony in a single package that costs £13 a month. The telephone service includes free internet access via NTLWorld, which is available to those without a PC by renting a TV-internet box – this costs an extra £10 a month.

NTL says that new interactive services, including full internet access, will follow shortly. If NTL's planned acquisition of CWC follows on schedule, CWC digital cable subscribers will be offered these services first.

The Telewest Active Digital service, which was launched last October, now has 156,000 subscribers. The target is for 500,000 by the end of the year. Telewest hopes to extend beyond its network areas by offering services via high-speed digital subscriber telephone lines and wireless systems. Adam Singer, Telewest's chief executive, says that the company's goal is to become a 'broadbandcaster': this would combine a "state-of-the-art network, top-quality branded broadband content and a focus on interactive product development".

ONdigital's CAM

ONdigital has launched its conditional access module, the ONdigital CAM, which enables IDTV receivers in the Bush, Grundig, Hitachi, Matsui, Panasonic, Philips, Samsung, Sony and Toshiba ranges to receive ONdigital without the need for a set-top box. The credit-card sized CAM is available to ONdigital subscribers free of charge. A small software upgrade may be necessary with some receivers.

To stimulate IDTV receiver sales – only some 32,000 have been sold to date – new sets will be fitted with the module, which will be preloaded with a year's subscription to six ONdigital primary channels of the customer's choice, at no extra cost.

ONdigital has launched its pay-per-view service, ONrequest, which is a joint venture with the French pay-TV operator SDN. Deals have been signed with Paramount and Universal Studios: others are expected to be concluded shortly. Viewers can order films directly, using a remote-control unit or an automated telephone system, the charge being about £3.

BSkyB Latest

BSkyB now has 4·2m subscribers, 3·4 million of whom take the SkyDigital service. During the latest reporting period, to the end of March, a further 190,000 subscribers signed up. The company expects to have 5m SkyDigital subscribers by the end of the year. Despite this success, the company is still making a loss – £28m pre-tax during the three months to end of March, reflecting the cost of all those free set-top boxes. This is likely to be a continuing problem, since competition from broadband operators means that a new range of fully internet-compatible equipment is likely to be required shortly.

Open, the interactive TV service via SkyDigital, has announced that over ten per cent of homes with Open have used the service to make a purchase, with 35 per cent making a further purchase. There were 3·3m users of the service during the four weeks between April and May: 1·6 million people used the service at least once a week. Open also has 750,000 registered e-mail users and claims to be one of the top five UK e-mail providers.

Analogue switch-off

The ITC, Oftel and the Office of Fair Trading issued a consultation document via three web sites in a rather curious effort at accelerating the take-up of digital TV in the UK. At the recent RETRA conference Culture Secretary Chris Smith announced that he would be setting up a "viewers' panel" to assist with the switch-over to digital TV, the aim being to gauge viewers reactions to the prospect. The government seems to be keen sell off part of the present analogue TV spectrum, following its recent success in auctioning spectrum space for mobile phones. Chris Smith spoke of the move to digital beginning in 2006 and being completed by 2010.

PAL I-1

As part of the transmitter tweaking, mentioned last month, to increase digital terrestrial TV coverage in the UK, a modification has been carried out to some analogue TV transmitters: the vestigial sideband has been reduced from 1·25MHz to 0·75MHz. This has been done to reduce adjacent channel interference. The modified analogue transmission standard is known as PAL I-1. Its effect on analogue reception is said to be negligible, though there had been concern initially that teletext reception might be affected.

Power-hungry STBs

Because of the power consumed in the CRT scanning process, TV sets have always been rather power-hungry devices. Digital signal processing consumes even more power however, which is why sets that converted the analogue signal to digital form for processing then back again never really caught on. The average digital set-top box consumes more power than the TV set it feeds. The Environment Change Institute at Oxford University has recently come up with the following average annual power consumption figures: standard TV set 120kWh/year, standard VCR 100kWh/ year, set-top box 130kWh/year and TV set with STB 250kWh/year. Maybe a later generation of lower-voltage digital signal processing chips will improve on this.

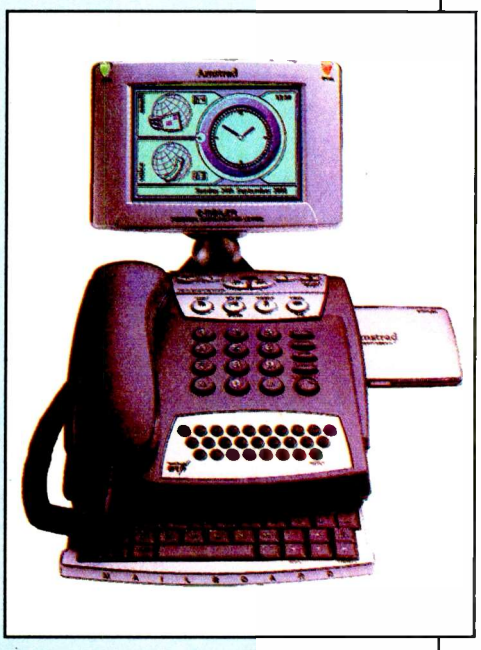
Broadband via satellite

SES and EMS Technologies have completed tests of the Astra broadband interactive (BBI) network. They were the world's first closed-loop broadband satellite access tests, and were based on the new international open standard DVB-RCS (Return Channel via Satellite). The system will enable users to have two-way communication from their own premises via low-cost Ka-band satellite terminals, at speeds of up to 35 times the current 56·6kbits/sec with a terrestrial modem. SES is to provide a full demonstration shortly and plans to launch a fully-operational system by the end of the year.

Interactive TV

Carlton Television has launched a new interactive service, Carlton Active, that enables viewers to interact with programmes and commercials. It has been launched on Carlton's two digital channels, Carlton Food Network and Carlton Cinema. Viewers can interact with a commercial while staying within the channel being watched, and can obtain additional programme information and programme content, with a branded message, on the same screen while viewing. The first four interactive commercials are from Proctor & Gamble, the AA, Onken and M&G Financial Services.

The BBC will be launching interactive TV via its digital terrestrial services during the Wimbledon tennis tournament. Updated news, player profiles and statistics will be available alongside the live coverage, on a quarter of the screen. The service will be available 24 hours a day with BBC1, BBC2, BBC Choice and BBC News 24.



The Amstrad e-m@iler, which has been developed in conjunction with British Telecommunications, combines a telephone, digital answering, a fax facility and e-mail operation with a keyboard and 22 x 18cm screen. The associated portable databank has a capacity of up to 700 names and contacts. Software upgrades can be downloaded via the telephone line as they become available. Price is about £80. BT is undertaking the e-mail and billing. For further details apply to Amstrad, Brentwood House, 169 Kings Road, Brentwood, Essex CM14 4EF. Phone 01277 228 888, fax 01277 220 477.

Latest Farnell CD-ROM

Farnell has just released, free of charge, the latest update (version 5) of the Farnell Connect CD-ROM. In addition to including Farnell's 100,000 plus products, the CD-ROM can be integrated with proprietary stock-control systems. It can also provide new product updates as part of its electronic ordering capability. The software includes data and ordering information for all Farnell product ranges, enabling most to be viewed on screen before purchase.

For further information on Connect 5 phone 0870 1200 200, e-mail sales@farnell.com or check at the web site http://www.farnell.com/uk

DESCO

Chris Keeble, who runs Sound & Vision Electronics, Frinton-on Sea, Essex and is a former president of RETRA, has set up a scheme that aims to reduce the cowboy factor in the servicing industry. He calls the scheme Domestic Electronic Service Centre of Excellence (DESCO). It is based on a star system, similar to one that's in operation for hotels and guest houses. Those who wish to join the scheme can apply for a 'certificate of intent' which implies a three-star rating, self-assessed. This sets fairly stringent standards. For a four- or five-star rating, an assessment has to be carried out by a professional inspector.

DESCO has already received backing from Sony. The aim is for it to achieve the status that CORGI has in the gas installation industry. Chris Keeble hopes that DESCO's code of practice will eventually become mandatory for all electronic service providers.

News from Pace

Pace has reached a wide-ranging agreement with Microsoft on digital TV development. The two companies will develop advanced set-top boxes for entertainment, communication, information services, internet access and on-line shopping via TV: Microsoft is to use Pace technology as a "main reference point" when developing digital TV applications. The two companies already had a co-operation agreement.

In a recent trading statement Pace announced that pre-tax profits for the year to June are expected to exceed market expectations. This is the result of a faster than anticipated up-take of digital TV in the UK – Pace supplies BSkyB, ONdigital and Telewest. At present Pace generates about ninety per cent of its revenues in the UK: this is expected to fall to fifty per cent within two years as a result of the company's contract to supply STBs to the US cable operator Time Warner.

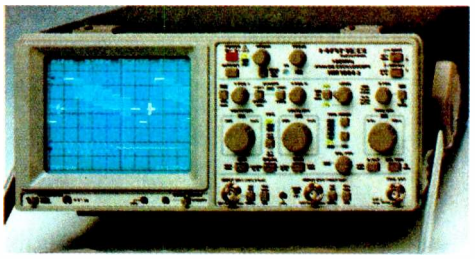
TV developments

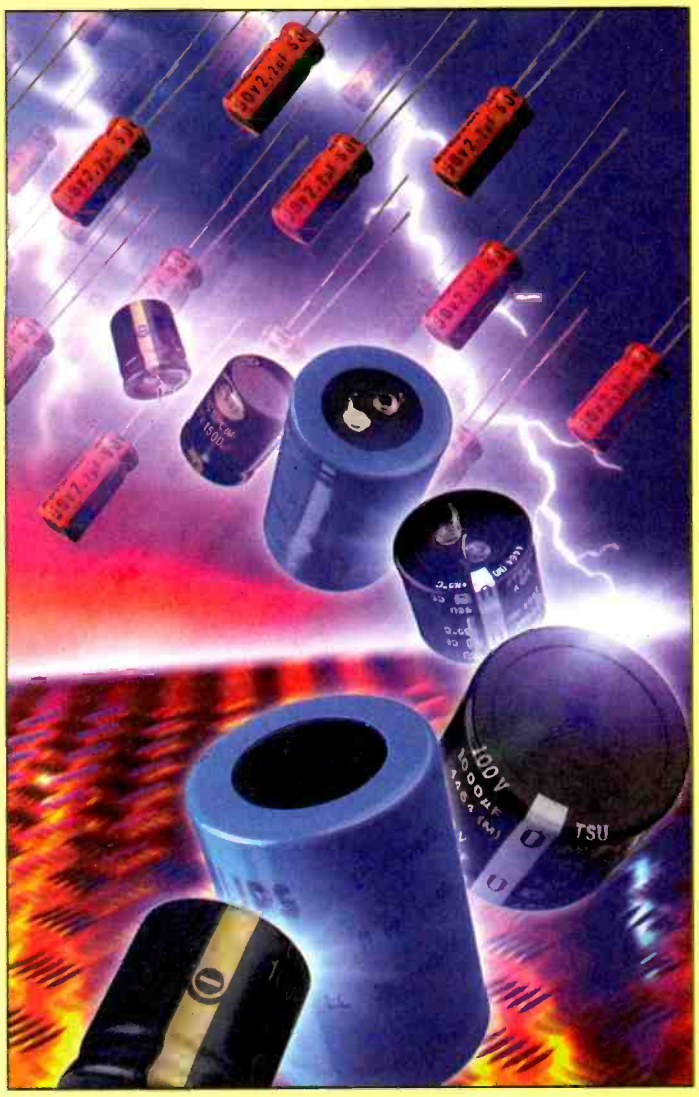
Philips Semiconductors and Eldon Technology are to develop a low-cost, intelligent IDTV reference design for the low- to middle-range section of the market. The new design will enable analogue TV set-makers worldwide to get into the emerging IDTV market by providing a basis for their own models. The development of Philips Semiconductors' intelligent bolt-on system into a reference design for IDTV manufacturers makes use of Philips' expertise in system-on-silicon technology and Eldon Technology's software capabilities. Eldon's digital software technology will be used to customise the basic reference design to suit manufacturers' own requirements.

Turkish consumer electronics manufacturer Vestel and the Israeli company Exatel Visual Systems are to start manufacture of TV sets with a built-in hard-disk digital recording module. Sets should be available this autumn. They will be able to store up to four hours of video and provide about thirty seconds of instant replay.

The Hameg 60MHz oscilloscope, a popular scope for TV/video servicing, has been replaced by the HM1004 – see photo. This 100MHz analogue oscilloscope is available for £785, almost the same price as its 60MHz forerunner when released over four years ago. Even better value is the HM1507, an analogue/digital oscilloscope with a 150MHz bandwidth and 200MS/sec sampling rate. This fully-equipped model comes with free Windows software for PC operation at just £1,125.

In addition to signal generation and measurement instruments, Hameg offers six spectrum analysers and tracker generators. The HM5010, with its 1GHz specification, is exceptional value at £1,192. For more information contact Hameg Instruments, 70-78 Collingdon Street, Luton, Beds LU1 1RX. Telephone 01582 413 174, fax 01582 456 416.





When an aluminium electrolytic capacitor fails, it rarely goes open- or short-circuit. To make matters worse, even its measured capacitance may seem OK. So how do you detect a failed electrolytic? Cyril Bateman explains.

Identifying failed electrolytic capacitors

A capacitor that fails open- or short-circuit can be quickly identified while it is still mounted on the PCB. Most ceramic, plastic-film and tantalum capacitor failures result in a short-circuited component and are relatively easy to locate[1].

With aluminium electrolytic capacitors however the normal failure mode is increased impedance. Capacitance value may also change, but it usually remains within tolerance. As a result, measuring an aluminium electrolytic capacitor's value is of little use.

The aluminium electrolytic capacitor is uniquely different from all other capacitor types. Its dielectric oxide film is self-renewing. This self-repair function, which works by consuming oxygen from the electrolyte, ultimately becomes a wear-out mechanism[2].

The capacitor's service life ends when the oxygen needed to maintain or repair the aluminium oxide dielectric can no longer be provided by the electrolyte. The conductivity of the electrolyte is reduced and the equivalent series resistance, or ESR, increases at all frequencies. This increased resistance is usually the only notable symptom, capacitance and leakage current remaining within limits.

How does a failure show up?

Failed aluminium electrolytic capacitors exhibit four common symptoms. The first two are visual, and are thus easily identified.

- Leakage of electrolyte, usually around one terminal. This can result from internal gas pressures, caused by internal reverse cathode-bias voltage.
- Discoloured insulating sleeve caused by excessive heat. This may be because adjacent components have raised the local ambient temperature or because of heating within the capacitor.
- Electrolyte exhaustion, commonly called 'drying up'. The measured capacitance may be little changed and still be within tolerance. The electrolyte may still be liquid, but have insufficient conductivity for the capacitor to function properly.
- Cathode-foil oxide growth. Called 'forming up', this condition occurs when the cathode foil's normal voltage 'reverses' to some 1·5V positive, relative to the electrolyte. This internal 'reverse bias' induced cathode oxide growth can cause the other symptoms[2].

Used correctly within their permitted ratings, aluminium electrolytic capacitors slowly degrade in circuit as the electrolyte becomes exhausted. Electrolyte exhaustion has two causes. Consumption of available oxygen by

the capacitor's leakage current, and permeation of electrolyte through the capacitor seals.

Electrolyte exhaustion results in increased ESR, an increase of the capacitor's tanδ, and a measurable increase of impedance – especially at higher frequencies. There's more on tanδ later.

Short-circuit aluminium electrolytic capacitor failures in service are rare. I have never come across one.

Capacitor parameters

Identifying a failed aluminium electrolytic capacitor is easier if you understand how the capacitor works. Capacitor ESR is a combination of three frequency-dependent mechanisms. These are the electrolyte resistance, the electrode foils together with their connecting tab resistances, and the anode and cathode foils' dielectric loss factors, expressed as a series resistive loss. There's more on this in the panel below (electrolytic capacitor series resistance).

Figure 1 represents a conventional 'polar' electrolytic capacitor[2]. Its anode and cathode foils both possess capacitance relative to the electrolyte. The cathode capacitance is larger than that of the anode. Capacitance measured between the terminals is the series sum of these cathode and anode capacitance values.

A bipolar or reversible electrolytic capacitor uses two anode foils formed to the same voltage. The additional anode foil replaces the unformed cathode foil. Both diodes then have the same breakdown voltage. Both foils have similar capacitance values, each double the capacitor's marked value.

Leakage currents

This equivalent circuit of an electrolytic capacitor merits consideration. Aluminium is a 'valve' metal, so called because, in the 1850s, researchers first noted that an insulating oxide film grown on an anode metal in a bath of suitable electrolyte exhibits a rectifying action. While connected to a positive voltage, the oxide film remains an excellent insulator[3].

Immersed in electrolyte and connected to a few negative volts, this oxide film becomes a conductor[2].

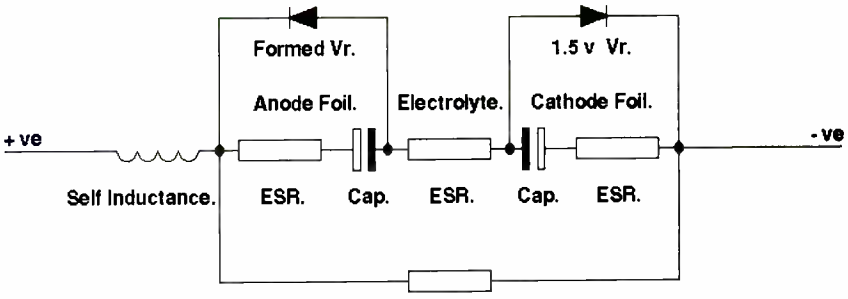


Fig. 1. Equivalent circuit of a polarised aluminium electrolytic capacitor. The cathode foil is etched but not formed. Its natural atmospheric oxide equates roughly to 1·5V of electrical formation. Using similar foil thickness and etch ratio as the anode foil, a 6V rated capacitor's cathode capacitance will exceed that of the anode by a good margin, but CV products will be similar.

Hydrogen gas released from the electrolyte is attracted to this negative voltage, chemically 'reducing' the oxide film. This degrades its insulating properties.

This rectifying behaviour is easily demonstrated. Simply measure a polar capacitor's leakage current with forward then reverse DC bias applied. Under DC bias, if the dielectric film had no rectification properties similar leakage currents would flow regardless of the polarity of the bias voltage.

Any rectifying behaviour must result from the oxide films, **Fig. 2**. To test this, take a new polar aluminium electrolytic capacitor and subject it to a low DC voltage of the correct polarity, using a 1kΩ current-limiting resistor. Wait two minutes for the capacitor to charge and the leakage current to stabilise. Increment the voltage and again allow the current to stabilise. Plot leakage current from zero to the capacitor's rated voltage.

Now reverse the polarity of the DC supply. Measure and plot leakage current from zero to say –5V, in 1V steps. Leakage current for negative voltages is considerably higher than for the same positive voltage.

Electrolytic capacitor series resistance

Capacitor electrolytes are conducting solutions, usually a neutralised weak acid in a solvent. This electrolyte must not freeze or boil at the extremes of the capacitor's working temperature range, nor attack pure aluminium at any temperature. For many years, very pure ethylene glycol was a solvent used in capacitors[2].

Most modern electrolytes are made without adding water. Using only dry ingredients, such as super purity ammonium borate crystals, a minute amount of water of crystallisation is inevitable. Even this minute quantity may be removed.

Low voltage electrolytes have low resistivity of a few millisiemens. Some electrolyte is contained within the minute oxide coated voids and tunnels in the anode and cathode foils. These can be tenuous and long relative to their cross section[2], so the effective electrolyte resistance in them increases quickly with frequency.

This increase in the electrolyte's effective resistance has two effects. It slows down the reduction of ESR with frequency and causes a notable reduction in measured capacitance at high frequency. One new 100μF, 16V axial capacitor measured only 37μF, at 100kHz.

Most of the electrolyte however will be absorbed in the separator, usually paper tissue, interwound between the anode and cathode foils during assembly. The resistivity of the electrolyte/paper separating tissue is increased compared to that of the bulk electrolyte, according to paper type and thickness used.

Low-voltage capacitors use very low-resistivity paper and electrolyte. Frequently, for low ESR, a single open-weave 'rag' tissue is used. Higher voltage capacitors use a higher resistivity paper/electrolyte combination and more than one tissue thickness.

As the capacitor's rated voltage increases, different electrolyte, papers and cathode foil thicknesses are used. These are chosen to minimise tanδ losses, capacitor case size and production costs, while ensuring a satisfactory capacitor service life and performance.

Low ESR capacitors use thicker, higher surface gain cathode foils together with more conductive paper/electrolyte combinations than standard capacitors of the same voltage. Naturally these carry a size and cost penalty.

Electrolyte/paper resistivity varies with temperature. Above room temperature its resistivity reduces. This reduction is influenced by the paper, and perhaps only halves by 85°C. Below 0°C, resistivity increases rapidly with increasing viscosity of the solvent.

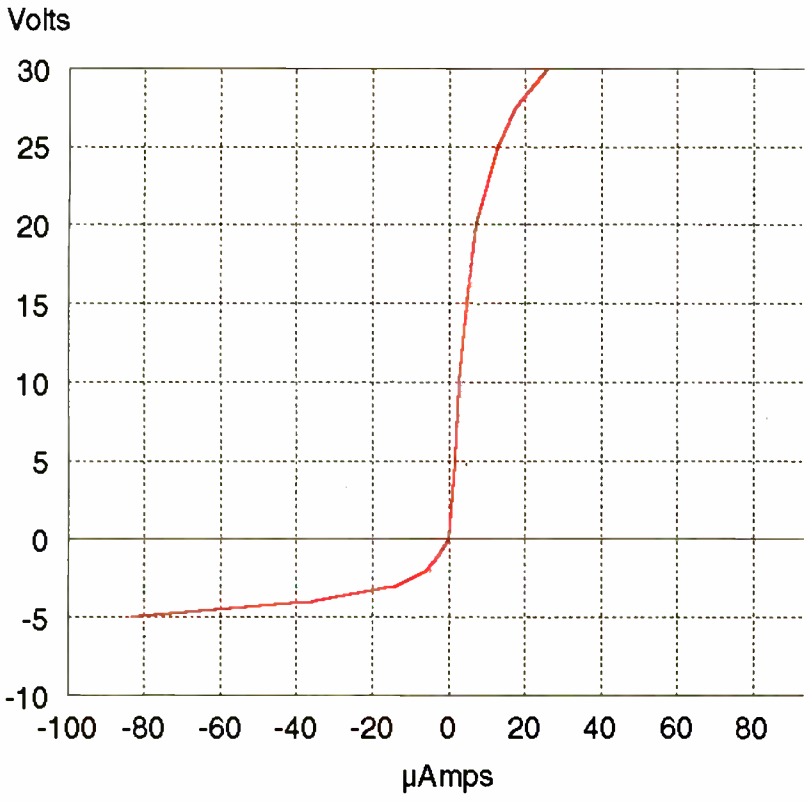


Fig. 2. Typical 'diode' forward/reverse characteristic common to all polar aluminium electrolytic capacitors. The capacitance value and rating of 25V were selected to provide easily measurable leakage currents for forward and reverse bias voltages.

For safety, the stabilised capacitor leakage currents should not be allowed to exceed 1mA. The resulting graph displays typical diode behaviour[2].

Component quality issues

The quality of many components, such as inductors and very low-loss capacitors, is often defined by their Q factor. Q is the result of dividing a component's measured AC reactance by its AC resistive losses.

The reciprocal of Q is called tanδ. It is defined as the capacitor's ESR/reactance. Tanδ, measured at normal room temperature, is used by capacitor manufacturers to describe the quality of almost all general purpose capacitors.

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

Conversely,

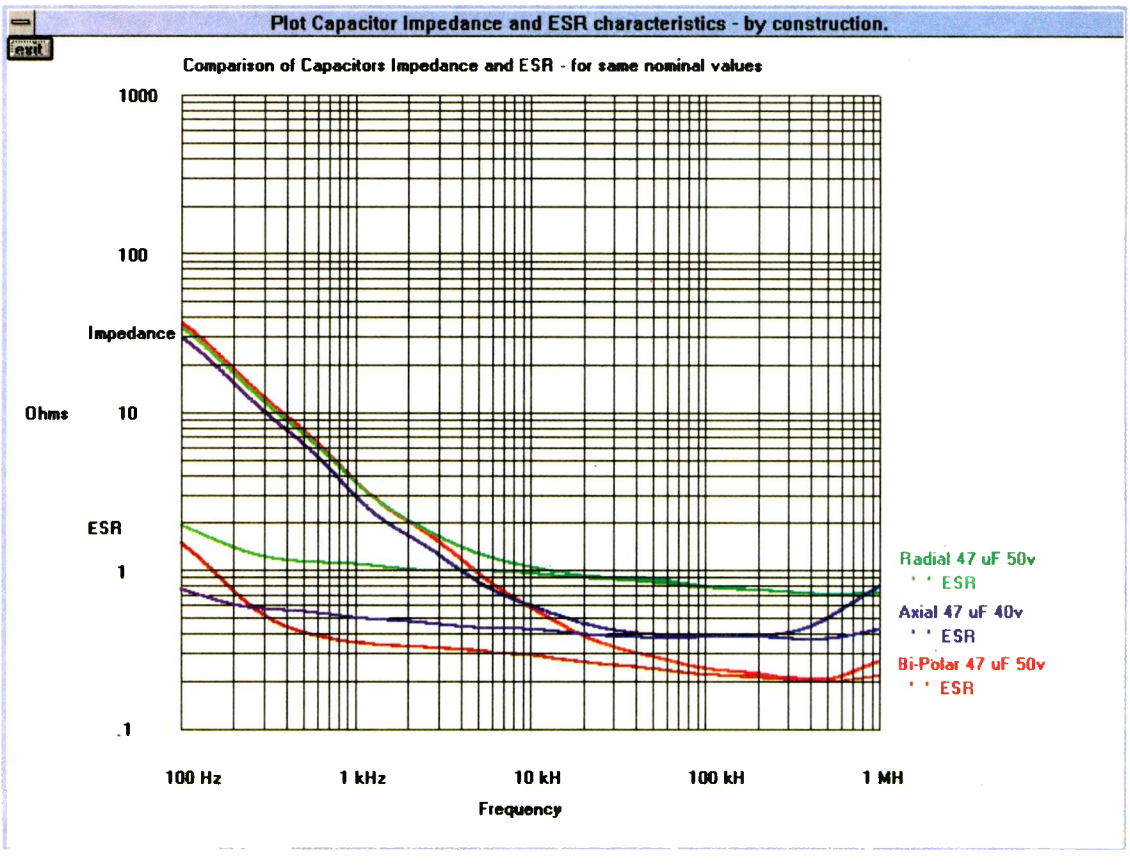
$$ESR = \text{abs}(X_C \times \tan\delta)$$

The capacitor's reactance reduces in proportion to capacitance value and frequency. Being a combination of fixed and variable losses, ESR also reduces with frequency but to a lesser extent[2]. Having reached a minimum value, ESR then increases with frequency. The measured tanδ of a capacitor is therefore frequency dependent and must always increase with frequency. From the equation, you can see that tanδ has no upper limit: it can exceed unity.

Equivalent series resistance is related to the specific construction of the capacitor, its voltage rating and its capacitance value. For all capacitor types, ESR varies with frequency. Especially for aluminium electrolytic capacitors, ESR is temperature dependent, reducing as temperature increases.

At any chosen frequency, the ESR and impedance of each capacitor value and voltage rating varies widely.

Fig. 3. True four-wire, four-terminal measurements of impedance and ESR against frequency for three 47µF capacitors. These are typical of the range of impedances and ESR found at 100kHz with medium-voltage electrolytics. Using a two-wire, two-terminal measurement, self inductance of the test leads would substantially reduce the apparent resonance frequencies, increasing the capacitor's apparent impedance/ESR.



No single global good/bad figure can be assigned. ESR or impedance can be used to identify a worn aluminium electrolytic capacitor, but only by comparison against known good identical capacitors, **Fig. 3**.

Tanδ at 100 or 120Hz, depending on the frequency of the AC mains supply, is used by capacitor makers to assess aluminium electrolytic capacitor quality. Every capacitor is tested for tanδ during production. Any that fail this test are scrapped. While many makers also table a 10kHz or 100kHz impedance or ESR value by capacitor, these parameters are typical and are not production tested.

Variation of tanδ with capacitor size and voltage rating is negligible compared to the wide range of ESR and impedance. Tanδ thus provides a good figure of merit for all capacitors.

ESR is of interest to a designer to determine ripple current or power ratings[4]. But when capacitor quality issues are concerned, 100/120Hz tanδ – not ESR – is the preferred criterion.

From the equation, you can see that tanδ responds to change of capacitance or ESR. A bad or failing aluminium electrolytic's capacitance usually reduces slightly, while ESR increases significantly. Tanδ reflects both changes.

Temperature effects

Capacitor leakage currents are temperature dependent, roughly doubling for each 10°C increase in temperature, according to Arrenhuis' law. Since the consumption of free oxygen from the electrolyte determines an aluminium electrolytic capacitor's service life, so does its working temperature.

When an AC ripple current is present, the capacitor's ESR results in the capacitor dissipating real power as the product of $I^2 \times ESR$, raising the capacitor's internal temperature above ambient. Each aluminium electrolytic capacitor has a permissible sinusoidal ripple current rating, usually based on a frequency of 100 or 120Hz. Correlation factors for other frequencies and ambient temperatures may be provided.

When a sinusoidal or other easily defined waveform is applied to the capacitor, compliance with the capacitor maker's ratings is easily confirmed. Such ideal waveforms rarely occur in practical circuits however.

Given a repetitive voltage or current waveform, power dissipation can be calculated. In many instances, especially with non-repetitive waveforms, the only practical method is measurement of the working capacitor's case temperature rise. A mathematical method, applicable to any repetitive waveform, was published in *Electronics World*[4].

When an aluminium electrolytic capacitor is used correctly, within its ratings, the leakage current will slowly consume the oxygen available from the electrolyte. The capacitance value will change, and the ESR will increase.

A capacitance value change of ±10% and a tanδ or impedance increase of 1·2 times the specified limits indicates that the component's service life has ended. Used correctly within the capacitor maker's published ratings however, electrolytic capacitors provide many years of satisfactory service. ■

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2. Understanding capacitors, C. Bateman, *Electronics World*, June 1998.
3. *Reference Data for Radio Engineers*, Newnes, Oxford.
4. Power dissipation in capacitors, C. Bateman, *Electronics World*, April 1995.

In a second article on this topic, Cyril looks at capacitor failure mechanisms and explains how to check a capacitor while it's in situ.

The JOULE A-400 Radio Decoder

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Customers and their mannerisms. Pops and blow ups. Servicing in earlier times. The problem with car radios. Donald Bullock's servicing commentary

WHAT A LIFE

There's something about this trade that makes you notice people's mannerisms. Take Mr Worrett for example. The other day he struggled in with a 28in. NEI Nicam teletext set. He kept opening his mouth wide while shutting his right eye and rubbing it.

"My eye's itching" he said. "The screen's blank, dark and narrow and the remote control don't work." Then he heaved the set on to the counter, stretched himself, opened his mouth, shut his eye and rubbed it.

"You need a shot of Joshua Juice" I told him, "there's a chemist over the road." As he departed, we took his set to the bench.

It was a Model E28G1TFXN, which is fitted with the E5 chassis. It seemed sensible to start by checking the voltages on the secondary side of the MOSFET chopper power supply. Most were OK, but there was only 2V instead of 8V across D683's reservoir capacitor C692. The output from this rectifier circuit feeds a 5V regulator transistor, T681. We decided to check the 2·2Ω fusible surge-limiting resistor R686, which is in series with D683, and found that it had risen in value to an astonishing 500Ω. As we couldn't see any reason for this, we simply replaced it then switched on again. We now had a picture, and the remote control unit worked. But the picture was narrow, with a one-inch gap at each side, and was slightly too dark.

This suggested trouble in the line output stage, and a check on C704 (2·2nF, 1·6kV), which is part of the tuning circuit, revealed that it had fallen in value to 54pF. It was an Iskra type, which is suspect in this position, so we fitted a different replacement. The result was a full-width picture with normal brightness.

It wasn't long before Mr Worrett returned.

"Got 'im done boys?" he asked. When we nodded he stretched, opened his mouth, closed his eye and started to rub it. Then he reached for his wallet.

Pop, pop, pop

Our next caller, Mrs Autridge, has a long, scraggy neck. She's all right until she starts to speak, then she starts to lift her chin and stretch her neck as though trying to pull a few extra inches out of her collar. She had with her a 21in. Sanyo Model CBP2145 (E2-B21 chassis).

"'E goes pop, pop, pop when I switch 'im on, an' the picture's snowy" she said as she stretched her neck. "but when 'e gets warm 'e's better."

Steven took the set over to the bench and got into the power supply to check C364 and C398. They are both 100µF, 16V 105°C electrolytics and are the reservoir capacitors for the 12V and 5V supplies respectively. When checked, both were found to be very low in value. We had only ordinary 25V types, so fitted these. While there was an improvement the faults were still evident. Further checks failed to reveal anything amiss, so Paul went out and obtained the correct type. Fitting them did the trick.

About to blow up?

Mrs Weir always looks and sounds as if

she's just seen a ghost. She padded in with her husband's VCR, which was a Panasonic NVJ35.

"I think this has been Visited" she said, pointing a long finger at the machine's tape slot. She tucked her chin in and looked up at me.

"It's dead all right, but when you plug it in there's a noise as if it's about to blow up" she continued.

I stepped back smartly, then pulled myself together.

"You've brought it to the right place, Mrs Weir" I replied, "our Mr Paul is an expert on these Panasonic machines."

Paul plugged it in. It was dead and, sure enough, started to tick.

"Wonder what's causing that?" he asked.

"Dunno"! I replied, "perhaps it's about to blow up."

He spent a good while checking through the electronics and eventually found that when he carried out some tests around the microcontroller chip IC7501 the ticking speed increased. When a new IC was fitted the recorder came back to life, minus its tick.

Cider with Rosie

The note I included in the May issue about my failure to record the original BBC version of *Cider with Rosie* brought me a welcome phone call from John Bateman, in Somerset. He had also set out to record the programme, all those years ago. But there was one important difference. He had succeeded, and has the recording to this day.

He made and sent me an excellent copy, and the other night Greeneyes and I were able to settle down and watch it. The programme I had set out to record depicted Laurie Lee's childhood in an isolated village nearby, fifty years earlier. By the time I came to play it, twenty eight years later, its nostalgic value had greatly increased.

I'm most grateful to John, not only for sending us the tape but also for bringing back, during our conversation, so many memories of this trade in those earlier times. He too had worked for the legendary John James in his Broadmead Wireless Company days.

"I could tell many a tale of the chaos at that time" I told him.

"Me too" he replied. "I found his set up so legendary that one day I upped and walked out, never to return."

We swapped one or two yarns and, later that night, while checking the quality of our whiskey stock, I reflected on some of the mishaps that befell me over my years in the trade. I remember one particularly awful day all too well.

A bad day

There had been a bad start to the day. Our van had gone in for a service and the engineer's report meant it needed big money spent on it. With this on my mind I decided to do my service calls in the car, which was a Mk 10 Jaguar.

The set at the first house had an intermittent fault. I decided that it would have to be dealt with in the workshop. The customer was edgy, but offered to help me carry it out.

"What might it cost?" he asked as we trudged down the path.

"All depends" I replied. "It could for example be the tube."

Just then he caught sight of the Jaguar and froze.

"Hang on" he said, "I don't think I'll bother. Let's take it back in."

The next call was at an isolated farm cottage across a meadow, where an old woman was with her strange son of about thirty. He was somewhat unkept, and sat by the fireplace in a haze of tobacco smoke, surrounded by matches and lighters and ashtrays and packets of cigarettes. He lit one up then another, and had two going at once.

As I picked the set up he threw back his head, bawled and threw himself flat on the floor. The old woman started to whimper and ran around me.

"He's gone again" she cried. "You'll have to help me get him to the doctor. There's no telephone. We gotta hurry!"

The upshot was that we half dragged and half carried him across the meadow, then into the car, and sped to the doctor's house.

"Again?" said the receptionist.

Not quite myself

By the time I reached the next house I was not quite myself, and tried to change a line output valve while the set was still working. I received such a large dose of pulsing RF that I shouted a naughty word and threw my tools across the room.

As I left the house I realised that I was late for an important meeting back at the shop. So I ran to the car, flung open the door, sat down and tried to pull myself together. Then I brought my hands up to the steering wheel.

It wasn't there. Nor were there any foot pedals. And there was no dashboard. In my haste I had jumped into the back seat.

Two or three people outside a paper shop had witnessed this and were curious. I did the only thing I could. I adopted a nonchalant air, fiddled with some imaginary papers on my lap, then fiddled a bit more at my shoelaces. Then I climbed out, casually, and re-entered the car via the driver's door. I drove off sedately until I was around the corner. Then I drove like hell.

Car radios

Years ago I learnt the hard way not to get involved with the repair of car radios. At first it had seemed a good idea. There were lots of them about and, since they used valves and mechanical vibrators, they tended to be unreliable. In addition they were not all that difficult to repair. So I cordoned off a corner of the workshop, rigged up a 12V car battery and a simple charger, slung up a simple aerial and a speaker on a hook, and settled down to make a few extra shillings.

They came in all right. But all too often the real trouble started a day or two after a radio had been collected and refitted in its car. The internal phone would buzz, and I'd answer it.

"Mr Chipper is here about the car radio he picked up the other day. He says it isn't quite right. Could you pop down and have a word with him?"

Down I would go. Not to speak, but to listen. This sort of thing:

"It crackles a bit when I signal left. Didn't do it before."

"It's not as clear as it was."

"It cuts out when I go under a bridge."

"It used to be louder on Luxembourg."

And so on. The upshot was usually an unwilling walk to some remote car park, or to the edge of town, where the car was parked. Sometimes it meant a drive to the offending railway bridge.

It always ended up with me crouching, wedged under a dusty dashboard, to press the aerial plug in or tidy up the battery or earth or speaker connections. Having done so I would find myself imprisoned there while the fanatical owner fiddled and twiddled and tuned and tested, and revved up and gradually convinced himself that all was now well.

After two or three consecutive outings in the rain, during one of which I had to buy a tin of Vaseline and remake the owner's battery connections, I decided I'd had enough.

On the way back I bought a drawing board. It wasn't long before our new sign went up: "No car radio repairs accepted."

Sad loss

My brother Terry died last week. He had a fine sense of humour, which was often directed towards me. I've mentioned him now and again in this column in the past.

He'd been all right a bit earlier, when I'd left to return to Spain. Then I got a telephone call to come back, and arrived to find him semiconscious.

"Donald's here. Can you see him?" he was asked.

"I can smell him" he replied.

"Would you like some orange juice?" they asked him.

"Hm" he said, "two pieces of ice, a splash of juice and – he lifted his thumb and finger well apart – that much whiskey." A little later he slipped away.

Various topics and developments were covered at the latest DVD Summit, including the use of hybrid DVD discs, Nuon-enhanced interactive players, fluorescent multi-layer discs and the CD-PROM. Peter Brough reports from Dublin

At the DVD Summit

The third DVD Summit was held recently in Dublin, where many of the industry's leaders met to discuss and demonstrate the latest DVD developments. Conference chairman John Barker announced that the theme this year would be "The Connected DVD". DVD is moving away from being a standalone format to one that's linked to the internet.

By the end of next year it's expected that about one in ten UK homes will have a DVD player, rising to one in three by the end of the year 2003. The number of PCs in Western Europe equipped with a DVD-ROM drive will rise from 22 per cent this year (out of some 27 million PCs) to 85 per cent (of 53m PCs) in 2003. Many PCs equipped with a DVD-ROM drive also include an MPEG-2 decoding card or software, enabling DVD-Video films to be watched on the PC.

It's interesting that between 60-70 per cent of the DVD-Video players sold in W. Europe are multi-region ones that can play both Region 1 (the Americas) and Region 2 (Europe) DVD titles. Of the 45 million DVD discs produced for the US sell-through market 10-15m were exported. The feeling at the Summit was that in the era of the internet and the global economy it's becoming harder to enforce regional coding. A French distributor pointed out that although her company had the rights to a particular film in the French market her business is being undermined by the flood of Region 1 titles available in French high streets. The general view is that Hollywood's traditional distribution pattern, with blockbuster films released to other territories months after the original release to US cinemas, will have to change. We shall see.

Table 1: Nuon specifications.

Processor: Over 1,500 MIPS, 216m 32-bit multiply-accumulate operations per second (MAO/sec); 864m 16-bit MAO/sec; 13·4m (94 x 4) x (4 x 1) MAO/sec (32-bit elements).

Firmware and library: MPEG-2 MP@ML audio/video decode, video scaling, zoom, picture-in-graphics, DVD subpicture, graphics overlays, PAL/NTSC.

Digital audio: Dolby AC-3, MPEG-1, MPEG-2, LPCM, 3D spatialiser, Dolby Pro-Logic, CD-DA, HDCD, CD-Text, DVD Audio, MP3, DTS, SPDIF output, ADPCM and PCM sample playback, 32-voice general MIDI wavetable synthesiser, full MIDI sample set, advanced karaoke.

Graphics: 2D graphics (16m colours) and 3D graphics libraries.

Supports HTML, Javascript, JPEG, GIF, Macromedia Flash.

Hybrid DVDs

Hybrid DVDs contain a film title that can be watched using a DVD-Video player connected to a domestic TV set, and DVD-ROM data that can be read by a domestic PC's DVD-ROM drive. The idea of a multi-purpose disc is not new. There have been a number of such discs in the CD format. The CD-Video disc for example can play music via an audio CD player and a short video clip via a CD-V machine; CDi-Ready discs offer red book audio (playable via a standard audio CD player) and green book CDi data that can be read by a CDi player; and CD-Extra discs offer red book audio and PC data that can be retrieved by inserting the disc in a CD-ROM drive linked to a PC.

The DVD-ROM data contains interactive content in the form of pictures, text, graphics and animation. It might include actors' biographies, the screenplay, and other background information associated with a film. InterActual Technologies, a US company, has developed software called PC Friendly that enables the interactive content of these hybrid DVD discs to be used. Over 250 movie titles are now available for use with this software.

Owners of hybrid DVD-ROMs who

have a DVD-ROM drive can access the film's screenplay, storyboard, essays, games and the original theatrical web site via the disc. They can also link up with selected internet sites and purchase film merchandise, as well as participate in web events and chat sessions linked to the film.

Hybrid discs have proved to be controversial however, not least because of incompatibility problems. A number of DVD-Video players in the USA and the UK have had problems reading some hybrid discs – the most notorious example was *The Matrix*. These incompatibility problems make themselves apparent in different ways, from some slight pixellation in certain scenes to blocking artifacts, fozen pictures or the player simply being unable to read the disc. A number of manufacturers have had to update their DVD player firmware to enable the machines to play hybrid discs.

Questions about the source of the trouble were asked during the Summit – was it the players or the discs? Todd Collart, president and chief operating officer of InterActual, said that the authoring and hardware companies had to work together. He added that it was wrong to blame the idea of the hybrid disc, as the DVD specification says you can include ROM data on a DVD-Video disc. Apparently most problems have been with first-generation DVD players from China, Taiwan and Korea.

Reza Aghevli, vice-president worldwide marketing of Mediamatics, called for a system to be introduced requiring hardware manufacturers and content companies to submit their products for certification. It does seem odd that there is not such system for DVD: it's common practice in the PC industry.

i-DVD

National Semiconductor Corporation and Planet Web unveiled a basic internet DVD (i-DVD) player design at the CeBit trade show in Hanover last February. It consists of a DVD chipset developed by Mediamatics, a subsidiary of NSC, and a special web browser developed by Planet Web. The browser requires only a small amount of memory (about half a megabyte) and can thus be easily installed on a DVD disc or inside a DVD player.

The i-DVD format is compatible with DVD, audio CD, CD-Video and the Super Video CD format used in China. A number of internet service providers, such as Favorite On Line and eHola, plan to launch subsidised i-DVD players this year.

Nuon

The usual way of using a hybrid DVD disc is to watch the film, using a DVD player connected to a TV set, then take the disc out and place it in a PC's DVD-ROM drive. The US company VM Labs however has developed a system that enables DVD players to provide PC-type features such as interactivity and connection to the internet. The technology is known as Nuon.

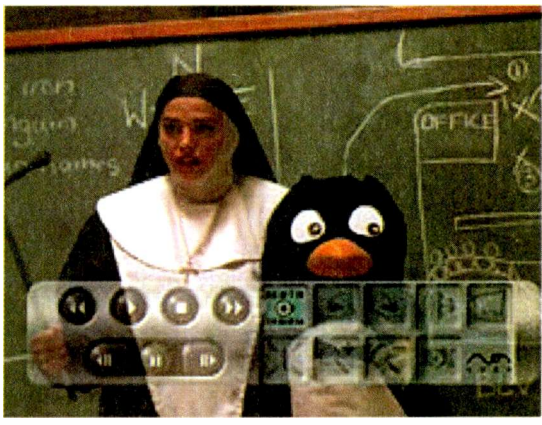
James Grunke, VM Labs' senior director of New Media Business Development, explained the Nuon system and released some marketing information. Nuon consists of four elements: a media processor chip that replaces a standard DVD MPEG-2 chipset, an operating system, mediaware and applications. The 128-bit processor operates at 50-100MHz. Table 1 provides basic details. A serial bus connects peripheral devices such as a modem, joystick and keyboard.

Although Nuon technology will first appear in DVD-Video players, it is also designed for use in set-top boxes, audio products and communications devices. VM Labs emphasises that Nuon is not a PC product. It uses Planet Web's browser technology and InterActual Technolgies' PC Friendly software. Nuon-enhanced DVD players will not read existing hybrid DVD discs however.

Nuon offers enhanced core DVD features such as improved graphics and on-screen menus, and new features such as multi-angle thumbnails, real-time zoom and pan and picture editing by image processing – users can adjust the colour, contrast and brightness. Other features include e-mail, internet links and interactive use.

James Grunke demonstrated some of Nuon's features, including its graphical user interface (GUI) which is more sophisticated than that used by existing DVD players. The GUI can provide up to 156 levels of transparency (see photograph) and 16 million colours. Pictures can appear within graphics or as overlays. It's also possible to display control panels for adjusting the soundtrack and speaker set-up without leaving the film being watched. Nuon players will have a built-in Dolby Pro-Logic decoder but not, presumably to keep costs down, a 5.1-channel Dolby Digital decoder. They will play audio CDs – there's even a half-speed and two-times speed facility.

Nuon-enhanced players will be able to play games ranging from puzzles to arcade-style titles. Some twenty games are planned for release this year, including *Merlin Karting*, *Dragon's Lair*, *Myst* and *Monopoly*. Add-on peripherals such as joysticks, steering wheels and a keyboard will be available from third-party suppliers. VM Labs says that Nuon's games play performance is similar to that of a first-generation PlayStation. The company is keen to stress that Nuon DVD players and games consoles are different animals however: games consoles do not change their size or shape, whereas DVD players are made by a multitude of manufacturers with different models such as portables, table tops and changers.



Nuon's graphical user interface can provide up to 156 levels of transparency and 16 million colours.

Nuon has gained the support of the major Hollywood studios, and Panasonic Disc Services Corporation (PDSC) is working with VM Labs on the development of authoring tools and replication services for Nuon-enhanced DVD players. Samsung and Toshiba are to launch Nuon-enhanced DVD players in the USA later this year – they will include connections for an external modem. The first Nuon-enhanced player is likely to be Samsung's DVD-N2000, at about $500 (£312). DVD hardware companies hope that Nuon-enhanced players will lift prices – entry-level DVD players sell for under $150 (£100) in the USA, and the sub-$100 barrier is expected to be breached by Christmas.

All Nuon-enhanced DVD players come with an NSB (Nuon Serial Bus) port that can be connected to an external modem. An optional modem and browser will go on sale in the USA this summer priced at about $50-$70, though the goal is to reduce this to less than $40 by the end of the year.

Nuon-enhanced DVD players with internal modems will become available next year. The Planet Web browser is transport independent, i.e. it will work with Ethernet, ISDN, ADSL and other types of connectors, and ISP independent. It can be customised for default ISP registration.

VM Labs says the internet link could be used to guide users to rental sites, studio websites plus music, merchandise and movie databases. Other possibilities include discs that contain a locked games code that can be opened only when the user pays a fee, on-line advertising and head-to-head networking.

VM Labs is to run a test programme on all Nuon hardware and software to ensure universal compatibility. No disc or player will be able to use the Nuon logo until it has passed a number of compliance tests.

Will Nuon succeed? According to VM Labs, research shows that consumers are prepared to pay $50-100 extra for a player that offers interactive features such as games. Much will depend on the quality and quantity of games available. Certainly

A prototype C3D FMD disc player. The photo was obtained from C3D's web site.

the trend is for video-based hardware to offer several features. For example Sega's Dreamcast console can link with the internet while Sony's PlayStation 2 has internet link capability and can play DVD-Video titles. But it's worth recalling that the Philips Cdi machines could play video titles, interactive discs and games and could even take users on-line. Much will depend on how much support Nuon gets from the major DVD hardware, software and games companies.

Fluorescent Multilayer Discs

It seems unbelievable today that when CD-ROMs were first launched many wondered how you could fill a disc that offered the storage capacity of 1,000 single-density floppy discs. It wasn't long however before CD-ROM's capacity was being stretched to the limit by large media files such as audio, video and high-quality graphics. The DVD format provides capacities up to thirty times that of a CD disc, but even the largest-capacity DVD discs (DVD-18) can store only about 17Gbytes of data. The search is already on for technologies that can greatly increase this, including the use of improved data compression systems and blue laser technology.

The US company Constellation 3D (C3D) presented an alternative approach, the Fluorescent Multilayer Disc (FMD) – see heading photo. The idea is to coat each storage layer with a fluorescent material. When a laser beam hits this, fluorescent light is emitted. Its wavelength differs from that of the incident laser light – it's shifted slightly towards the red end of the light spectrum (680nm instead of 650nm). This emitted light is not affected by data or other marks, and is passed to a photodetector via a filter that removes stray light and interference.

DVD and FMD discs both use red laser light for scanning, and have storage layers that are stamped with data pits. The FMD pits differ in being filled with fluorescent material. This produces reflected light that is incoherent (laser light is coherent) and is more robust when it comes to interference.

C3D's research suggests that FMD discs could have up to 100 layers, providing a capacity of hundreds of gigabytes. Theoretically, a 1,000-layer disc is possible. According to C3D, the use of fluorescent emitted light rather than reflected laser light has several advantages. These include a smaller loss of energy between each layer (less than one per cent), lower sensitivity to media and drive imperfections, and an improved signal-to-noise ratio (in comparison with reflected laser light) as the number of layers increases.

FMD discs would have the same physical form as CD and DVD discs, i.e. 12cm diameter and 1·2mm thickness, and would be compatible with these formats, enabling an FMD player to play CD and DVD discs. The discs have protective substrate layers at the top and bottom with the data layers in between, the layers being bonded together to form the complete disc. Data can be stored on both sides of each layer.

The FMD data read speed is between 45-150Mbits/sec, and C3D says that green laser or blue laser technology would greatly increase storage capacity. The company adds that existing CD production lines could be used for producing the new discs. Hot embossing or a modified photo polymerisation (2P) system could be used for disc replication. In volume production, C3D suggests that the discs would cost about $1-2, with drives at $50-70.

Constellation 3D has also developed a credit-card sized format that uses the same technology. Called ClearCard, it can have up to twenty layers giving a maximum storage capacity of 10Gbytes. C3D says that a 50-layer card could be developed within a year. There is also a recordable version of ClearCard, which would be aimed at laptop PC, mobile phone, in-car entertainment and digital camera use. Also for use with VCRs, which could use ClearCard for downloading information from the internet.

C3D says that its first product, a ten-layer disc with a storage capacity of 140Gbytes, providing up to twenty hours of HDTV-quality video, will be available next spring. It says that the technology has been demonstrated to the US data storage industry and Hollywood studios, and that much interest has been shown.

There was scepticism at Dublin however, not least because there was not a disc to be seen never mind a demonstration system. C3D maintained that this was because the current system is bulky and expensive. According to the company the final format specification will be released this summer – barely six months before the first commercial products are due.

The history of the data storage and consumer electronics industries includes many technologies that seemed to offer great benefits over other formats but never achieved a commercial launch. It remains to be seen how FMD will fare.

CD-PROM

Kodak showed a new format, CD-PROM (Programmable Read Only Memory), that combines CD-ROM and CD-R technologies. A CD-PROM disc is the same size as a standard CD disc and has a data capacity of 680Mbytes. The format makes possible multi-session recording, enabling data to be added to a recordable area. The area's size is variable. Kodak says that CD-PROMs could be used for games, video or music titles.

Kodak is using the new disc for its Picture-CD format, which enables photographic images to be recorded on a CD disc. It plans to develop DVD-PROM discs, but points out that while there are specifications for hybrid media in the CD format (via the orange, red and yellow book standards) these are currently not available with DVD.

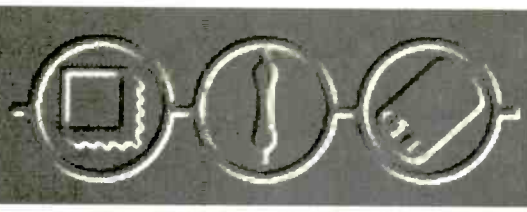
Conclusion

The third DVD Summit showed that DVD will be able to survive in a world that offers hard-disk recorders and on-line delivery of music and video via broadband connections to domestic users. There will soon be two types of DVD players, standalone and connected. It's even possible that future DVD players will use recordable discs for archiving and storage and hard disks for "watch-and-wipe" recordings.

One thing is certain: there will be plenty of new developments at next year's Summit in Rome.

Grandata Ltd

distributor of electronic components



Line Output Transformers

Part No	Code	Price
ALBA		
3714002	LOT02	800p
043714002J	LOT02	800p
43700000	LOT02	800p
AMSTRAD		
1810951	LOT55	1250p
3714002	LOT02	800p
043714002J	LOT02	800p
43700000	LOT02	800p
AM152591	LOT55	1250p
FERGUSON		
00 D-3-508-002	LOT381	1400p
06 D-3-083-001	LOT82	1100p
06 D-3-083-002	LOT82	1100p
06 D-3-084-001	LOT23	1050p
06 D-3-087-001	LOT23	1050p
06 D-3-088-001	LOT84	1200p
06 D-3-093-001	LOT204	1250p
06 D-3-508-003	LOT275	1200p
06 D-3-512-001	LOT204	1250p
29201-022-01	LOT63	1500p
473197	LOT301	1300p
D 059 / 37	LOT26	1250p
HINARI		
3714002	LOT02	800p
043714002J	LOT02	800p
43700000	LOT02	800p
CF 124 B	LOT67	1250p
CF 124 E	LOT67	1250p
HITACHI		
2424593	LOT44	900p
2432461	LOT169	1250p
2432761	LOT169	1250p
2433453	LOT82	1100p
2433751	LOT01	1050p
2433752	LOT01	1050p
2433891	LOT23	1050p
2433892	LOT84	1200p
2433893	LOT23	1050p
2433952	LOT33	800p

Part No	Code	Price
HITACHI..continued		
2434002	LOT226	1350p
2434141	LOT33	800p
2434274	LOT44	900p
2434393	LOT405	1800p
2434593	LOT44	900p
2435006	LOT401	1500p
2435131	LOT251	1300p
2436201	LOT90	850p
2433891H	LOT23	1050p
MATSUI		
20070	LOT438	1250p
20071	LOT438	1250p
20072	LOT438	1250p
20073	LOT438	1250p
20074	LOT438	1250p
20075	LOT438	1250p
3714002	LOT02	800p
3221008	LOT438	1250p
043714002J	LOT02	800p
043221088P	LOT438	1250p
43700000	LOT02	800p
7140021	LOT02	800p
MITSUBISHI		
731003	LOT51	1300p
339 P 18506	LOT51	1300p
ORION		
3714002	LOT02	800p
043714002J	LOT02	800p
43700000	LOT02	800p
PANASONIC		
TLF 14512 F	LOT39	1500p
TLF 14520 F	LOT40	1500p
TLF 14521 F	LOT39	1500p
TLF 14567 F	LOT39	1500p
TLF 14568 F	LOT40	1500p
TLF 14584 F	LOT41	1550p
TLF 14586 F	LOT42	1500p

Part No	Code	Price
PHILIPS		
3119 108 31260	LOT90	850p
3119 108 31290	LOT73	1000p
3119 108 31440	LOT433	1100p
3119 108 31441	LOT433	1100p
3119 108 31442	LOT433	1100p
3119 198 62930	LOT57	1000p
3122 108 10246	LOT111	1200p
3122 138 36070	LOT111	1200p
3122 138 36072	LOT111	1200p
3122 138 36920	LOT57	1000p
3122 138 36922	LOT57	1000p
3122 138 36923	LOT57	1000p
3122 138 37050	LOT132	1300p
3122 138 37520	LOT90	850p
3122 138 38040	LOT73	1000p
3122 138 38123	LOT395	1200p
3128 138 20200	LOT433	1100p
3128 138 20201	LOT433	1100p
3128 138 20202	LOT433	1100p
3139 128 30400	LOT90	850p
4812 140 10246	LOT111	1200p
4812 140 10369	LOT90	850p
4812 140 10421	LOT90	850p
4822 140 10274	LOT123	1100p
4822 140 10246	LOT111	1200p
4822 140 10306	LOT57	1000p
4822 140 10381	LOT128	1100p
4822 140 10384	LOT127	1550p
4822 140 10406	LOT73	1000p
4822 140 10544	LOT433	1100p
4822 140 10566	LOT433	1100p
AT 2076 / 10	LOT57	1000p
AT 2078 / 21	LOT395	1200p
AT 2079 / 21	LOT395	1200p
AT 2079 / 40	LOT73	1000p
AT 2079 / 99	LOT276	1200p
SAISHO		
3714002	LOT02	800p
043714002J	LOT02	800p

Part No	Code	Price
SAISHO..continued		
43700000	LOT02	800p
7140021	LOT02	800p
SHARP		
RTRNF 1220 CEZZ	LOT39	1500p
SONY		
1-439-286-00	LOT46	1000p
1-439-286-11		LOT46
1000p		
1-439-286-12	LOT46	1000p
1-439-286-13	LOT46	1000p
1-439-286-21	LOT46	1000p
1-439-332-41	LOT100	1200p
1-439-332-42	LOT101	1200p
1-439-332-52	LOT100	1200p
1-439-363-11		
LOT268 1100p		
1-439-363-21	LOT268	1100p
1-439-387-11		
LOT311 1200p		
1-439-387-21	LOT311	1200p
1-439-416-11		
LOT255 1300p		
1-439-416-12	LOT255	1300p
1-439-416-21	LOT255	1300p
1-439-416-23	LOT255	1300p
1-439-416-41	LOT255	1300p
1-439-416-51	LOT255	1300p
TOSHIBA		
1810951	LOT55	1250p
2433751	LOT01	1300p
23236098	LOT288	1200p
23236198	LOT288	1200p
23236201	LOT395	1200p
23236245	LOT395	1200p
23236255	LOT289	1100p

Many many more LOPT's in Stock... Please ring for ones not listed

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105° c Radial Electrolytic Capacitors

VALUE	CODE	PRICE	PER PACK
10 volts			
470uF	CAP29	120p	10
16 volts			
330uF	CAP30	175p	10
470uF	CAP31	175p	10
680uF	CAP32	210p	5
1000uF	CAP33	210p	10
2200uF	CAP34	525p	10
3300uF	CAP35	500p	5
4700uF	CAP36	610p	10
25 volts			
10uF	CAP37	45p	10
22uF	CAP38	45p	10
47uF	CAP39	48p	5
100uF	CAP40	70p	10
150uF	CAP41	95p	5
220uF	CAP42	120p	10
330uF	CAP43	140p	5
470uF	CAP44	190p	10
680uF	CAP45	315p	5
1000uF	CAP46	365p	10
1500uF	CAP47	390p	5
2200uF	CAP48	200p	2
3300uF	CAP49	220p	2
4700uF	CAP50	365p	2
6800uF	CAP51	390p	2
35 volts			
10uF	CAP52	50p	10
22uF	CAP53	45p	10
33uF	CAP54	50p	5
47uF	CAP55	85p	10
100uF	CAP56	85p	10
150uF	CAP57	95p	5
220uF	CAP58	145p	5

VALUE	CODE	PRICE	PER PACK
35 volts continued.....			
680uF	CAP59	650p	10
1000uF	CAP60	435p	10
2200uF	CAP61	245p	2
3300uF	CAP62	1000p	5
50 volts			
10uF	CAP63	50p	10
22uF	CAP64	70p	10
47uF	CAP65	85p	10
100uF	CAP66	85p	10
220uF	CAP67	175p	10
330uF	CAP68	245p	10
470uF	CAP69	435p	10
680uF	CAP70	490p	5
1000uF	CAP71	525p	10
2200uF	CAP72	325p	2
63 volts			
0.47uF	CAP73	35p	10
1uF	CAP74	35p	10
2.2uF	CAP75	35p	10
3.3uF	CAP76	50p	10
4.7uF	CAP77	35p	10
10uF	CAP78	50p	10
15uF	CAP79	95p	5
22uF	CAP80	75p	10
33uF	CAP81	85p	10
47uF	CAP82	95p	10
68uF	CAP83	130p	5
100uF	CAP84	120p	10
150uF	CAP85	280p	5
220uF	CAP86	280p	10
330uF	CAP87	400p	10
470uF	CAP88	525p	10
680uF	CAP89	500p	10

VALUE	CODE	PRICE	PER PACK
63 volts continued.....			
1000uF	CAP90	540p	5
100 volts			
0.47uF	CAP91	50p	5
1uF	CAP92	85p	10
1.5uF	CAP93	70p	5
2.2uF	CAP94	50p	5
3.3uF	CAP95	50p	5
4.7uF	CAP96	50p	5
10uF	CAP97	95p	10
22uF	CAP98	105p	10
33uF	CAP99	155p	5
47uF	CAP100	175p	10
100uF	CAP101	210p	10
220uF	CAP102	600p	5
470uF	CAP103	600p	5
250 volts			
3M3	CAP104	175p	10
10uF	CAP105	260p	10
47uF	CAP106	435p	10
400 volts			
1uF	CAP107	215p	5
2.2uF	CAP108	225p	5
4.7uF	CAP109	315p	5
10uF	CAP110	400p	5
22uF	CAP111	250p	2
47uF	CAP112	350p	2
450 volts			
1uF	CAP113	280p	5
2.2uF	CAP114	320p	5
4.7uF	CAP115	495p	5
10uF	CAP116	550p	5
22uF	CAP117	415p	2

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Part No	Price
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KSS 210 A	£10.50
KSS 210 B	£15.00
KSS 240 A	£20.00
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KSS 213 C	£11.50
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OPTIMA 5	£11.50
RCTRTH8151	£20.00
RCTRTH8112	£15.00
CDM12.1	£15.00
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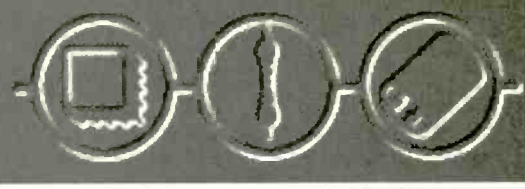

Satellite PSU Repair Kits

MAKE & MODEL	CODE
ALBA	
SAT6600	SATPSU2
AMSTARD	
SAT250 , SR950 , SRD2000 , SRD700,SRD950 , SRX1002 , SRX2001 , SRX301 , SRX501 , SRX502	SATPSU16
SRD510 , SRD520 , SRD540 , SRD545 , SRD550	SATPSU3
SRD500	SATPSU4
BRITISH TELECOM	
SVS300	SATPSU17
BUSH	
IRD150	SATPSU12
ECHOSTAR	
SR5500 EARLY PSU WITH ADJ.	SATPSU12
FERGUSON	
SRD 5 , SRD16	SATPSU1
SRD4	SATPSU11
SRV1	SATPSU2

MAKE & MODEL	CODE
FINLUX	
SR5700	SATPSU12
SR5100	SATPSU23
GOODMANS	
ST700	SATPSU1
GRANADA	
KR1 , LR1 , LR2 , M/N92MR1/A	SATPSU1
HR 1, JR1	SATPSU2
NR2 , PR2	SATPSU8
M92MR2	SATPSU9
GRUNDIG	
STR1	SATPSU1
GRD2000 , GRD3000	SATPSU2
GRD150 , GRD250 , GRD280 , GRD300 , STR200S	SATPSU20
HITACHI	
SR-1050D	SATPSU1
MASPRO	
SRE250S/1 , SRE 350S/1	SATPSU1
SRE250S , SRE350S , SRE450S	SATPSU2
ST5 , ST-12	SATPSU20

MAKE & MODEL	CODE
MATSUI	
RD600	SATPSU20
MITSUBISHI	
ST-PB10	SATPSU1
NOKIA	
SAT1500 , SAT1600	SATPSU2
SAT1700 , SAT2200 , SAT2202	SATP-
SU23	
PACE	
PRD700 , PRD800 , PRD900 , PSR800 , PSR900 , MRD950 , MRD960	SATPSU1
MSS500 , MSS1000	SATPSU10
MRD920 , SS9000 , SS9010 , SS9200 , SS9210 , SS9220	SATP-
SU2	
MSS100 , PRIMA	SATPSU8
APOLLO , MSS200 , MS290 , MSS300	SATPSU9
PANASONIC	
TU-SD200	SATPSU1
TU-SD250	SATPSU9

MAKE & MODEL	CODE
PHILIPS	
STU802/05M , STU804 , STU811 , STU824	SATPSU1
STU801	SATPSU2
STU3301	SATPSU20
STU909	SATPSU22
STU350	SATPSU9
SONY	
SAT301	SATPSU10
THOMSON	
SRD11 , SRD 14	SATPSU1
SRD7/8 , SRS3 , SRS4	SATPSU2
THORN	
SAT99 , SAT120	SATPSU1
TOSHIBA	
SAT99 , TU-SD200	SATPSU1
TS540	SATPSU10

CODE	PRICE	CODE	PRICE	CODE	PRICE	CODE	PRICE	CODE	PRICE
SATPSU1	600p	SATPSU4	600p	SATPSU10	1230p	SATPSU16	1250p	SATPSU22	1050p
SATPSU2	550p	SATPSU8	650p	SATPSU11	650p	SATPSU17	350p	SATPSU23	650p
SATPSU3	600p	SATPSU9	900p	SATPSU12	1600p	SATPSU20	600p		

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VT540,VT545,VT546,VT548,VTD660,VTD665,VTM598,VTM640, VTM645,VTM646,VTM730,VTM731,VTM735,VTM736,.....etc

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BR1600,HRD140,HRD141,HRD142,HRD143,HRD150,HRD152, 8947,8948,3V42,3V44,3V45,3V46,3V47,3V52,3V54,3V55,3V56

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HRD154,HRD160,HRD170,HRD171,HRD210,HRD211,HRD217, HRD310,HRD320,HRD321,HRD350,HRD521,HRD522,...etc

8950,8951,3V64,3V65,FV10,FV11,FV20,FV21,FV26

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HSE30,HSB30

ORDER CODE : VH326 PRICE : £14.50 + VAT

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VHR1110,VHR1150,VHR1300,VHR1700,VHR2300,VHR2370

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VHR3200,3270,3100,3110,3150,3300,3400,3310,VHRD500

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VHR120,VHR130,VHR14,VHR141,VHR143G,VHR14SP,VHR151 ,VHR15,VHR16,VHR171,VHR220,VHR23...etc,VHRD4400, VHRD4410,VHRD4500,VHRD4600,VHRD4610,VHRD6700...etc

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Samsung TV	RCUNI07
Toshiba TV	RCUNI08
Ferguson TV	RCUNI09
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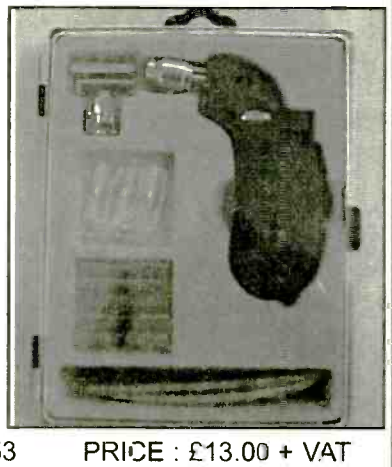

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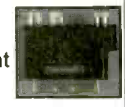

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BU2508A	100p	BUT56A	65p	MJ15004	300p	TIP32A	21p	LM2416T	650p	STR20005	450p	TA8718N	550p	TEA2260	225p	UC3844	70p
BU2508AF	110p	BUW13A	200p	MJ15015	250p	TIP33	50p	LM324	30p	STR40090	350p	TDA1170N	85p	TEA2261	185p	UC3844AN	80p
BU2508D	130p	BUZ80	135p	MJ15016	350p	TIP33C	60p	LM339	35p	STR4211	315p	TDA1175	175p	TEA2262	275p	UC3845AN	80p
BU2508DF	120p	BUZ80AF	200p	MJ15022	400p	TIP34C	60p	LM393	45p	STR440	800p	TDA1180	120p	TEA5101A	300p	UPC1188H	350p
BU2520AF	170p	BUZ90A	180p	MJ15023	400p	TIP35C	65p	LM723	40p	STR441	950p	TDA1518BQ	240p	TEA5101B	175p	UPC1488H	115p
BU2520DF	225p	BUZ90AF	280p	MJ15024	400p	TIP36C	65p	SAA1293	550p	STR44115	475p	TDA1557Q	300p	TEA5170	200p		
BU2525A	325p	BUZ91A	260p	MJ2501	100p	TIP41A	20p	SAB3035	275p	STR451	800p	TDA1558Q	300p	UC3842N	60p		
BU2525AF	220p	IRF510	70p	MJ2955	55p	TIP41C	22p	STK4131	480p	STR4512	400p	TDA2004	150p	UC3842AN	80p		
BU2525D	240p	IRF520	75p	MJE13007	100p	TIP42C	22p	STK4141 II	420p	STR50103A	260p	TDA2005	150p	UC3843	80p		
BU2527AF	400p	IRF530	75p	MJE13009	100p	TIPL791A	80p	STK4142	530p	STR54041	320p	TDA2030	80p				
BU426A	70p	IRF540	100p	MJE18004	125p	AN5151	200p	STK4151	680p	STR58041	250p	TDA2030H	100p				
BU508APH	60p	IRF610	80p	MJF18004	175p	AN5601K	750p	STK4152	650p	STR59041	300p	TDA3562A	260p				
BU508D	75p	IRF620	100p	MJF18006	200p	BA5406	180p	STK4171	900p	STR6020	270p	TDA3653B	80p				
BU508DF	85p	IRF630	75p	MJF18204	350p	BA6209	85p	STK4172 II	680p	STR61001	475p	TDA3653C	85p				
BU508V	110p	IRF640	150p	MJW16206	600p	HA13150A	1150p	STK4191	700p	STR81145	375p	TDA3654	80p				
BUF405A	200p	IRF710	150p	MJW16212	350p	HA13151	875p	STK4332	365p	STRD1706	360p	TDA4565	150p				
BUH1215	450p	IRF720	85p	S2000A3	175p	HA13152	800p	STK5331	300p	STRD1806	360p	TDA4600	200p				
BUH315	200p	IRF730	125p	S2000AF	90p	HA13153A	900p	STK5332	180p	STRD1816	350p	TDA4600 II	160p				
BUH315D	175p	IRF740	90p	S2000N	150p	HA13155	920p	STK5333	650p	STRD4420	550p	TDA4601	120p				
BUH515	200p	IRF820	90p	S2055A	175p	HA13157	950p	STK5337	500p	STRD6108	450p	TDA4605	190p				
BUH515D	250p	IRF830	85p	S2055AF	175p	LA4440	200p	STK5481	470p	STRS6707	1000p	TDA4950	100p				
BUH517	275p	IRF840	85p	S2055N	150p	LA4445	200p	STK5482	285p	STRS6708	575p	TDA8170	170p				
BUH517D	175p	IRF9610	95p	TIP121	35p	LA4460	120p	STK7341C	350p	STRS6709	600p	TDA8171	230p				
BUH715	425p	IRF9620	85p	TIP122	30p	LA4461	120p	STK7341C II	500p	STV9379	400p	TDA8172	200p				
BUT11A	35p	IRFBC30	120p	TIP125	30p	LA4705	400p	STK7348	400p	TA8207K	175p	TDA8350Q	275p				
BUT1AF	35p	IRFBC40	210p	TIP127	35p	LA7830	90p	STK73605	375p	TA8215	300p	TDA8362N3	1200p				
BUT12A	80p	IRFZ44	160p	TIP2955	50p	LA7851	200p	STK73907	700p	TA8221AH	600p	TEA1039	150p				
BUT12AF	90p	MJ11015	250p	TIP29A	22p	LM1207N	450p	STK7406	650p	TA8227	250p	TEA2018A	80p				
BUT18A	80p	MJ11016	300p	TIP3055	50p	LM2405T	625p	STK7563F	650p	TA8251AH	700p	TEA2037	200p				

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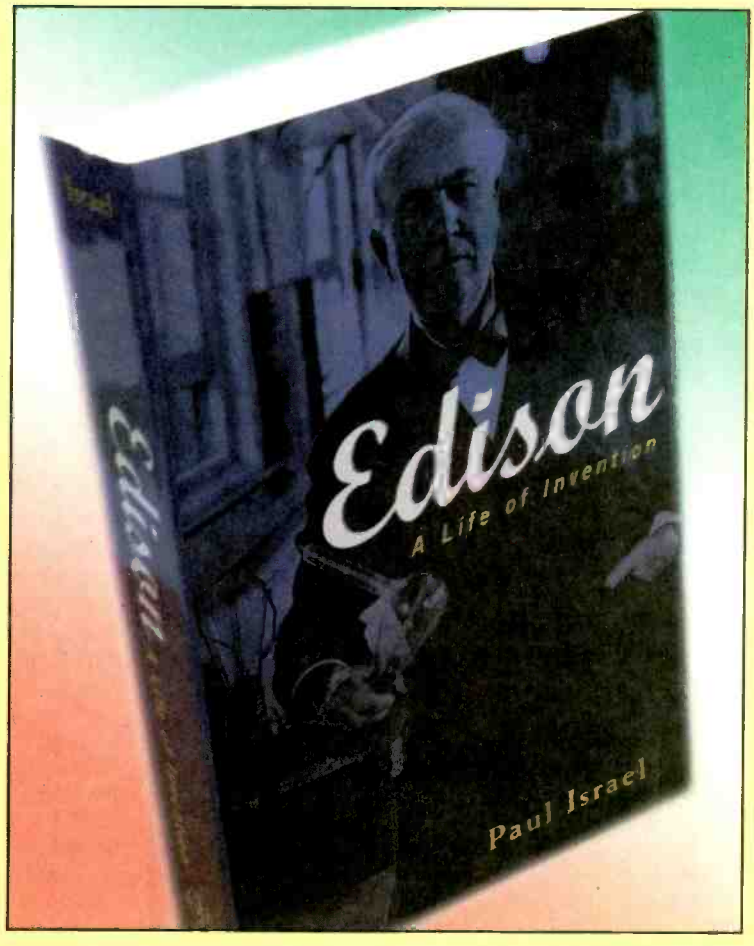

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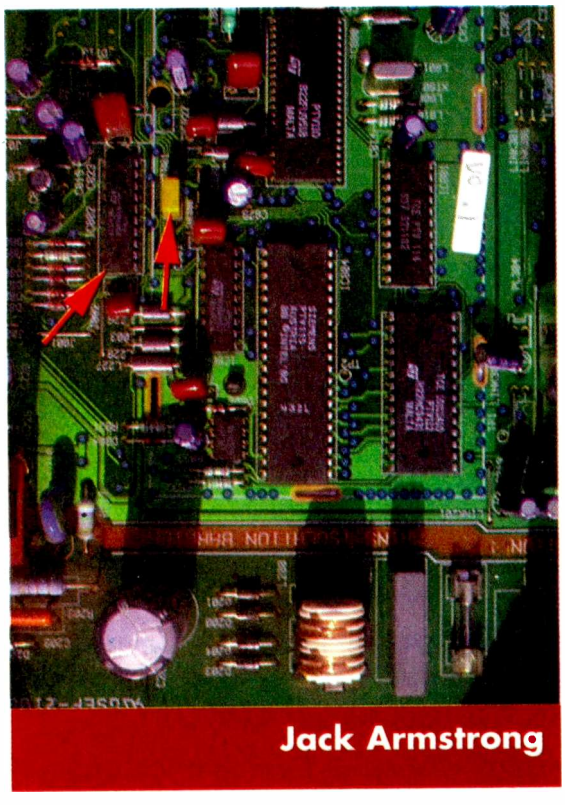
Satellite WORKSHOP



Jack Armstrong

Our heading photograph shows the 503kHz resonator and PTV111chip in the Minerva SAT5000

Minerva SAT5000

There was a call from the local Cricket Club.

"Got a problem wit' Sky".

"Yes. It always rains when there's a match, doesn't it? Do you want me to arrange a marquee?"

"No, no. It's t' Sky that's off. Well not exactly off, but you can't see it."

Using my wonderful powers of deduction, I guessed that he was talking about satellite TV.

"I'll pop round and take a look. Don't touch it."

A visit to the Cricket Club often brings a free drink, so I walked. It's only half a mile away.

When I arrived the pint was already on the counter, and I was ready for it. I really ought to walk more often.

The television set is a projection type, and the picture is always a bit 'washed out' on sunny days. But it was clear enough for me to see that there was no 'Please insert card' message. I switched off the mains power at the wall socket then switched it back on again. This action often resets the internal processor, but on this occasion it had no effect. The picture remained scrambled.

"Does pouring beer in it do any damage?"

"Yes. Give it to me in a glass instead."

"Oh dear. It 'appened last night. Archie got a bit excited watching t' match. 'is beer flew everywhere, mostly up there." He pointed at the self that supported the receiver.

We discussed it for a while, and I was given another drink. I finally headed back to the workshop with the Minerva SAT5000 (**Matsui RD600**) under my arm. It's all plastic and as light as a feather.

When I tested it I found that the decoder messages were still missing. I left it to cool while I did other work. Next morning it was working again, and continued to give clear pictures for an hour. Then they went off again. So I replaced the PTV111 sync-separator IC, using one from a scrap receiver. I also replaced the 503kHz ceramic resonator and the two electrolytics (1µF and 4·7µF) next to it. Two days later the receiver was still working, so I arranged to take it back.

Quite often it's the expensive PTV110 chip that fails. So the Cricket Club was lucky not to have a large invoice to pay.

Philips CTU900

The market has been flooded with these cheap French cable TV boxes purporting to be D2-MAC decoders. Indeed with only minor modifications they will work in this way satisfactorily with lots of different analogue satellite receivers, but not all. My advice is to "try it before you buy it": if it doesn't work with your own receiver, don't take it out of the shop.

My friend Jerry at the local TV repair shop has a CTU900 that's connected to his Pace MSS300 receiver. It had worked well for six months, but the display now consisted of narrow, vertical coloured lines except for some semblance of picture in a narrow strip down the right-hand edge.

"It's the codes again" he moaned.

I didn't think so. When the encryption codes change, the result is usually a scrambled picture that consists of *horizontal* coloured lines, not vertical ones. It looked as if the decoder was trying to reassemble the picture using the wrong algorithm.

"Try unplugging it for a few seconds" I suggested.

"It's the codes" he repeated, but nevertheless reached behind the CTU900 and pulled out the power plug. When he reconnected it there was a perfectly decoded picture.

"There!" I cried smugly. "It's like a computer: just needed a reset."

At that moment the picture briefly scrambled then reappeared. It continued to do this at intervals of a minute or less. The effect was random and was accompanied by occasional clicks. Sometimes the screen would go completely blank, but the audio would remain.

"Bad scart connection" I suggested.

"Can't be – the plugs are pushed in tightly" Jerry replied.

He looked at my expression and wiggled both scart plugs behind the CTU900 and the MSS300. The picture then remained stable.

"Shot myself in the foot there" I commented.

"Huh?"

"You'd have paid me to take it away and fix it. I'm too good to you. Where's that cup of tea?"

An Oyster

"Got problems with my Oyster" the man said.

I could barely make out his face, as his mobile home was right outside the shop window and blocked most of the light.

"Reckon you want Charlie the fishmonger" I replied, "he's just up the road."

"The Sky keeps dropping out" my visitor persisted, "just climb the ladder and have a look at it, will you?"

"I can see the sky from here thanks, and it looks just fine when your van isn't blocking the sun!"

"It's not a van! It's a mobile home, and it cost me sixty grand. The Oyster probably wasn't cheap either. Just climb the ladder and have a look at it."

I reluctantly went out to the back of the van and looked at the ladder. Would it really take my weight? The van's owner had most of my weight in his hand as he pushed me up it however. Once I was level with the roof I saw a white, circular object that looked like the trapdoor of a submarine. "I'll turn it on" came the voice from below.

As I teetered on the ladder the circular trapdoor suddenly swung open then rotated. It was a white satellite dish with the word 'Oyster' printed on its face in large letters.

When I went inside the van its owner explained that he had bought the entire mobile ensemble from the previous owner, who had had the satellite system installed by a specialist. The electronics consisted of an Amstrad SRD750F receiver, which is known in the trade as Chernobyl because of certain things that happen in the power supply, and something I'd never seen before called a 'Ten Haaft' receiver with 'Digital Audio'. The two had to be used in tandem to get a picture and sound. The Ten Haaft controlled the position of the Oyster dish, while the SRD750F accepted the analogue Sky card. When I pushed a few buttons everything seemed to work fine, though it was decidedly tricky to get the correct audio with the picture!

"It's all right now of course, but when I'm mobile the stupid dish goes up and down and round and round and can't seem to lock on" its owner said, "so the Sky keeps dropping in and out."

I pointed out that, clever though the dish controller might be, there was no way in which it could track a satellite when the signal was being blocked every few moments by buildings, trees and other obstructions. I recommended that he switch it off when he was on the move.

He accepted my explanation with some reluctance. As he drove off, the dish was still making itself dizzy as it searched for the Sky. I just hope that he will be a thousand miles away when the analogue Sky transmissions are switched off in favour of digital.

Random Channel Changing

I received an e-mail from Germany as follows: my Pace MSS1000 receiver changes channels every twenty-thirty seconds by itself, on a random basis.

This is a known fault, though not a common one. I replied telling the owner to give the rotary switch a couple of turns. The early version tends to stop with its contacts in an open position: when this happens interference reaches the microcontroller chip.

The complete solution is to fit the later switch (146-0002421) and the socket to match (161-1020310). You can get a similar problem with the infra-red receiver (replace with type 215-1910521) or because of faulty capacitors (fit the items in Relkit 10).

[redacted]

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 L302, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS. Please enclose two first-class stamps. envelopes.

Test Case 451

Mr Fisher was one of our more prosperous customers, with a rented TV set, VCR and DVD player. I say was rather than is because one bright day we got a call to collect all the rental gear, terminate the contracts and repair an Hitachi TV set. It seems that he had had some sort of trouble with his investments (dot-com companies?) and was now in straightened circumstances.

Doc Colin carefully loaded all the posh gear, widescreen TV and all, into the van then turned his attention to the Hitachi set, a seven-year old Model C2114R which had for a long time been stored in a spare room. When he switched the set on it produced a sort of strangled squeak then shut down. The set was added to the rest of the gear in the van, and Mr Fisher was lent a somewhat tatty 14in. portable TV. He also had to pay £40 up-front for this call-and-collect service: it safeguards us if, for any reason, the repair is not completed.

Because of holidays the workshop was, as usual at this time of year, short-staffed. Sage was there but Television Ted, our real TV expert, was away. The set went on to Cathode Ray's bench and the back was soon off. Ray figured that the 'one-squeak' effect meant that the protection circuit was cutting in, so he spent some time checking the semiconductor devices in the power supply for shorts or leaks. None could be found, and there were none in the line output stage either. The last TV repair job Ray had done involved a short-circuit field output IC. That set had also refused to come on. So he disconnected the 27V supply to the field output chip, IC601, and tried again. There was no difference!

Ray dragged Sage away from a delicate operation on a Pioneer DVD player to ask his advice. Sage's view was that if a protection circuit was being triggered the cause was unlikely to be excessive current. You wouldn't normally get a squeak in that situation, he felt. His advice to Ray was to hook a scope to the power supply's HT output and watch the display carefully at the moment of switch on.

The scope showed that the HT, which should be at 112V, rose rapidly to 130V then collapsed to zero. The HT pulse coincided with the squeak, which probably came from either the chopper or the line output transformer. Now we were getting somewhere! The result of this test was reported to Sage who, after a look at the circuit diagram, made some further suggestions. The cause of the trouble was then soon tracked down. What was it? Certainly not an expensive or complex component, and the problem *was* in the power supply.

Once he'd got the power supply working Ray discovered that there was another problem, possibly caused by the set's long period of storage. It was to do with the field scanning. At switch on from cold there was reduced height, with a strange jittering, weaving effect on the scan lines. The picture gradually got better as the set continued to run, and after an hour or so was almost normal. Once again the scope was brought into play alongside, this time, a can of freezer spray and a hairdry-

The Sony International Service Contest 2000

Richard Flowerday, G3ZHH, again reached the Tokyo finals of the revived Sony International Service Contest. In the following account he describes the background and the contest itself, some highlights of the visit to Japan, and comments on his approach to speedy fault-finding

Sony's biennial International Service Contest was first held some twenty years ago. It was originally started "to promote technical excellence in engineering by competition". Six areas of the world and over forty countries were involved. Technicians who were successful in the qualifying rounds, held in their own countries, would travel to the Sony HQ in Tokyo, where they would compete with the best technicians from the rest of the world. The prize, apart from a few days in Japan, was a Gold, Silver or Bronze award in each of three categories, TV, Video and Audio.

The International Contest was discontinued when the Gulf War started. It didn't however stop each country or area of the world from holding events every two years – for example the European Service Contest.

The European Service Contest

In the UK, the ESC normally begins early in the year with a mail-shot. This is nothing more than an informal ten-question, tick-box paper designed to generate interest. Those who answer the questions correctly are invited to a Regional Final, where they sit a more formal and much harder examination. Successful candidates go forward to their country's final, which involves a practical fault-finding test in their chosen speciality, TV, Video or Audio. Each country's final also has separate categories that distinguish between Sony-employed technicians and those who work for independent Sony Authorised Service Centres.

My own involvement began in 1993 when, for a bit of fun, I filled in and returned a tick-box mail-shot. I then forgot about it, and was surprised to learn that I had been invited to the Regional Final. I was even more surprised to reach the UK final, where I had to repair three specific faults on a domestic VHS VCR faster than anyone else in my category. Taking only twenty seven minutes of the two hours allowed, I secured a place in the European Final held in Amsterdam that year, where I won my first European Gold Medal.

Medal winners do not have to re-qualify for the following contest, so in 1995 I found myself invited to take part in the UK Final without having to sit the Regional Final's test paper. Despite a change in category to TV rather than video, I won the UK event and was flown to Milan for the European Final, where I again won the Gold.

The result of the 1997 Contest, also held in Milan, was the same. This was record-breaking stuff – to my knowledge, no other European technician has won three Gold Medals in three successive contests, competing against technicians whose skills are also par excellence.

Back to the International

Last year's European contest was postponed until 2001. Meanwhile Sony, as part of its Millennium celebrations, decided to resurrect the International Service Contest, which took place recently. Because there was no time to hold national qualifying rounds, this time the 62 competitors from over forty countries were those who had won prizes at previous events.

Bharat Parmar, 1997 ESC Bronze Medal winner and camcorder technician from Sony's Heathrow Depot, and myself were chosen by Sony UK to represent Britain as part of the European team at the event, joining the other nine jet-lagged members of the team in Tokyo on February 21st. There were four categories in the event, TV, VCR, audio and camcorder, with no distinction between Sony and SAC technicians.

The competitions took place on February 23rd and 24th. Bharat's was at 09.15 on the 24th, mine at 13.45 on the 23rd. Since Japanese time is nine hours ahead of GMT, Bharat's contest started at 00.15 and mine at 04.45 British time. We were concerned about the effects of jet lag, but this was not as bad as we had feared.

The Contest

Bharat was given two hours to mend three faults on Sony's latest digital camcorder, the NTSC Model DCR-TRV10. The first fault confused several contestants, including Bharat, because it was intermittent. In an effort to remove the take-up FG pulses, the organisers had mechanically disconnected the magnet under the take-up turntable, so that the turntable didn't rotate with the spool. But more often than not it did! Despite this, Bharat was able to repair the camcorder in the time allowed. But neither he nor anyone else was a match for the Japanese contestants, who took places 1, 2 and 3 in this category.

My machine was a Sony SLV-ED70MJ, which is very similar to the UK Model SLV-730UX but far easier to work on when taken apart. The first fault was straightforward, the 'dead' symptom being cured by replacing an open-circuit coil (L301) in the 12V output from the power supply. The second fault was a bit more tricky. The VCR would accept a tape only with difficulty, and then wouldn't play it. There was a clue: with the light from the cassette LED blocked, the voltage across the start sensor was the full 5V while the voltage across the end sensor was only 1·5V. I naturally suspected its surface-mounted pull-up resistor R103 and, when I eventually found it on the PCB, its value turned out to be 820kΩ instead of 33kΩ. Devious, or what?

Then disaster struck. When I powered the machine after replacing R103 the drum rotated at top speed. The machine then shut down, with an error code that indicated lack of drum FG pulses in the display. A quick check at the microcontroller chip showed that the pulses were of the correct amplitude, though the frequency was obviously too high. I deduced that the microcontroller chip was faulty, and that it had probably been damaged by static from the unearthed soldering iron (nothing in Japan appears to be earthed, and they don't use isolating transformers) or by the voltage applied by the ohmmeter battery in the cheapo analogue meter we had to use. I replaced the chip and then set about finding the cause of the last fault, no E-E or playback video output via line or at RF.

The fact that there was, in addition, no on-screen display narrowed the fault area considerably. Q901, a surface-mounted buffer transistor that feeds the video signal to the RF modulator and the line output, was the culprit. There was a 1V peak-to-peak video signal at its base but nothing at its emitter. One of those double-diode things had been fitted in its place!

Of the fourteen video contestants I was the fourth to leave the room, some ten minutes after my European colleague Manuel Copeto from Sony Portugal. Despite the problem I'd had, with its time wasting, I won a Bronze Award. Manuel, whose score was the same as mine, also got a Bronze. Sven Urban from Sony Germany won the Gold in the audio contest, so three awards went to Europeans. This was as good as any other continent. I still wonder what might have happened if my VCR had not gone wrong . . .

The winner was Wu Szu-Yi from Synvision Corporation of Japan, followed by Anthony Boronczyk from Sony USA. Wu is a walking directory of part numbers – one wonders what he does with the rest of his life!

The Visit

As the contest took only two days of the week we were there, we had quite a lot of time to ourselves. For the electronics or photographic enthusiast, radio amateur or computer whizz-kid, a visit to Akihabara is a must. It's a suburb of Tokyo in which literally thousands of electronics shops are crammed in an area of less than a square mile. Bharat and I spent most of the Tuesday afternoon there, being quite astounded by the range of products on sale and the absurdly low prices compared to the UK. You could for example buy a DVD player for less than £100, a digital camcorder for £250 and a GPS in-car navigation system with TFT screen and DVD-ROM drive for around £400.

Friday morning saw us at Media World, an exhibition of current AV products that reflect Sony's involvement in digital technology. Highlights include an integrated TV studio set complete with ENG equipment and a digital control room, a 32in. widescreen Plasmatron monitor only two inches deep, and an excellent demonstration of stereoscopic high-definition TV using projection and a 170in. screen. With the exception of the tour guide, everyone ducked when a kingfisher flew towards the camera!

That afternoon we visited Sony's Kisarazu factory where over 2,500 people are employed, mainly producing the new PlayStation 2. It takes under half an hour to turn a bare PCB into a tested and working module. I found it fascinating to watch the component-insertion machines mount eight plus surface-mounted devices a second on the boards, including some massive PLCC processor chips.

The following day a small group of us decided to visit the less Westernised, more traditional city of Kyoto, taking the Bullet Train from Tokyo Central station. This trip was incredible: despite two stops and a fairly slow run out of Tokyo, it took just 135 minutes to cover the 273 miles, an average speed of 121 m.p.h. While there we took a coach tour of the many religious sites that surround Kyoto. Some of the Bhuddist temples and pagodas date back to the eleventh century. Unfortunately it was the wrong time of the year to see the full beauty of the gardens at these sites: we could only imagine how they would have looked in full bloom.

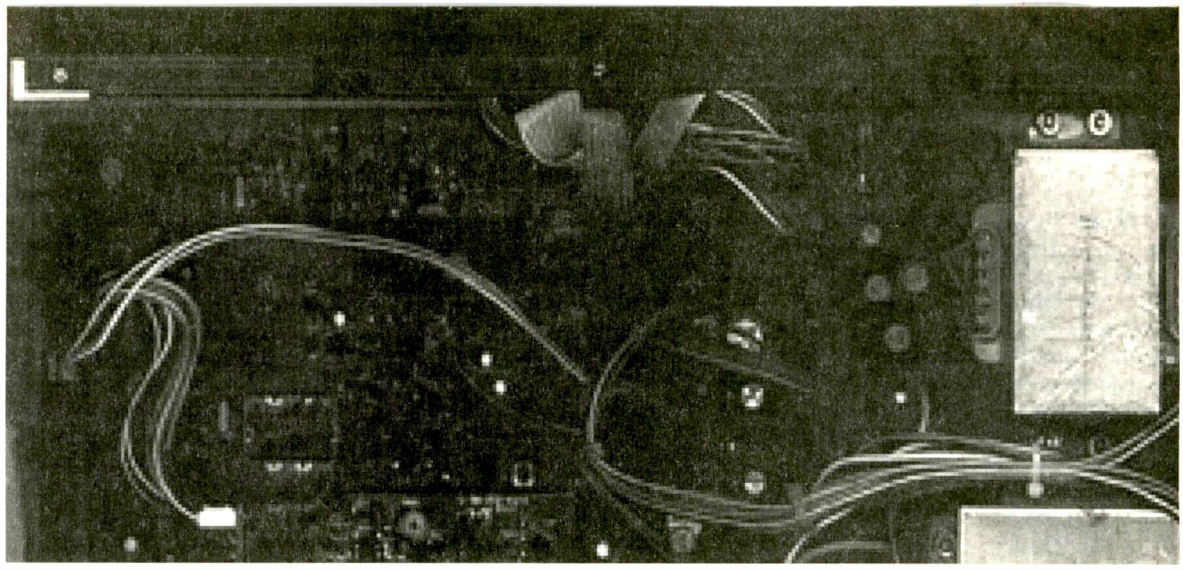
Sunday saw our return home, courtesy of a Japanese Airlines Boeing 747. The thirteen hours spent in this aircraft were a total anticlimax after the previous few days, though the films, food and drink were excellent. After a final trip up the M40 I was home, where I could have some decent beer!

Fault-finding at Speed

Many technicians, other contestants and even some customers have asked me how I can find faults in contest products in what seems to be double-quick time. I put it down to experience, to product and circuit knowedge, and to my belief that fault-finding is a creative art as well as a science, involving method and skill. The ability to think laterally when fault-finding is essential. Perhaps it's because I have never attended a college course in radio and TV servicing, and have no qualifications other than Granada's Tech. IVE, that I can do this. Add to it a near photographic memory for circuit diagrams and some experience as an instructor, particularly in introducing faults on products for practical training sessions, and you might have an answer.

Acknowledgements

Thanks are due to Werner Ziemann, of Sony's European HQ, for putting the team together, and to Chris James and David Meyer at Sony UK for organising and supporting the UK effort. We'll try to do better next time!



Satellite Notebook

Reports from Hugh Cocks and Christopher Holland

Uniden UST7007

These analogue receivers are now about ten years old. The one we were called to see is used by its Dutch owner mainly for reception of the analogue Eurosport and German stations from Astra at 19·2°E. He also has a digital receiver to pick up the Dutch package from this orbital position. At present Eurosport is not available in the package or as a free-to-air digital signal. While most of the FTA German channels can be received via the digital box, they are difficult to select. So the customer prefers to stick with their analogue counterparts as long as possible.

The problem with this receiver was no video or audio output, though the channel number was present in the front-panel display. I noticed that the usual reassuring click from the relay on the power-supply board did not occur when the receiver was switched on, which suggested that there was a fault on this board. The fuses on the board were all intact, so I removed the bottom panel to gain access to the other side of the PCB. The cause of the problem was then immediately obvious: there was a poor soldered contact between one of the pins of the output socket and the associated PCB track.

I resoldered all poor-looking contacts and cleaned the power output plug/socket assembly, whose pins were a bit tarnished. After that the receiver behaved perfectly.

I've had only three faults with this model. First, dry-joints in the power supply. Secondly the small electrolytic capacitors in the tuner dry up. This gives rise to various video problems. Repair involves removal of the tuner's F socket chassis securing nut. In the process of undoing this the socket normally parts company with the tuner PCB. The final fault is when the non-rechargeable memory battery that's soldered to the main PCB comes to the end of its life. The receiver will then forget all channel settings after a power cut. **H.C.**

Digibox Channel Changing

Mr Aspen's SkyDigital satellite system had been working well since it was installed a couple of months ago. But one evening the digibox started to change channels at random by itself! During our phone conversation I asked him to remove the box's remote control unit from the room in case it was transmitting random signals to the box. I also got him to unplug the digibox from the mains supply, wait a brief period, then reconnect it to see if this cured the fault. There was no random channel changing after doing this, but Mr Aspen was back on the phone within the hour to report that his Pace digibox was once again changing channels by itself.

When I called I found that the receiver was behaving perfectly. It would change channels normally, using either the remote control unit or the front panel buttons. There was no remote-control extension 'mouse' connected to the second RF output socket, but I noticed a Powermid remote-control extender receiver in the living room: it was plugged into the mains supply and was pointing at the digibox. Rather mysteriously, a Powermid infra-red transmitter was not used in the house.

I decided to remove the Powermid receiver from the scene of the crime as a possible source of spurious infra-red signals. For good measure I unplugged the digibox from the mains supply, pressed the backup button, and reapplied mains power. This installs new operating software in the receiver – it takes about ten minutes. Since then the receiver has behaved correctly, with no more random channel changes. **C.H.**

Dish Stabilisation

The problem with a Dutch satellite TV installation to which we were called recently was "no signal". The dish was on the roof of a ten-story block of flats in a relatively windy location near the sea front. The digital satellite receiver was in a flat on the second floor.

We soon discovered the cause of the problem: the solid 1m offset dish wasn't pointing at the Astra 19·2°E position. Because of metal-fatigue cracks, there was play in the dish-mounting bracket. I put it down to the effect of high winds and salty sea air. Replacement of the dish and the mounting bracket is a simple matter, but I was concerned about a possible repeat performance.

A simple solution, after reinstalling the dish with a new bracket, was to drill two holes in the side rim of the dish in order to guy the dish in position – using stout galvanised wire. The two guy wires were fixed at suitable points to the rear of the dish. This would prevent any oscillation of the dish assembly during high winds and keep the dish in the correct position.

When this is done it's important to avoid excessive stabiliser wire tension. Too much tension could cause dish surface distortion with, as a result, reduced gain. I found that the easiest approach was to put one wire slightly under tension to pull the dish fractionally off-beam then, with the dish alignment meter connected, tighten the other wire to

bring the dish back to its correct position. The result was a very rigid assembly that should be able to withstand the high winds without problems. **H.C.**

SkyDigital Additions

The channels listed in Table 1 have been added to the SkyDigital package since the listing in the April issue. The Sky electronic programme guide (EPG) number is given in brackets after the channel name. **C.H.**

Table 1: Additional SkyDigital channels.

*Frequency**	*Pol*	*Channel*
12·032 (17)†	H	Ideal World (642), Bollywood 4U Music (668).
12·110 (21)	H	Pin (639), World Radio Network (937), United Christian Broadcasting (currently testing, not in EPG yet).
12·324 (32)	V	Premier (938), Heart (939), Sky News Radio‡.
12·363 (34)	V	Hallmark (190)

* Frequency in GHz. Transponder number on brackets.
† Transponder 17 is transmitted via Astra 1D.
‡ Sky News Radio is a feed signal for participating radio stations. The channel is not listed in the EPG but can be stored by the digibox as an extra channel. It's encrypted however, and is not available using a standard SkyDigital subscription card.

SkyDigital EPG Changes

A number of our customers were confused by the recent SkyDigital electronic programme guide changes – moving the Discovery package and other channels that were in the 531-553 range up twenty to 551-573, and MTV/VH1 from around 640 to 440. When the familiar channel numbers were entered the viewer got the red "channel unavailable" message. Perhaps in future Sky could provide a "channel moved to" message for a limited period of time, somewhat like the 'ITV' 103 advice, whenever an 'old' channel number is entered. This would enable viewers to become familiar with new numbers.

A remote-control unit last-channel recall button would also be a handy feature. Such a button was often provided with analogue receivers to provide quick zapping between two channels when, for example, waiting for a programme to start.

The TV guide confuses some new viewers when they move ahead of the current time slot and press the 'select' button in order to view the programme. Naturally enough nothing happens, as the programme has not started. Newcomers are, I've found, confused because it says "choose title and press select" at the bottom of the screen. It would make life easier if a "help" message came up when the 'select' button is pressed, to tell the user that programme viewing isn't possible yet, rather than there being no response as at present. **C.H.**

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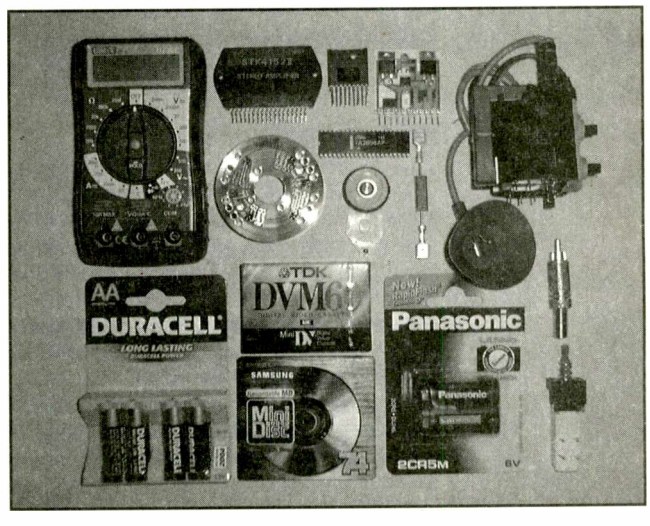

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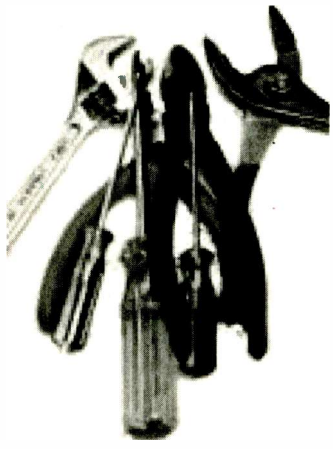

John Edwards' Casebook

JVC AV29SX1EK (JA chassis)

The top half of the raster was missing. The first thing I noticed while removing the back cover was how flimsy the plastic cabinet was, considering the weight of the set. With the cover removed the heavy tube rocked to and fro precariously. I tilted the set forwards, placed a large cushion between the tube face and the wall, then inserted a book beneath the cabinet. This seemed to stabilise the chassis.

The TDA8350Q field output chip IC401 has two supply pins, 4 and 8. There should be 14·5V at pin 4 and 42V at pin 8 – both supplies are derived from the line output transformer. Checks at these pins showed that there was only 16V at pin 8, because the surge-limiter resistor in this supply was open-circuit. It's FR553 (5·6Ω, 0·5W). I fitted a replacement and switched on confidently. To my disbelief there was then complete field collapse! As luck would have it I had an identical IC in a scrap chassis. Once this had been fitted there was full scanning. Knowing when to accept good fortune, I resisted the temptation to investigate further and settled for a job done. The worst part was several attempts at reuniting the very large, thin and wobbly back cover with a forever moving front cabinet!

Matsui 1455

This model is fitted with one of the infamous Onwa chassis. The problems are mainly in the power supply, but affect other circuits – especially when the HT voltage increases because of defective regulation. This time there was the classic field collapse. R310 (10Ω, 0·5W) was open-circuit, so there was no supply to the field output stage. And as the 12V zener diode D219 was short-circuit there was no supply to the 6501 colour decoder/timebase generator chip IC202.

I explained to the customer that this was a common problem, and from that moment on he stood close behind me looking over my shoulder to watch my every move. I would have liked to have fitted the power supply repair kit that's available from most component distributors. But the customer wanted a cheap repair, now. So in went a new resistor, zener diode and replacements for the two electrolytic capacitors that are the usual cause of unstable power supply operation – C606 (10μF) and C607 (47μF). The former is the reservoir capacitor for the supply to the voltage error-sensing stage, the latter being the chopper transistor's base drive coupling capacitor.

The whole operation took about twenty five minutes, from putting the faulty set on the bench to taking measurements, carrying out the repairs and a check on the results. I charged £25, at which point the customer scooped up the four original components, slipped them into one of his pockets and announced "now I know what to buy in future – I bet these cost all of a quid". He then mumbled something, probably not very flattering, paid me and departed.

Hitachi C1714T

This set was stuck in standby with no other signs of life. I've had failure of the TA8427K field output chip in these sets before, so this seemed to be a good place to start. Sure enough when I disconnected the supply to it, by unsoldering the anode of D702, the set came to life with field collapse. In with a new chip then. Once this operation had been completed and D702 had been reconnected I confidently switched on.

Oh dear. The standby mode again. Once again the set sprang to life with field collapse when I disconnected the diode. At last I behaved like a proper engineer and checked the diode.

Yes, it was short-circuit. Well, we all get off days, don't we?!

CTX1451CLR Monitor

I take on monitor repairs only when I think I have a good chance of success without having to obtain a circuit diagram or specific parts, which can be well-nigh impossible to get. Sometimes I'm lucky, sometimes not. I took this monitor on because the symptom, a 'yellow' picture, seemed to be a classic case of a dry-joint somewhere on the tube base panel.

I started by examining the RGB output transistors, which were all properly soldered. I had no more success with the rest of the board. Gentle tapping had no effect either. So out came the meter, scope and pattern generator.

There were correct inputs at the M51387P video processor chip IC601, but one of the three output waveforms was of very low amplitude in comparison to the other two. I next discovered that each colour has its own preset gain control. The one connected to pin 4 of the chip had no effect. At last a clue! The voltage at the slider of this preset control was only 0·5V, compared to 5V with the other two. What could be dragging the voltage down? The chip was obviously a suspect, but the cause was fortunately a simpler one. Pin 4 is decoupled by an 0·01μF capacitor, C604. I snipped one of its legs and switched the monitor on. The result was a perfect display. When I checked C604 I found that it had a 2kΩ leak.

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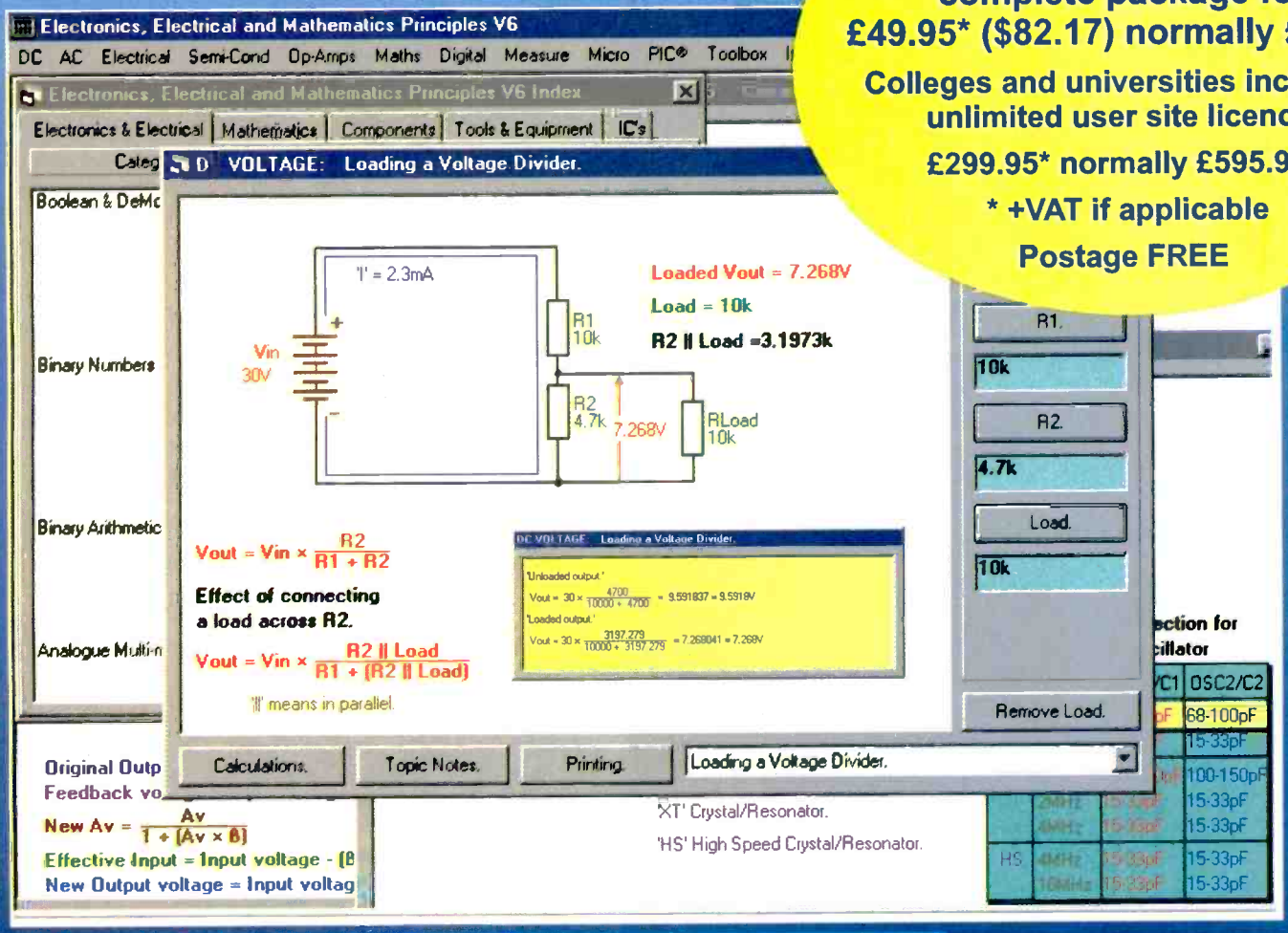

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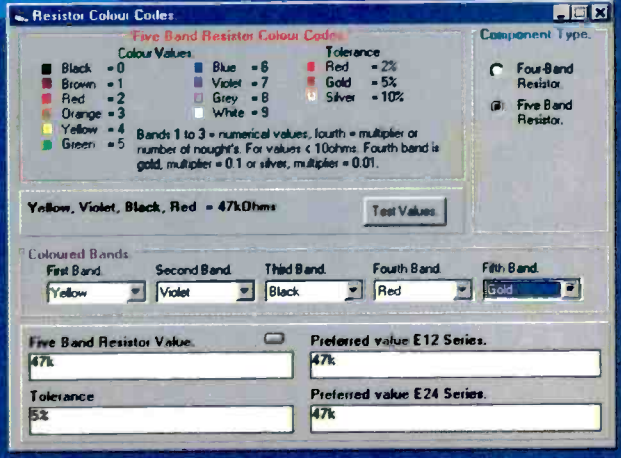
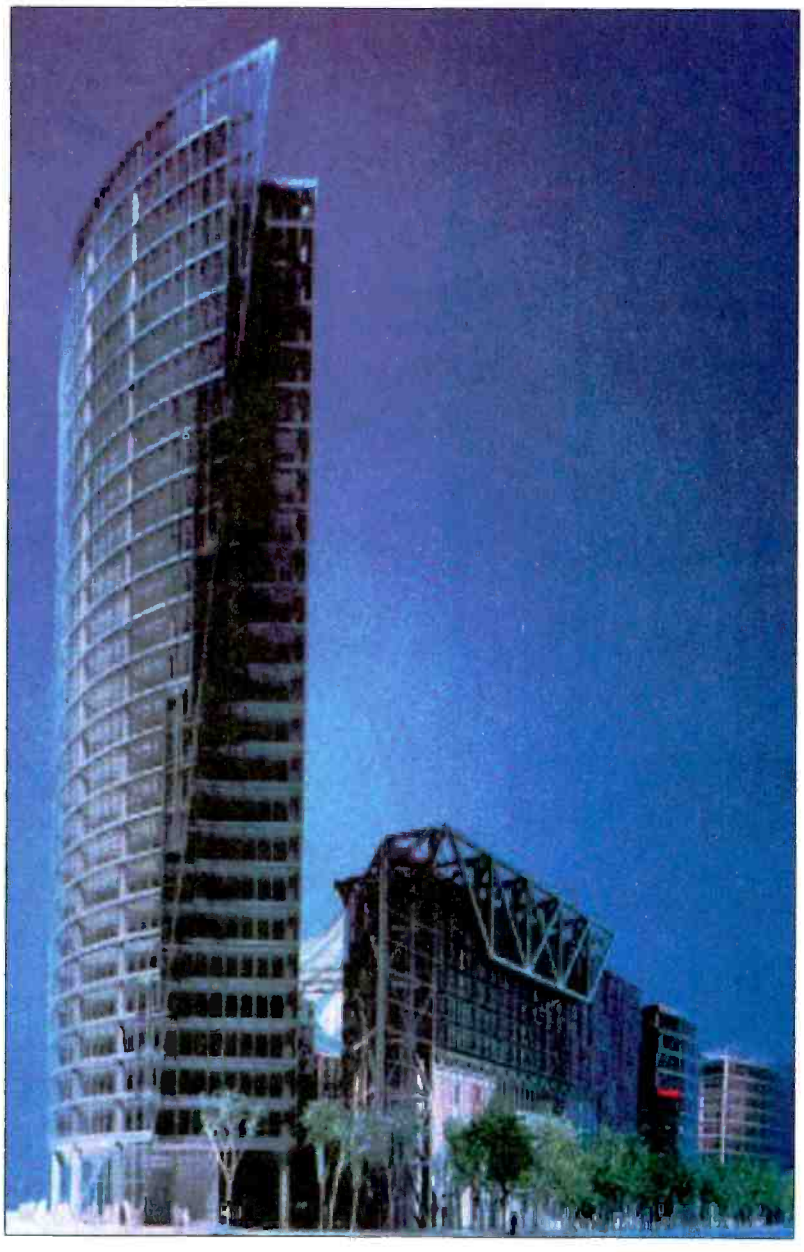




Always at the forefront of consumer electronics technology, Sony took the opportunity of the opening of its new European headquarters to show and demonstrate its latest systems and products. George Cole was there to assess the new innovations

At the Sony Center

Sony recently invited a group of technical journalists to visit its new European headquarters, The Sony Center, at Potsdamer Platz, Berlin. There are seven buildings with a floor space of almost 133,000 square metres. The Center includes offices, flats, shops, restaurants, an IMAX 3D cinema and an entertainment area. During our visit we saw many new products and heard about Sony's plans for the future. The company sees great change taking place in the consumer electronics market, with the internet and broadband signal connections to homes, for example via cable modems and ADSL digital telephone lines, playing a central role in the way in which the market is developing.

Sony has formed an eManagement Committee, set up a NetBank with Sakura Bank and J.P. Morgan, and is selling products on-line. Equipment such as digital set-top boxes, mobile phones, VAIO computers and PlayStation 2 will provide domestic internet gateways. But the company continues to develop traditional consumer electronics products such as TV sets, VCRs and audio CD players.

Television: DRC-MF

Digital signal processing has long been used to enhance picture quality, for example by reducing noise or removing flicker. Sony's Digital Reality Creation Multifunction (DRC-MF) technology is the latest development in this area. It uses a proprietary signal-processing algorithm that Sony says increases picture resolution by up to four times, effectively creating near-HDTV pictures from a standard-definition picture source.

DRC-MF is designed to work with all types of signal: analogue and digital, and live or recorded broadcasts. Conventional digital picture-enhancement systems increase the resolution by using motion-adaptive linear interpolation (see Fig. 1, top) based on filtering theory to increase the number of pixels or the field frequency. DRC-MF on the other hand maps out a high-definition signal from the standard-picture signal. Sony claims that this improves the picture quality and produces moving pictures that are smoother and more natural.

There are two, switchable modes with a TV set that incorporates DRC-MF: DRC50 and DRC100 (see Fig. 2). In the former the field frequency remains at 50Hz but the number of scanning lines is doubled, from 625 to 1,250. The mapping also increases the number of pixels per line from 720 to 1,440. As a result, the resolution is increased by a factor of four. In the DRC100 mode the field frequency is doubled to 100Hz and the number of pixels per line is doubled to 1,440, but the number of scanning lines per field remains at 625. Resolution is thus increased by a factor of two.

With DRC50 there is spatial display creation: the number of pixels is doubled horizontally and vertically. With DRC100 there is temporal display creation as a result of the horizontally and temporally doubled pixel count. The two modes are designed to cater for different types of material. DRC50 works best with pictures that have little movement, such as a static, talking head, while DRC100 provides high resolution with realistic motion.

Sony has already incorporated its DRC-MF technology in a range of TV sets that include Model KV36FS70, a 36in. 16:9 receiver which has two tuners, a 500-page text memory, auto 14:9/16:9 switching, Dolby Pro-Logic and three scart sockets. Three other sets in the current range (KV32FQ75, KV29FQ75 and KV28FQ75) feature DRC-MF, which is also used in a number of projection TV receivers (KP61PSI, KP53PS1 and KP48PS1). In each case the number indicates the screen size in inches.

How does DRC-MF look? I was a little concerned that the viewer cannot switch DRC-MF off, as digital signal processing can sometimes make certain material look worse. Sony says that the system has been tested under a wide range of conditions however and that no problems have been encountered. The material we were shown had been shot using an HDTV camera and then transferred to a DVD – there were no live broadcasts. The demonstration was impressive, with pictures that appeared clearer, cleaner and sharper in comparison with displays produced by sets without DRC-MF.

Since Sony first unveiled its DRC-MF technology a number of specialist video magazines have tested the TV sets under 'real-world' conditions. The verdict on DRC-MF has been very positive.

DVD

In a presentation on DVD Sony highlighted the success of the new format, which was launched in Europe in 1998. 340,000 units were bought during the first year and 1·5m units in the second year. This year 4m players are expected to be sold, with the forecast for next year eight million. In comparison, CD player sales were 90,000 in the first year, 260,000 in the second year, 770,000 in the third year and 1·6m in the fourth year. During the first four years LaserDisc players sold 20,000, 30,000, 50,000 and 90,000 units respectively. Sony's DVD-SF35D player includes a digital video enhancer system that enables the user to adjust the sharpness of the image outline and a digital video equaliser that can be used to adjust the picture contrast and colour. It provides multi-channel DTS decoding, and virtual surround-sound and component video outputs.

There were two portable DVD players, Models DVP-FX1 and DVP-F5. The former has a 7in. LCD screen while the latter is designed to be connected to an external TV set or monitor. While the FX1 provides up to four hours of playback time when battery powered the F5 provides twice this time, which does bring out how much power an LCD screen consumes.

A novel product was the Glasstron Lite PLM-A35E, which is designed as a 'private theatre'. It consists of a pair of glasses, with a 180,000-pixel LCD screen, that aims to create the illusion of watching a 52in. image two metres away. I tried them on and have to confess that I didn't see anything like that!

One thing that was missing was recordable DVD. To recap on this topic, while most major hardware manufacturers have opted for DVD-RAM or DVD-RW, Sony and Philips support another format, DVD+RW. However while Philips plans to launch DVD+RW machines for domestic video use Sony says it will use the format for PC applications. Asked what were Sony's plans in this field, the video product manager replied that Sony felt the existing rewritable DVD formats were not adequate for home video recording and that the company was developing alternative systems. These are understood to use blue laser technology to provide longer recording times.

VCRs

Although DVD is now an established format, Sony expects DVD and VHS to coexist for some time. Evidence from the US market seems to support this view. It is clear however that we are unlikely to see any great advances in technological development in the VCR field. Sony is concentrating on ease of use, and showed its SmartTimer technology. This uses a dial to set the timer quickly and easily. With just a few press-and-twists of the dial, the user can set the start and stop times and the channel number. Sony claims that this can all be done in less than ten seconds – a Sony rep proved the point! Note however that this does not include setting the tape speed or PDC control.

The Sony SCD-XB940 SACD player, which is due for release later this year.

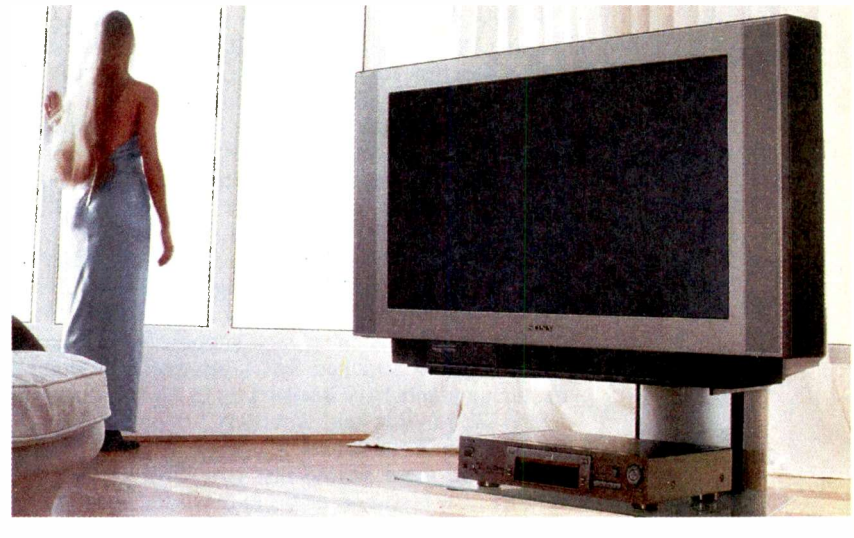
Sony also displayed its SmartFile tape library system, which stores recording information on an IC sealed inside a cassette label.

Camcorders

Camcorders have become smaller, lighter and smarter over the years. At Berlin we were shown what Sony claims is the world's smallest camcorder. The presentation began with a look at how Sony camcorders have decreased in size and weight over the years. The CCD-TRV10 weighed 650g and had a bulk of 590cc. Next the DRC-PC7 had figures of 500g and 500cc, while the DRC-PC1was 450g/380cc. Sony has now developed what is at present known as the "DCR-PCNew". It's a MiniDV camcorder that also incorporates a Memory Stick system to enable digital still images to be stored.

Camcorder engineer Katsuaki Otsubo explained how the latest miniaturisation has been achieved. A new LSI system has enabled four video and audio signal processing chips to be combined in a single one. Chip capacitors and resistors have been reduced from the standard 1005 size (1 x 0·5mm) to a new 0603 size (0·6 x 0·3mm). An eight-layer, high-density PCB is used, the main board being fifty per cent smaller than that in the DRC-PC3. There is also a new tape path system.

We were able to handle the DCR-PCNew, which is cer-



The Sony CTV Model KV36FS70, which has a 36in. 16:9 display and incorporates DRC-MF technology.

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tainly very compact and light. I asked whether there might be problems when it came to servicing and repair, but Katsuaki Otsubo said this wouldn't be the case. As to whether camcorders could become even smaller, the feeling was that we are approaching the limits of miniaturisation: ultimately, the size of the MiniDV cassette determines how small you can get.

Super Audio CD

Sony and Philips have also gone out on a limb when it comes to the next generation of audio discs. Although the two companies were part of the working group that helped develop DVD-Audio, Sony and Philips have developed the alternative Super Audio CD (SACD) format. Whereas the audio CD and DVD-Audio use PCM (pulse-code modulation) technology, SACD uses a system known as Direct Stream Digital (DSD). It uses a 2·8224MHz sampling frequency, with the 1-bit signal directly recorded. This is claimed to provide better quality audio than PCM. The SACD system has a theoretical frequency response of up to 100kHz and a dynamic range of over 120dB. SACD players are designed to be able to play audio CDs as well. The format makes use of hybrid disc technology to enable SACD discs to be played by standard audio CD machines.

Hybrid discs use a dual-layer system, with one layer storing PCM audio (for CD players) and the second DSD data for SACD machines. Sony was asked to comment on suggestions that as many as one in three standard audio CD players are unable to read hybrid discs. The reply was that about half the SACD titles on the market (about 100) are hybrid discs, and that there have been no reports of player compatibility problems.

The SACD presentation was made by Jeffry van Ede, senior manager, marketing for hi-fi in Europe. He had much to say on the format's evolution. Fifteen hardware manufacturers now support SACD, and six of them have launched SACD products. Disc manufacturing plants have been set up in Japan, Europe and the USA. Mr Ede said that Sony has adopted a three-stage strategy for SACD.

The first phase started last year with the launch of SACD as a high-end audio enthusiasts' format. With the launch of the SCD-XB940 model this year SACD will be aimed at a wider audience – it will cost about a quarter of the price of the first SACD model. Next year, with the launch of multi-channel SACD titles and lower-priced products, also SACD in-car systems, hi-fi systems and Universal Players, SACD will be aimed at a mass audience. Universal Players will be able to play SACD, DVD-Audio and DVD-Video discs.

LISSA

All MiniDV camcorders have an IEEE1394 digital signal output socket. Sony also uses the socket, which it refers to as an iLink connector, with some of its VAIO portable computers. We were shown the world's first hi-fi system to use iLink connection. It's known as LISSA (iLink Interface Stylish Slim Advanced technology!) and Sony is planning a launch for this August. The iLink is a high-speed (data rate 200Mbits/sec), bidirectional digital connector that enables audio data to travel in one direction while control signals are being sent between devices in the other direction.

LISSA consists of the STR-LSA1 stereo receiver (with 2 x 50W), the CDP-LSA1 CD player and MDS-LSA1 MiniDisc player. The system, which includes front speakers and a sub-woofer (140W), will sell for about £1,450.

The iLink can also be used for carrying video and computer data, and LISSA will come with an optional PC kit that enables users to play music downloaded from the internet. According to Sony copy protection systems are still being discussed.

LISSA also uses a new technology, HATS (High-quality digital Audio Transmission System), that employs a buffer in the stereo receiver to synchronise audio and command data from a CD player or MiniDisc deck. By monitoring the data levels in the buffer, HATS controls the data transmission rate between the various items in the system, making it unnecessary to synchronise the signal from the source with the master clock in the receiver's DA converter. This ensures jitter-free data transmission.

Personal Audio

The Sony Memory Stick, which has been referred to in these pages before, is a memory card that's about the size of a stick of chewing gum. At present it provides a storage capacity of 4-64Mbytes, though 128 and 256Mbyte cards are under development. Memory Stick technology is used by Sony camcorders, digital still cameras, portable PCs, music and speech recorders. Nineteen companies now support Memory Stick, including Compaq, Fujitsu, Hitachi, Mitsubishi and Sharp. The NW-MS7 Memory Stick Walkman converts MP3 and WAV music files to ATRAC3 files and can currently store 60-120 minutes of music, depending on sound quality, on a card. ATRAC3 is a more powerful version of the data compression system used by MiniDisc.

The new NW-E3 Network Walkman can store up to 120 minutes of music in a flash memory chip. It's very small, weighing just 45g with an AAA alkaline battery. The player has three audio recording levels: 132kbits/sec which gives up to an hour's recording time, 105kbits/sec which gives up to 80 minutes' recording time, and 60kbits/sec which gives up to two hours' recording time. According to Sony the best setting provides "near-MiniDisc" quality sound. The NW-E3 also uses ATRAC3 audio compression and Sony's Magic Gate and OpenGate copy protection technology.

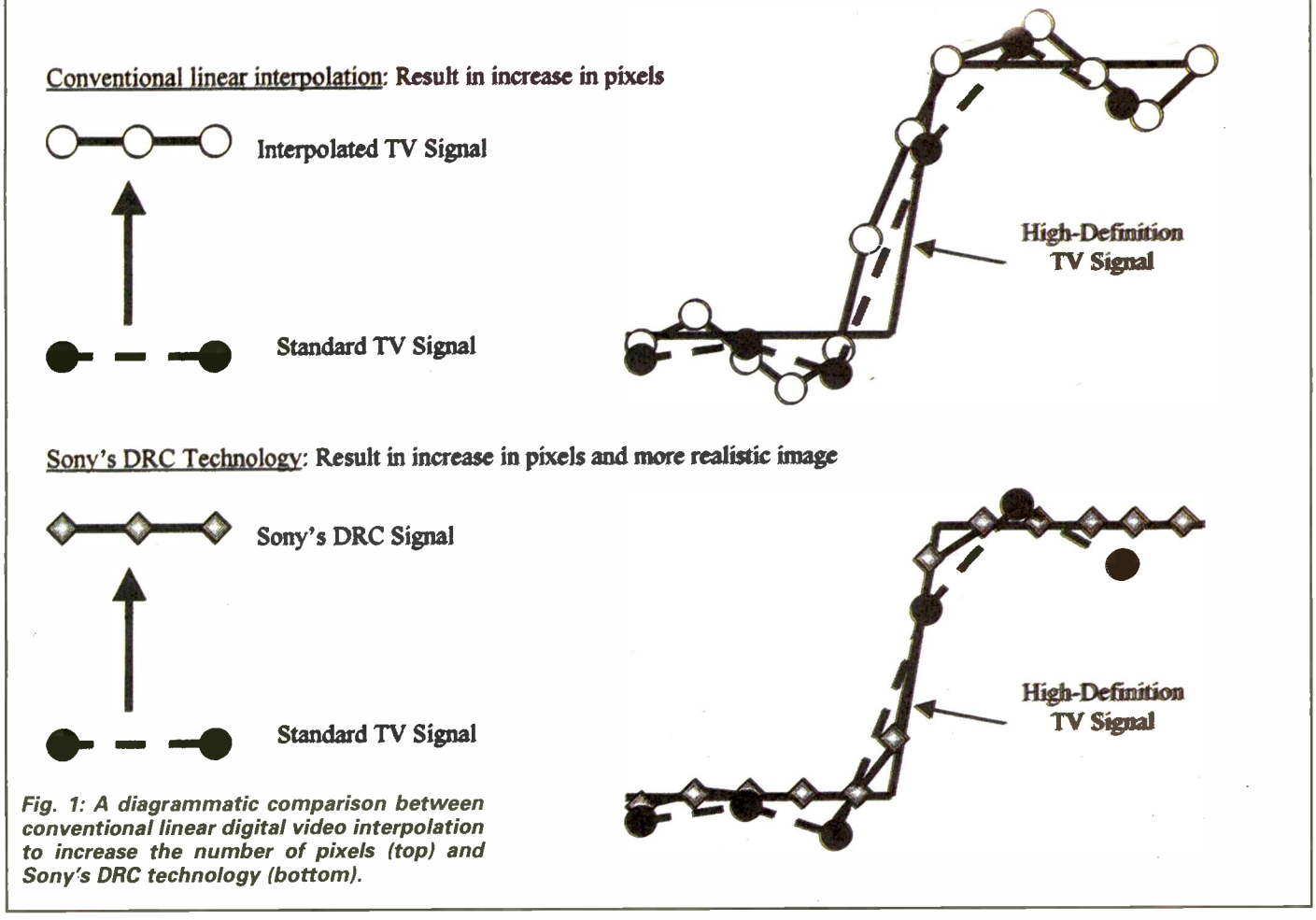


Fig. 1: A diagrammatic comparison between conventional linear digital video interpolation to increase the number of pixels (top) and Sony's DRC technology (bottom).

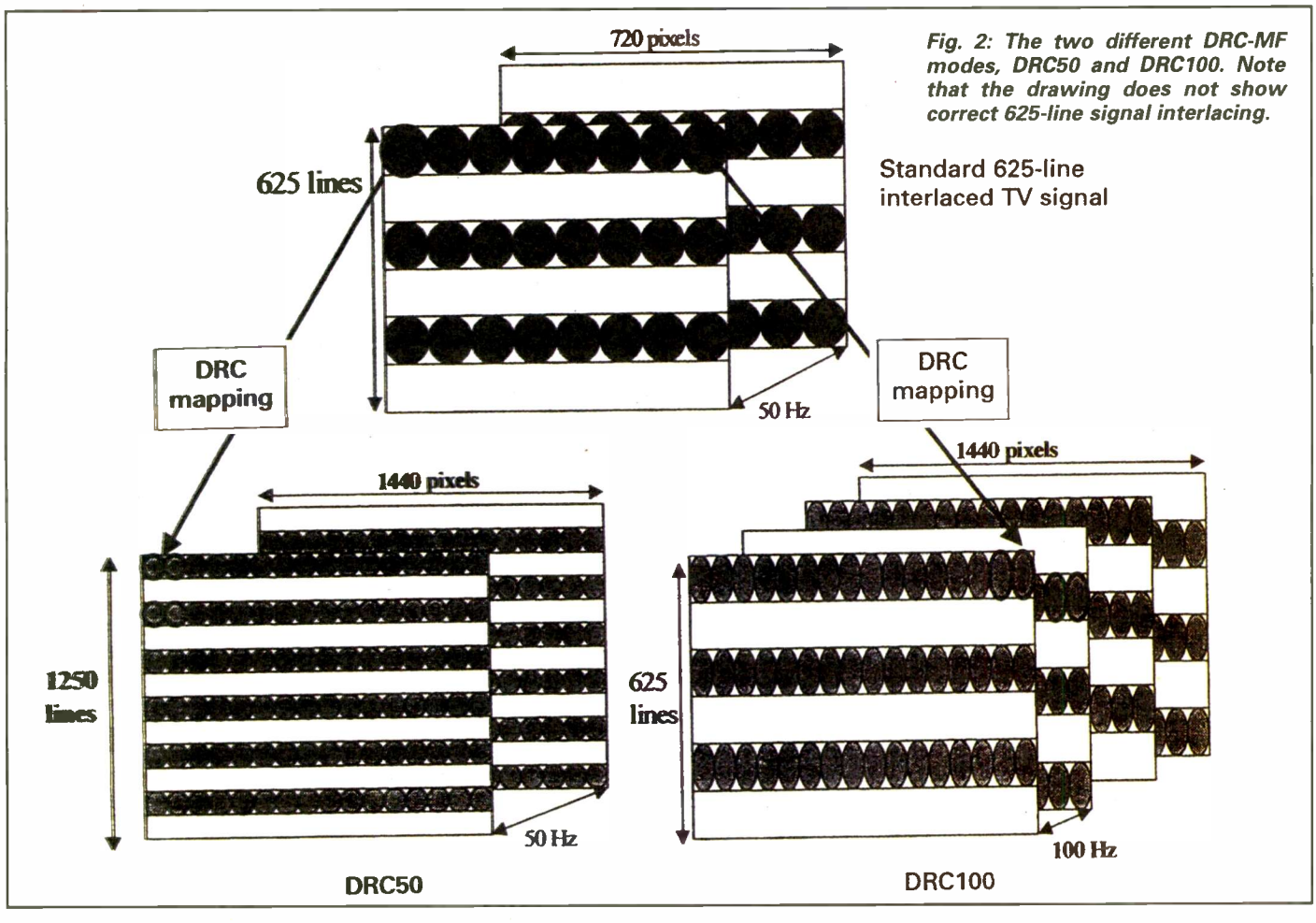
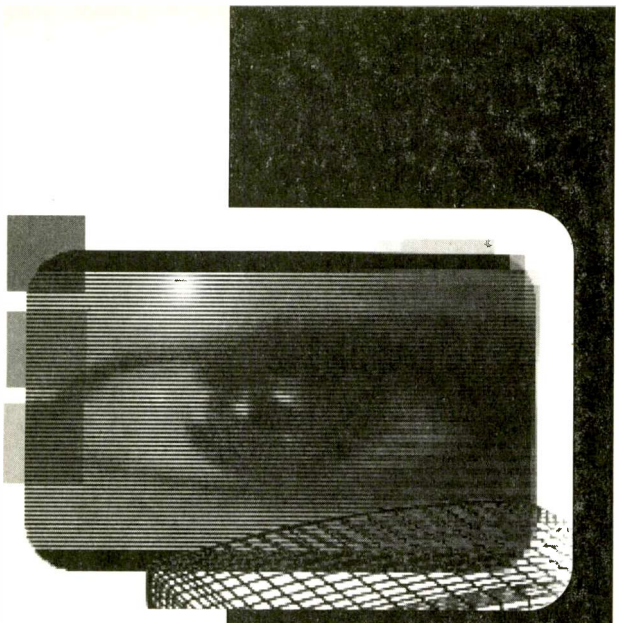


Fig. 2: The two different DRC-MF modes, DRC50 and DRC100. Note that the drawing does not show correct 625-line signal interlacing.



TV Fault Finding

Reports from
Pete Gurney, LCGI
Steve Hague
Andy Barkley
Ian Bowden
Maurice Kerry
Colin J. Guy
Adrian Spriddell and
Denis Foley

Matsui 21N1

The customer complained about a rather intermittent loud crackling on sound. It took some time to find the cause, as no amount of heating or tapping would produce the symptom. When the fault did occur, either a loud crackle or hissing was present. The volume control had no effect on it, and the on-screen volume graphics disappeared from time to time.

The source of the fault was eventually found to be the Nicam panel, which is mounted above the tuner. When the fault was present the 5V supply on the panel varied wildly. The cause was a hairline crack at the rear, right side of the panel. Two lugs from the chassis pass through the panel and are twisted to secure it. The crack radiated from this general area. Carefully bridging the two tracks affected cured the problem. **P.G.**

GoldStar CF28C22F (PC33J chassis)

"Dead" was written on the job card. Voltage checks showed that the power supply was operating correctly – all the outputs were within their specified values. My next test was for drive at the base of the line output transistor. While doing this I discovered that the transistor was extremely hot. I suspected the line output transformer, but a check with the LOPT tester said otherwise. While refitting the transformer I noticed that the scan-correction capacitor C405 (0·22µF, 400V) had a slight bulge in its case – this was not visible with the transformer in place.

The capacitor checked OK when removed, but a replacement cured the fault. I can only assume that the original one was going open-circuit under load. **P.G.**

JVC C14E1EK (Onwa chassis)

The complaint was field collapse. Some quick checks showed that there were no voltages at the LA7830 field output chip IC401 because the 25V supply was missing. This is derived from the line output transformer via the surge-limiter resistor R433 (0·68Ω) which was open-circuit. Having checked for shorts I replaced this item, but the new resistor died immediately.

Several items were suspected but the culprit turned out to be C424 (4·7nF, 500V), which is the protection capacitor for the 25V supply rectifier D406. This capacitor measured OK when checked, but turned into an effective resistor as soon as a supply was present. A 1kV type was fitted as the replacement, as the original seemed to be somewhat underrated. **P.G.**

Goodmans 2875 (F11 chassis)

This set was dead. A quick check around the TDA4601 IC based power supply showed that there was HT at the chopper transistor but little else. The start-up feed consists of two resistors (1·2kΩ and 1·5kΩ) and a little blue thermistor, PTC2. The latter measured open-circuit, and on removal left one of its legs behind. Replacement of this component and resoldering the extremely bad joints on the chopper transformer completed the repair. **P.G.**

Philips 15CE1210 (CP90 chassis)

This set had a fairly straightforward line output transformer fault. When a replacement had been fitted the set came back to life, but with no channels and no display. A quick check around the microcontroller chip showed little amiss apart from the fact that the 6V supply to the LED driver transistors Tr7876 and Tr7878 was missing. It comes via an *RC* filter: the 220Ω series resistor was OK, but the 330µF, 6V smoothing capacitor C2875 was short-circuit.

A new capacitor restored the display, and it was then obvious that the channel-up button had been pressed several times in an attempt to get the set to work, sending it to a blank channel. **P.G.**

Mitsubishi CT29AT5

There was no sound and it didn't take long to discover that the TA8218AH audio power IC had failed – the supply voltage was present but there was little else by way of voltages around the chip. While the replacement was being fitted I noticed that there were signs of electrolyte leakage in the area. Both the 470µF, 35V speaker coupling capacitors and the 100µF, 35V supply decoupling capacitor were found to be leaking badly when removed.

Once these items had been replaced and the electrolyte had been cleaned from the PCB there was normal sound. **P.G.**

Sharp 66CS03H

Yet another of these sets turned up recently, with a symptom that was new to me. There was a raster with numerous out-of-focus coloured

blobs and what looked like a few lines of field non-linearity near the top of the screen, also no sound. It looked like a Ferguson ICC5 when the east-west correction chip fails, only brighter. Checks on the supplies derived from the line output transformer, always a good starting point with these sets, revealed that the 45V supply was missing. It supplies the field output stage and the hideously complicated sound output stage.

The 5·6Ω feed resistor R643 was open-circuit and the 10V zener diode D623 was cooked to a frazzle, though it checked OK. I replaced these two items then switched on again. R643 started to smoke, so I switched off quickly and removed Q509, which feeds the field output stage. When I switched on again the 45V supply was correct. While checking around the field output transistors I found that there was no –13V supply at the emitter of Q508, because R631 was open-circuit. Normal operation was restored by replacing R631 and refitting Q509. **S.H.**

Grundig CUC7350 Chassis

Although a replacement chopper FET and control IC restored some life to this set it wouldn't come out of standby properly. Most of the supplies were at about 30-50 per cent of their rated value. After a fruitless search for an overload on one of the outputs from the power supply I decided to check the primary side in more detail.

There are two parallel-connected 0·56Ω, 1W resistors (R60027/8) in series with the chopper FET's source connection. I had suspected them at an earlier stage, but an in-circuit measurement of about 0·6Ω seemed to be reasonable. When out of circuit, one of the resistors measured OK but the other produced a reading of 44Ω. Replacing them both provided a complete cure. **A.B.**

Panasonic TX28PK1 (Euro 4 chassis)

When this set was switched on you could hear the power supply start up then, after a couple of seconds, shut down. It seemed that the line output stage wasn't starting up, and checks showed that the fusible HT feed resistor R877 was open-circuit. No shorts were discovered when the line output transistor and transformer were checked, so a suitable replacement was fitted and the set was tried again. This time it ran a little longer and produced a peak-white raster before shutting down. I found that the rectifier (D554) for the 200V supply had split in two. There was normal operation once a replacement, also a new reservoir capacitor, had been fitted. **I.B.**

Sharp DV3760

The job card simply said "dead". When the set was switched on the red standby LED flickered green and red but, apart from a pulsing noise from the power supply area, the set was indeed dead. This was one of those faults where you spot the cause of the trouble as soon as the back cover is removed, then spend time going through a logical fault-finding procedure that takes you back to where you started.

I spotted a capacitor on the secondary side of the power supply with what looked like old glue under it. After checking the outputs on the secondary side of the circuit I was back at C604 (1,000µF, 16V), which was open-circuit and had leaked on to the PCB. A replacement cured the fault. **I.B.**

Philips 28GR9 (G110 chassis)

The picture would blank intermittently and lines would appear on the picture. There was also no teletext. Supplies 12G and 12H on the teletext panel measured low at 6V. They are derived from the 12F supply via R3917, which was dry-jointed. Resoldering it restored normal operation. **M.K.**

Sharp CS Chassis

Models that are fitted with this chassis include the **59CS03H**, **59CS05H**, **66CS03H** and **66CS05H**. The power supply can fail catastrophically, the cause being diodes D609 and D610 – they go high-resistance intermittently. The sequence of events is as follows: when these diodes are faulty the line output stage is switched off and on rapidly; the power supply fails, sending excessive HT to the line output stage; then the line output transistor goes short-circuit. There's a kit of parts, part number 59CSCHASSISKIT, for the power supply. It includes the offending diodes and a line output transistor.

It's advisable to check and replace R707 and R720 in the power supply and, in the line timebase, change C604 to 330µF, 10V and R638 and R641 to 390Ω, 2W. Also check for dry-joints at the scan coil plug mounted on the yoke. This is very important, since failure here can result in Q601 going short-circuit and the line drive circuit in IC201 dying. If this chip is faulty the resistance across the pull-up resistor R611 will be low at 15-28Ω instead of 820Ω. In this case the chip will have to be replaced. **M.K.**

Sharp 37AM23H

There was no tuning function and the on-screen display was almost off the screen. A new non-volatile memory chip (IC1002) and resetting the height restored normal operation.

To enter the service mode you have to press and hold the front +P and –V keys while switching on the mains supply, then release the keys when the set starts up. Use the channel up/down keys on the remote control unit to select "vertical height adjust", then use the volume up/down keys to carry out the adjustment. To exit the service mode either switch the set off or press the remote control unit's mode button. Do not alter any NVM memory location settings without reference to the service manual. It's a good idea to note the hex value before changing any memory setting so that you can go back to it again if need be. **M.K.**

Sony KVX2872U (AE2 chassis)

The complaint with this set was that it would shut down after about thirty seconds, with no LEDs alight, come on again after a few minutes or longer, then go off again thirty seconds later. This cycle would continue as long as the set remained switched on.

The power supply could have been shutting down altogether, or going to standby, but in the fault state neither the standby LED nor the A and B LEDs were lit. Initially, at switch on, the standby LED would flash as normal, then the A and B LEDs would come on to indicate that a signal is present, followed by a picture and sound.

The LEDs are driven by the microcontroller chip on board M. In the event of a fault the A/B LEDs flash in a sequence that indicates the fault area. In standby the other LED should be lit.

To ascertain whether the power supply was in standby or not I checked the HT voltage, which should be 135V in normal operation and 61V when in standby. It was in standby. I then checked whether the microcontroller's 5V standby supply was present. In the

fault condition it was low at 0·7V. So this was why the standby LED was not lit and the set shut down.

The cause of all this was circuit protector PS681, which feeds the standby 5V regulator. It was going high resistance. These items are both on board A, which is near the front adjacent to board D. **M.K.**

Sony KVM1401U (BE2 chassis)

No or intermittent colour is often caused by the trimmer in the crystal reference oscillator circuit. Just touching it will often restore the colour. For more reliable operation I replace it with a fixed 22pF or 27pF capacitor. **C.J.G.**

Tatung TU2C52G (C series chassis)

This set couldn't be tuned, had no sound and the colour was wrong. The cause of the first two faults was the fact that the 'hotel lock' was on. To release it, hold down the vol– button while switching on. The cause of the colour fault was a large splash of solder under SK501: as a result the blue and green drives to the CRT base panel were shorted together. A sticker inside the set stated that it had been "Boldon Refurbished". Enough said! **C.J.G.**

GoldStar CI20A80 (PC31A chassis)

This set appeared to be dead, though the power supply was working. A scope check revealed that there was line drive at about 20kHz, which led me to suspect the TDA8362 colour decoder/timebase generator chip IC501. In fact its main 12V supply was missing: it was running on the 8V start-up supply. Regulator IC401 (7812) was open-circuit. **C.J.G.**

Ferguson C39F (new TX90 chassis)

Remote control worked but the front controls were all inoperative. When I managed to extract the front PCB I found that all five tact switches were open-circuit. **C.J.G.**

GoldStar CI20A80 (PC31A chassis)

The width would decrease when the scene was bright. If the bright scene was prolonged, the set would trip off. Tests showed that the HT voltage varied with picture brightness. Dummy load tests then revealed that the power supply was unable to provide the full output. I noticed that R802, in the feed to pin 3 (primary voltage monitor) of the TDA4605-2 chopper control chip, was 68kΩ instead of 680kΩ. Fitting the correct value cured the fault, which must have been present from new. **C.J.G.**

JVC C140EKY

This set often didn't start or, when it did, there would be no channel change with spurious graphics on the screen. The cause was C015, a 22µF, 6·3V surface-mounted electrolytic capacitor on the control module. It's in the microcontroller chip's reset circuit. **C.J.G.**

GoldStar CIT9902F (PC04 chassis)

The customer complained that the "on/off switch is broken". Needless to say it wasn't. We plugged the set in, switched it on, fiddled with the handset buttons to find out how to bring it out of standby and eventually got it working. After resoldering various dry-joints and replacing a number of low-voltage electrolytic capacitors in the power supply we left the set on the soak-test bench. When, the following morning, power was applied to the bench the set came on in standby. A quick flick of the remote-control unit and all was well. The set was switched off and on several times during the day with no ill effects. However we noticed that if the set had been switched off the previous night it wouldn't start up next morning until it had first been put into standby, either using the remote-control unit or by interrupting the mains supply. Once it had fired up, the set would work normally unless switched off for a considerable length of time.

The cause of this unusual behaviour was eventually traced to the supply to the line driver stage. There's a start-up supply, which is derived from the chopper transformer, and a running supply which is derived from the line output transformer. The start-up supply comes via D401 (1N4003). With the set in its fault condition and meters attached, we found that D401 had a forward drop of about 15V. A BYV95C was fitted as a replacement and seems to have cured the problem. **A.S.**

Hitachi C2573TN

This was a bit of a nightmare. The set came to us as dead, so all the electrolytics in the chopper circuit were replaced. Then, after checking the supply lines, we left the set on soak test. The following day the LOPT failed. A new one was fitted, after which the set was put back on soak test with a voltage monitor. It shut down three times during the morning. Over the next week much resoldering was carried out and a number of components were replaced, including the TDA4601 chopper control chip. We eventually discovered the cause of the mayhem: the mains bridge rectifier's reservoir capacitor was going open-circuit intermittently. **A.S.**

Philips 25PT4521/05 (MD1.1E chassis)

Flyback lines were visible across the top third of the screen. The culprit was found to be the BC327A transistor Tr7400 on the TESLA panel, which is used with the A59TMZ 40X01 CRT. It's not in all sets that have this model number. When fitted you will find it on the main panel, next to the field output stage heatsink. **D.F.**

Hitachi C21P819 (G8Q chassis)

Neither the remote-control unit nor the front controls P+ or P– would bring this set out of standby. The power supply was working, but there was no line drive output from IC701. Previous contributors have described how to check the standby control from the microcontroller chip IC1501. The voltage at pin 10 of this chip was at the standby level (1·1V). Removal of the inverter transistor Q1510 restored timebase operation, but still with both green LEDs showing and no signals. It seemed that the microcontroller's clock wasn't working. While carrying out further checks around IC1501 the set sprang to life. It now appeared to have an intermittent fault.

I replaced the 8·8MHz crystal X1501, but was not confident that this was the cause of the trouble. Now that the set was working, I tried the remote-control unit again. It seemed to be sluggish in operation, as if something had been spilt into it. The batteries were low!!

Further investigation revealed how I had been fooled yet again. This version of the G8Q chassis, with control panel PC298-10, uses a different microcontroller chip (type T900514) from the one in my circuit diagram. Furthermore there are no wiper contacts on the mains switch to trigger pin 1 of the IC. The P+ and P– buttons don't, for some reason, turn the set on as one would expect.

So how much can I charge for replacing a pair of batteries? **D.F.**

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: LOPT (type no. F1143A WCBN) for the Sanyo CTV Model CTP6130 (80P D22 B3BY00 chassis, 20in.). C.M. Crook, 1 Carice Gardens, Clevedon, N. Somerset BS21 5DG. Tel. 01275 879 620.

Wanted: Scan coils for the Osaki P20H portable TV. Scan yoke is type DID-1492SL S.E.P., CRT type 3701B22. Leslie E. Swain, 53 Park Road, St. Neots PE19 5SL. Tel. 01480 881 058 or e-mail leswain@lineone.net

Wanted: Service manual or circuit diagram for the Apple Multiscan 20in. colour display monitor (Sony innards), and for the Sun 15in. colour monitor (Sony SCC D96D-A chassis). M.P. Quinn, 21 Hawarden Way, Mancot, Deeside, Flintshire CH5 2EL. Tel. 01244 531 639.

Wanted: CRM71 7in. CRT for a pre-war Ekco TV set – or any narrow-neck 7in. tube. Geoff Holden, 5 Craigour Avenue, Torphins, Banchory AB31 4JA. Tel. 01339 882 979.

For disposal: Following the death of a relative I have been asked to find a good home for a fair amount of TV, video and radio items as follows: Telequipment D61 oscilloscope; A56-120X (two), A67-150X and AW63-120X CRTs; Farnell Instruments TSV12/2 transistor power supply; BPL RS600 RF signal generator; Universal Uvometer and another EHT meter; Advance Electronics E2 signal generator; Sinclair DM2 multimeter; three VHS videos; a compact reel-to-reel tape recorder in excellent condition; a selection of 78s; various valves, resistors etc. I am not in a position to vouch for the condition of any of these items. Any offers? Keith Vincent, Leckhampstead Manor, Manor Lane, Leckhampstead, Newbury, Berks RG20 8QR. Tel. 01488 638 854.

Wanted: Remote control unit for a Grundig 2 x 4 Super VCR, also user and/or service manual, spare machine/parts, Philips V2000 cassettes. Phone Steve Rowley on 01889 578 416 or e-mail stever@ljl.co.uk

Wanted: Does anyone know the reason for internal flashover in the focus potentiometer in a Fidelity Model CTV20R? Have replaced the potentiometer and C412 but the problem remains. John Reed, 88 Conway Road, Llandudno LL30 1PP.

Wanted: Power supply for the BT DF100 fax/phone, or details of the voltage and current required. Also connector polarity details. Phone R. Morris on 01676 533 060, fax 01676 530 004 or e-mail rc.morris@lineone.net

For disposal: Copies of *Television* from January 1977 to December 1997. Every issue in good condition. Also several other hobby electronics magazines. Phone B. Mistry on 020 8997 2646 or 020 8422 0728 for details. Best offer considered.

Wanted: Circuit diagram (photocopy OK) for the Toshiba V73DC VCR, in particular the power supply and servo sections. Thys Saayman jnr., 69 Delver Street, Parys (OFS), 9585, South Africa.

Wanted: The following issues of *Television* to complete my set: Aug 1998; July 1989; Oct 1998; Jan 1993; Sept 1995; Oct 1995; May-Aug 1998. Have a surplus Sept 1993 issue for disposal. Phone L.C. Dilke on 0121 441 2449.

Wanted: Operating instructions for the Akai SX1000 satellite receiver. Loan would enable me to photocopy and return immediately. F. Nedza, 40 Brynhyfryd, Glynneath, Neath, W. Glamorgan SA11 5BA. Tel. 01639 720 429.

Wanted: Ferguson TX100 non-FST chassis, 22 or 26in., in any condition. Paul Farnfield, 24 Hillside Road, Ashtead KT21 1RX. Tel. 01372 275 351.

Wanted/for disposal: Require a circuit diagram/servicing details for the ICL ErgoPRO 141p 14in. PC colour monitor (marked type A1014F A3S). There's a blank screen with a flashing LED power supply fault. Good home wanted for three vintage working Sony 18in. colour TV sets, Model KV1820UB, also a Sony CTV/monitor Model CVM1850UB (composite video, audio and line outputs). All have teak cabinets and are fitted with Sony 479F WB22B CRTs. Plus spare PCBs and service manuals. Not recommended for domestic resale: suit a TV enthusiast or collector. Space required, so these items must go. Other items available. Phone Don Janner (Brentwood, Essex) on 01277 822 380 for further details.

Wanted: Instruction manual/circuit diagram, original or photocopy, for the Tandy auto-ranging digital multimeter type 22-167 or 22-178. D. Lee, 16 Devonshire Place, Claughton, Birkenhead, Wirral, Cheshire CH43 1TU.

Thanks: My thanks to the very kind person who sent me a circuit diagram for the Manor Supplies colour-bar generator. Gary (Huddersfield).

Wanted: Element for the Antex Model X25 (22-25W, 220-240V). P.T. McKeever, 4 Castleview Park, Derry BT48 8DL. 02871 353 613.

Wanted: Circuit diagram or manual for the Telequipment S51A oscilloscope. Mick Mc Dermott, 91 Hargwyne Street, Stockwell, London SW9 9RH. E-mail maccles@btinternet.com

Wanted: Chopper transformer for the Crown 21in. Model CTR5912RT. The transformer is identified as TER-MAL002190102 TELRA SGS HI POT. The usual suppliers have been unable to obtain this. Anyone know of a source? N. Balmforth, 17 Newnham Avenue, Eastcote, Ruislip HA4 9RW.

Wanted: A Quad 33 preamplifier for spares or possible repair. Please phone Mike on 01758 613 790.

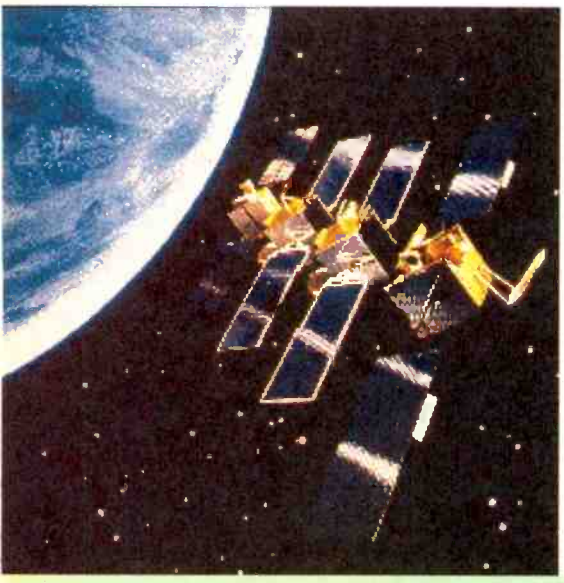
Wanted: Circuit diagram or kit for converting composite video into separate line and field sync pulses and RGB video. S. Venkatachellam, Gaby Avenue, Palma Road, Q-Bornes, Mauritius. Tel. + 230 425 4501, fax + 230 424 8500.

Wanted: Chopper transformer for the Ferguson Model 36K3 (TX99 chassis). The number on the transformer is 3112 338 32642. P. Bentley, 43 Breach Road, Marlpool, Heanor, Derbyshire DE75 7NL. 01773 765 258.

Wanted: Complete cabinet for the Philips STU902 satellite receiver, also a remote control unit (type RC5802) for it. J. Rudd, tel./fax 01964 626 471 or e-mail john@thorn77.freeserve.co.uk

For disposal: Copies of *Television* complete from 1989-1999. Best offer secures. Tektronix 2337 100MHz oscilloscope £250 ONO. Tektronix 475A dual-beam oscilloscope £250 ONO. Also twenty VCRs free to student or repair centre. Hugh Tamney, Portumna, Co. Galway. 00 353 509 41324.

Wanted: New video head disc for the Sony SLHF950UB, part no. A-6762-226-A, or a non-working machine with good heads. A.C. Griffin, 89 The Ridgeway, Sedgley, W. Midlands DY3 3UN. Tel. 01902 880 063.



Terrestrial DX and satellite TV reception. Broadcast, overseas and satellite TV news. How to hunt for digital satellite TV signals, and advice on some aerial problems. Roger Bunney reports

DX and Satellite Reception

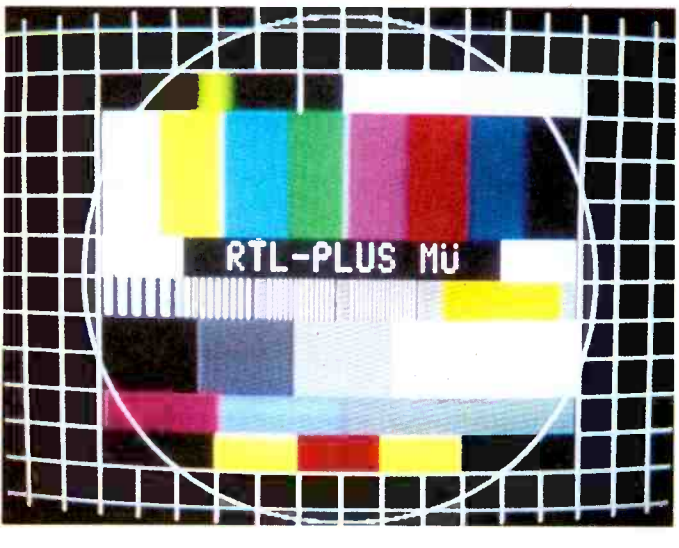
In the past, some Sporadic E activity in mid-April has been a sign of a good season to come. There have been no such signs this year however. The only SpE report during the month came from Peter Schubert (Rainham, Essex), who logged mostly unidentified ch. E3/4 signals on April 9th, 15th and 21st. The wet weather effectively muted any tropospheric signal propagation.

The most noteworthy occurrence was an aurora on the evening of the 5th. A visible aurora is extremely rare here in the southern UK. When I arrived home that evening the local radio station was broadcasting reports of Northern Lights. Fortunately I live on the northern side of Romsey, with a clear view to the north. At 2230 I saw a white glow that faded up and down slowly. It resembled the effect produced by a distant, floodlit football pitch, but the glow was perhaps upwards of 30° elevation north. Police driving across the high downs on the Isle of Wight reported red lights from the aurora. More spectacular displays were seen farther north. I checked for signals at 2300, using a scanner and Band I TV receiver, but there was little evidence of enhanced RF despite the visual display. Very odd.

An aurora usually has two phases, early and late. The former often occurs in the late afternoon, the latter during the evening up to past midnight. Either can be more active, with signals being reflected from the auroral sheets. Reception of Scandinavian Band I TV is fairly common, but note that the reflected signals will arrive from a single or several northerly angles rather than the direct transmitter direction. Hum/buzz on audio and hum bars across the picture, with perhaps multiple imaging, are the characteristics of auroral signal reception.

There was further F2 reception in Australia during early April, with the maximum usable frequency rising through the mid-30MHz spectrum. April 8th was a particularly active day, with reception from Malaysia (ch. E2), China (ch. R1), Iran (ch. E2) and Dubai (ch. E2 again). This was all F2 rather than TE reception, confirmed by the reception times.

The latest *Skywaves* DX bulletin mentioned F2 reception by Paul Logan (Lisnaskea) during March. On the 4th he monitored a Californian Highway Patrol at 42·44MHz, clearly hearing the despatcher and motor bikes, with cars being stopped at Interstate 405 in West LA. The despatcher was at CHP office 79, Culver City near LAX airport (KBO570). The highest US utility signal heard this past winter was KED348, the Dutchess Co. Fire Department, New York at 46·36MHz.



An analogue test pattern (FuBK) received from Astra at 19·2°E.

Satellite Sightings

It has been an extremely quiet period for satellite TV reception – fortunate, perhaps, as high levels of activity often mean a disaster, tragedy or we're at war again. While checking my favourite, Eutelsat II F3 (36°E), on April 22nd (a Saturday) I noticed at 1330 BST a fragmentary incoming news feed for which I have been unable to establish the reason. A Quantas airliner was parked on a tropical airfield away from the main runway. It shimmered in the heat, viewed from a distant camera. Various military personnel were present. There was no commentary, just sound fx. The service ident was unusual in that it included a UK uplink serial number – IMAGE-UNLTD1 UKI425. The transmission included a VTR roll from a still frame and was eventually just cut. The frequency was uncommon – 11·683GHz H (SR 5,632, FEC 3/4). Was this a Philippines hijack, and if so why a UKI involvement? Any answers on a postcard please!

Roy Carmen reports a new digital multiplex via NSS K (21·5°W) with sports action. It could be a good one to check for PGA golf

feeds from the USA. The details are 11·502GHz H, SR 6,111, FEC 3/4 – for those who input PIDs, the relevant ones are 1160 VPID, 1120 APID and 1160 PCR. The Globecast multiplex via NSS K is a good source for golfing and other sports feeds. NASA TV's coverage of the Atlantis Shuttle launch, subsequently terminated because of high winds, was carried on April 24th. This was at the first of NASA TV's three channels, 11·590GHz V (SR 20,145, FEC 3/4).

I noticed the Globecast multiplex with a colour-bar transmission from Venezuela recently, UPLINK-1 VENEVISION – the inlaid digital-time readout was many hours out of sync with the real time.

When digital signal hunting you sometimes come across a strong signal that just won't lock: a full-scale signal-strength indication is present and parameters are displayed, as in lock, but the receiver refuses to produce a picture. The RSD receiver I use has this habit, but the same problem is experienced with other ones. The APTN news feeds at 13°E (Hot Bird) always refused to lock, though they could be locked using a Nokia digital receiver. Roy has found another non-locker, at 36° E, the details being 12·716GHz H with the unusual parameters 2,714 SR and 1/2 FEC. Lots of signal but no picture! The problem doesn't occur only with Eutelsat craft: I recently received a strong, non-locking signal via Intelsat 605 (27·5°W) – this was at 11·460GHz H with SR 4,343 and FEC 7/8.

Eutelsat II F1 (48°E) has been showing more signs of life recently. Check the following, to list just a few: Sicilia International 11·110GHz H SR 2,293, FEC 2/3 (a clear picture); Euro Mediterraneo 11·090GHz H SR 2,277, FEC 2/3; and SKYDSL 11·552GHz H SR 30,000, FEC 5/6.

Another vintage satellite that was previously dormant, Eutelsat I F4 (33°E), has woken up. You can find Fashion TV at 11·656GHz H and Digitaly at 11·509GHz H – these are both analogue signals. There are also digital signals, for example Telespazio's multiplex at 12·523GHz H, SR 27,500, FEC 3/4. This includes about seven TV and various radio channels. News feeds have also been reported from this satellite.

Mike Evans, an old-time TVDXer, asks about analogue sightings, but we just have to accept that transmissions are increasingly digital. Mike has seen the recently-launched Sirius 3 satellite (5°E) on test with analogue colour bars, inlaid SIRIUS, via three transponders – 11·993, 12·053 and 12·437GHz, all H. Here's another analogue signal to try for, at 13°E: DEUTSCHE TELEKOM USINGEN E/S – check at about 11·094GHz H for this very strong signal. The new Hispasat 1C satellite (30°W) has been transmitting analogue test patterns (with the ident GUADALAJARA) at 11·578GHz V – nice to see a PM5534 pattern again!

I searched without luck for uplinks from Silverstone at 36°E on the 22nd. I should have looked at 43°W (PAS 3R), where Roy Carmen found Silverstone in the clear at 12·715GHz V (5,632 and 3/4).

BBC UKI-234, seen on the 27th with a feed from the Murrayfield rugby ground, has gone digital. The transmission was via 36°E rather than Telecom 2C (3°E) but used the common BBC frequency 11·600GHz H (5,632 and 3/4). On the following day the same saturated pitch came from UKI534BBCD-SNG.

Those interested in French Supafoot league OBs should try 12·529, 12·548, 12·577, 12·585 and 12·697GHz H (SR 6,289, FEC 7/8) at 3°E. These transmissions are all in the clear.

Terrestrial TV

UK: The LITN (Local Independent TV Network) has criticised the ITC's decision to withold further RSL-TV frequency allocations until the development of digital terrestrial TV (DTT) has been finalised. The aim is for 99·4 per cent digital coverage of the UK while ensuring continued viewer access to analogue UHF transmissions. According to the ITC thirty per cent or so of the present UHF TV spectrum could eventually be sold off to other users. Seven RSL-TV stations are now on air, and according to the LITN fifty could be on air within the next eighteen months

Nick Cope took this photograph of the Gangtok transmitting mast, Sikkim Province, North India during a holiday trip last year.

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Kurd TV, an analogue signal from Eutelsat W2 at 16°E. Frequency 11·163GHz with horizontal polarisation.

if channels were allocated. The ITC maintains that priority must go to expanding DTT coverage, though RSL-TV still features in its plans.

RSL-TV station TV 12 (Isle of Wight) should have relays at Luccombe and St. Boniface in operation by the end of June and August respectively. The studio at Chichester is expected to open later this year. Thought is being given to the possibility of going digital.

Australia: This year, at the current stage in sunspot cycle 23, will be the last chance for TVDXers to receive the Australian channel 0 (vision carrier 46·25MHz). Chs. A0, A1 and A2 will be closed down on September 9th, 2008, with the frequencies reallocated to other users. Those at present using these channels, mainly ABC plus some relays, will be moved to Band III or UHF with digital transmission.

Spain: The government has given approval for two new national, digital commercial TV channels to start broadcasting by April 2002. The present five commercial channels have all to start digital transmissions at the same time. Simultaneous analogue and digital broadcasting will continue, with the analogue switch-off planned for 2012.

The Netherlands: DVB-T transmissions are to be started by Nozema in the Almere, Amsterdam, Haarlem and Hilversum areas by the end of 2001. Randstad (Utrecht, Rotterdam and DenHaag) will follow by the end of 2004 to complete the network. Ch. E60 will be used for test DVB-T transmissions. The plan is for analogue and digital transmission to operate in parallel, with the analogue shut down in 2010.

It's possible that DAB will be moved from Band III to UHF.

Satellite TV: the Digital Hunt

The change to easy-to-use digital TV links means that there is now much more activity in the satellite belt, but how do you find those elusive OB signals, newsfeeds etc.? Several receivers have a search facility. You can tell such a receiver to check say the whole Hot Bird spectrum at 13°E. Leave it to carry out the search, come back in an hour's time and you'll find that perhaps 500 radio and TV channels have been found, mostly intended for broadcast reception.

Let's say you want to check Eutelsat II F3 (36°E) for any sports feeds. Again you can use a search receiver to check everything transmitted by the satellite. This could take some time. There is however a tendency for SNG uplink trucks to continue to use particular frequencies. So it's a better idea to check existing memories first. I have in my ODM300 receiver for instance various frequencies stored in memory from 50 to 89, some going back to the Balkans war. A check on such frequencies will often produce signals.

Roy Carmen and I have adopted an alternative technique for rapid signal hunting. We start off using a cheap analogue scanning satellite receiver, Roy a BT SVS300, myself a Manhattan LT6300 Plus Mk 2. Set it at the bottom of Ku band, go to horizontal polarisation (experience shows that most news feeds from 36°E are horizontally polarised), go to scan/search and the receiver starts off, stopping at various frequencies. A TV screen check will show whether an analogue or a digital signal has been found. If there is just snow, or a slightly darkened noise, it's possible that you have found a digital signal. Read off the frequency and feed this into your digital receiver (I use an RSD ODM300, Roy an ODM302). It will settle at this frequency and, if the signal is a digital one, determine the symbol rate and forward error correction. This is sufficient to lock a picture provided the signal is reasonably strong. These RSD receivers don't have a good weak-signal digital threshold: they will establish the digital signal parameters but, with a weak signal, won't produce a picture.

This is as far as it goes with my set-up. Roy can take it a step further. Once he knows the frequency, SR and FEC he can fed this information into his Echostar AD3000IP receiver, which will always lock on a weak signal! Roy has also found that the compact Praxis 9500 will read off the exact frequency of a digital signal, whereas the RSD receivers seem to have a generous AFC range.

This is still a laborious and inefficient way of operating. We have still to find the ideal enthusiast receiver, though there are hopes that the Sat Cruiser DR101 series or German Neveling Europa 2000 may be the answer. They will be on display at the Earl's Court Satellite Show and have received good reviews in Australasian quarters.

If you are about to buy a digital receiver, it would be worth waiting a few more weeks.

Satellite News

The new Eutelsat Sesat craft has joined II F3 at 36°E. It has eighteen Ku-band transponders that are intended for video, data and various internet applications. The wide-beam coverage extends across Europe, Western Siberia, North Africa and the Middle East while the new, innovative steerable spot beam is initially programmed to cover India – the first time Eutelsat has employed a dedicated aerial system for access to India. Incidentally Sesat = Siberia East Satellite.

The EBU and Intelsat/Telstra Corporation have reached agreement on coverage of the Olympic Games 2000 from Sydney. Up to 40,000 hours of programme transmission have been pencilled in via seven Intelsat craft. The EBU has booked capacity on the Intelsat craft at 64° and 66°E to feed thirty European national broadcast TV networks, in MPEG-2 digital form of course.

News from Astra. Zee-TV in analogue form at 19·2°E is to close down on October 31st, while TNT is ending its analogue transmissions on June 30th. TCM (Turner Classic Movies) UK will replace TNT at night, with Cartoon Network UK during the day. An Amsterdam commercial TV station, AT5, intends to provide an FTA digital service via 19·2° as soon as the Dutch authorities give the required permission. Astra 2B is now expected to be launched in mid-July.

Scandinavian broadcaster Viasat, which uses Sirius capacity at 5·2°E, intends to start digital transmissions at the end of April, with its D2-

MAC services ending in June 2001. Check 11·977GHz V for the basic Viasat package (VH-1, TV1000, Cinema and ZTV plus lots of radio channels) and at 12·054GHz V for 3+ Denmark, Viasat+, TV6 Sverige, Nickelodeon, Playboy, Viasat Sport, Hallmark, MTV, BBC World, Travel.

There is concern in Australian satellite circles over the suggestion that the government may allow the use of 3·2-3·4GHz for data, mobile terrestrial communications and TV distribution. The result could be that conventional C-band users experience considerable interference. The Channel 7 broadcast group is interested in this spectrum.

A similar situation exists across the Tasman Sea where Television New Zealand is attempting to sell off part of the 12GHz band for terrestrial use.

Aerial Notes

In the May issue I mentioned George Gaskin's problem with his wideband Band I aerial (type WB4). The symptom was poor results, the cause being water inside the insulator/dipole connection box. In particular water was present at the air-spaced coaxial cable, where it was split between the inner and tail for terminal connection. The remedy was to disconnect the cable, trim about 15 inches from it to ensure that no moisture remained in the air-space dielectric, reconnect the cable and finally drill a small hole (about 1/4in. diameter) in the underside of the box to allow air to enter and prevent condensation build up.

Watertight insulator boxes can cause considerable problems because of condensation. It's not unknown for water to build up, get into an air-spaced cable and eventually exit at the coaxial plug behind the receiver. The complaint is "my picture's gone snowy and the TV is leaking"! Such a cable would have to be replaced. The aerial insulator, if rust free, can often be put back into service once dried and provided with ventilation.

Another cause of trouble is where different metals are used in the construction of an aerial: electrolytic corrosion can occur. One aerial I built used 2in. alloy tubing jointed and clamped with a J-Beam galvanised-steel sleeve. There was a build up of white corrosion at the joints. The solution was simply to remove the sleeve, clean off the white powder, apply heavy grease to all surfaces and reclamp.

I would strongly recommend that aspiring aerial constructors and professional riggers read the VHF/UHF Antennas section of the RSGB publication *Radio Communication Handbook*. Towards the end there's a section on electrolytic corrosion, with a table that lists the electrochemical potentials of various metals. Some are anodic, others cathodic. It's OK if aluminium and zinc are in contact as they are both anodic. But if aluminium is in contact with gold or platinum, both of which are extremely cathodic, there will be chemical corrosion at the metal contact, especially in a sea water/salt air environment. Copper is cathodic, so expect problems when in contact with aluminium. Check the RSGB table, and standby with the silicone grease!

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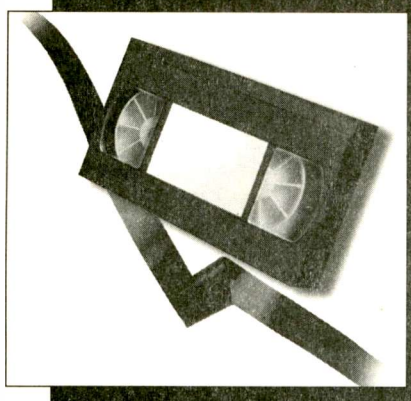

VCR Clinic

Reports from
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Maurice Kerry
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Bob McClenning
Paul Smith and
Adrian Spriddell

Hitachi VTF550E etc

Other Hitachi models that use this deck could suffer from the same fault, which can produce several symptoms: groaning or squealing in the play, record and fast-transport modes; and intermittent shut-down at any time, often trapping a cassette in the machine. The culprit is the capstan motor. It's best to fit a new one, though you may find that careful dismantling and lubrication is successful. **E.T.**

Aiwa VXT1420

A broad noise bar could be seen during playback, even with a known good recording, and tracking adjustment wouldn't move it. The cure was to replace IC102, an XL24C04 EPROM that had to be obtained from Aiwa. Auto head switching set-up could then be carried out as follows: in the play mode, press volume down and channel 5 on the remote control unit to set tracking centre, then press volume down and channel 3 to set the head switching.

This is of course a TV/VCR combi unit. **M.K.**

Mitsubishi HSB10

Tape playback was OK, but in the E-E mode there was a blank screen and no sound – as if the machine was in the external or AV mode, which it wasn't. The tuner's 12V supply was present, and setting the VCR to channel search produced the correct ramp voltage at the tuning pin. A scope check at pin 18 (video output) of the M51496 vision and sound IF chip while scanning through the channels produced very brief bursts of composite video. It seemed that something was wrong with the control of the tuner, and a check at pin 17 (AGC output) of the M51496 chip produced the clue. The reading was 0V – the tuner's gain was being switched off. As a further check I connected the tuner's AGC pin to a 6V DC source instead. Up came a picture – not a good one, and in monochrome, but a picture nevertheless.

I decided to replace all the components that would affect control of the tuner by the chip: the 4·7µF AGC reservoir capacitor C02, the 4·7kΩ AGC feed resistor R02, the 12kΩ resistor (R105) that connects the AGC preset to the 9V supply and the preset itself. As preliminary checks had indicated that the fault was tap-sensitive, I resoldered the chip's pins then scraped and tinned the numerous very fine print tracks to them. When I switched on again sound and a good, stable picture were present. No amount of tapping interfered with it, and a two-day soak test confirmed that all was now OK. **J.E.**

ITT VR3907/Samsung VI611

The problem with this machine was that it couldn't be switched off. The standby LED remained on all the time, as did the channel indicator. Q2 (2SA634) in the power supply was short-circuit. It's a pnp device and a TIP42A proved to be a suitable replacement. **J.E.**

Panasonic NVSD100

There were two faults with this machine: first intermittent failure to accept and/or load an accepted cassette; secondly very poor E-E and record pictures. The first was dealt with by replacing the loading motor's plastic coupling, the worm wheel (most of its inner teeth were chewed), and the main unit which was cracked in two places – it's sometimes called a plate assembly.

The cause of the poor pictures was the chrominance/luminance module, in which the video signal was being distorted (the sync pulses were being crushed). Most of the processing is carried out within a thick-film unit, which is usually not repairable and is also expensive. The service manual does not give component reference numbers within this unit but does provide a circuit diagram. Replacement of a 3·3µF, 50V surface-mounted capacitor within this unit cured the fault. The replacement was not easy. **M.M.**

Pye DV291/Philips VR6290

It didn't take too much to restore this dead machine to life. I had to replace the chopper transistor, optocoupler and the surge-limiter resistor. **M.M.**

JVC HRJ610

The complaint with this machine was that the E-E and record video would blank out intermittently. When I got it back to the workshop it was dead. Once C12 (2·2µF, 63V) in the power supply had been replaced the machine worked and I was able to tackle the original fault.

Video muting is carried out in these machines by feeding a video signal from the IF module to a 15·625kHz tuned circuit, rectifying the output and using the DC thus obtained to switch a transistor on or off. As the transistor wasn't getting enough drive, it was switching on and off at random. A comparison check with another machine that uses a similar IF module revealed that the video output to the muting circuit was low. The manual for the HRJ610 doesn't show the circuit of the IF module. But I had a circuit for a similar, discrete component module that's used in Model HRD910. Reference to this suggested a check on C206 (0·1µF, 50V), which proved to have gone low in

value (0·03µF). A replacement restored correct operation of the muting circuit. **M.M.**

Ferguson FV32L

This machine performed faultlessly during my first call, much to the embarrassment of its owner. On my second visit she told me that she had to reset the clock, which was a very helpful clue. The back-up battery was dead. A replacement cured the various complaints – after reprogramming the relevant data. **M.M.**

Sony SLVE280UX

The original complaint had been intermittent stopping while in play or record. By the time the machine reached me it was dead. I found that fuse PR512 was open-circuit, but couldn't find any cause for its failure. A new fuse restored normal operation, and a long soak test proved that the intermittent stopping had been cured. **M.M.**

Panasonic NVJ700AM

This multi-standard VCR was dead – there was just a squeal from the power supply. The usual cause of this is the 1µF, 400V start-up capacitor, which goes open-circuit. Not this time however. There was a dead short on the secondary side of the power supply, the cause being C49 (0·1µF, 100V). A replacement cleared the short and restored normal operation. **M.M.**

Matsui VP9506

The owner complained that there was a wide grey band at the bottom of the picture. For some strange reason the head switching point was way out. Resetting it cured the fault. **M.M.**

Sanyo VHR335E

There was no playback colour, though recordings made by the machine were played back in colour by another VCR. Most of the video processing is carried out within the LA7345M chip IC101, but the playback chroma signal path can be checked by connecting an oscilloscope to pins 20 and 22. Between these pins the signal passes through comb filter DL101 and a 5·7MHz trap that consists of L1010, C1058, L1008 and a couple of resistors. The output at pin 3 of the comb filter was being pulled low by L1008. This 15µH choke produced a short reading of 0·5Ω – a new choke should read 1·7Ω. A replacement cured the fault. **G.M.**

Philips VR675

This machine would accept a cassette, lace up but then immediately unlace and eject the cassette. The cause of the trouble was obvious once the deck had been removed. The INIT microswitch 1460 on the right-hand side of the PCB under the deck was jammed in the on position – its tong had become pushed back and down. Freeing it cured the fault. **G.M.**

Philips VR6591/75

If the complaint is noisy E-E audio, replace C16 (0·47µF, 50V), C23 (2·2µF, 50V), C29 (47µF, 16V) and C42 (1µF, 50V) on the IF PCB. Also check for dry-joints at the 5V regulator IC75. **N.B.**

Sony SLV353

This machine wouldn't erase tapes despite a healthy bias being present at the full-erase head, which was OK. I cured the problem by removing the connectors and hard wiring instead. **N.B.**

Toshiba V321B

It looked very much as if the drum motor was useless, as it was very unstable. Cleaning the dust off the optocoupler and the 'windows' on the head disc restored normal operation however. **B.McC.**

Akura VX110

This VCR wouldn't accept a cassette. If one was loaded manually however it could be ejected. A series of function tests showed that the loading motor would turn in only one direction. Voltage checks at the mode switch revealed that the highest reading was only 1·7V. When I traced the 5V rail back to the power supply I came to D702 which was open-circuit.

This diode is about 3cm behind the surface-mounted system control IC. **P.S.**

LG T263i

On eject, a loop of tape would be left protruding from the cassette. The supply spool didn't rotate during the unload sequence because the idler-arm assembly (item 072) didn't swing across to it. A new idler cured the fault.

As a temporary measure, or to prove that the idler is faulty, press in the brass pin at the centre of the assembly. This increases the resistance of the cogs in relation to each other. **P.S.**

Daewoo DVK985P

This machine wouldn't accept a cassette until the loading motor was tweaked by hand. After doing this all functions operated normally until the cassette was ejected, when the mechanism would again jam. The cause of the problem was the master cam gear, which had rough grooves on its underside.

When a replacement had been fitted I noticed that the loading motor turns back slightly at the end of the unload sequence, thus resetting the mechanism ready for the next cassette. **P.S.**

Goodmans GVR3400

This machine came in for a head clean but had a more serious fault. One head seemed to drop out half way through every test recording. Freezing two of the disc capacitors in the head amplifier module cured the fault for several minutes, but fitting replacements had no lasting effect. I eventually traced the cause of the fault to a dodgy AN331YK IC. **A.S.**

Ferguson FV62LV

This machine was dead because of trouble in the power supply. The following items had to be replaced to get the machine working again: CP05/6/7 (all 1µF, 50V); CP10 (10µF, 50V); TP91 (2SA1020); and RP91 (1·5Ω). **A.S.**

Panasonic NVFS90B

The complaint was no playback sound. This was not quite accurate: there was sound, but only for a second or so; and, after failing, it could be restored by putting the deck into reverse search then back into play. The counter was also erratic, working in fast wind but tending to freeze during standard play.

Having waded through much of the sound and system control circuitry I eventually found that C2311 on the servo card had fallen in value from 1µF to 10nF. As a result the microcontroller chip IC6001 pulled down the mute lines from pins 12 and 14 to the main audio chip IC4501, via pin 65. **A.S.**

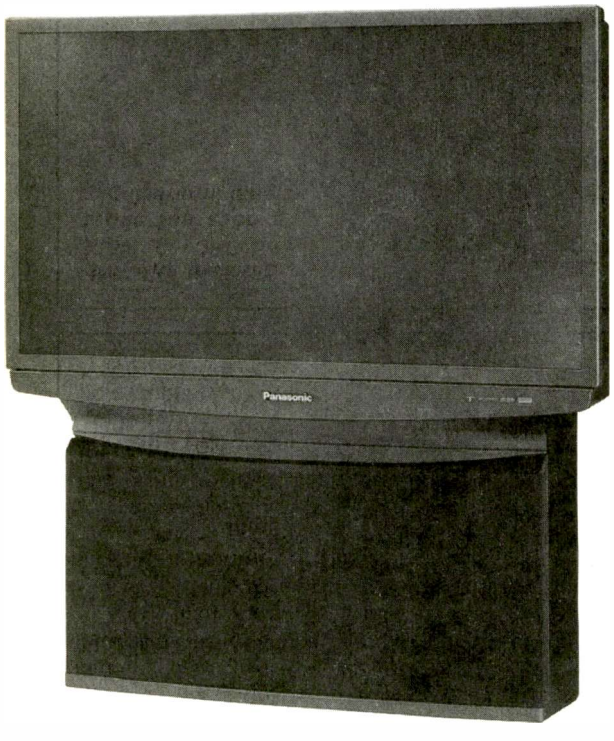
Ferguson FV50

This VCR was brought to us to have the pause button disconnected. When we questioned the customer he said "the pause light always comes on when you try to record". We tried this and found that it did. But it's supposed to – it's a cue function.

We were also asked to supply a new remote control unit as the original one "had failed". The VCR was first tried with our programmable workshop remote control unit. We got no results until a new U2505 chip had been fitted on the timer card. **A.S.**

Modern Projection TV Techniques

Projection TV dates from the earliest days of television. There has been increased interest in this approach in recent times because of the demand for Home Cinema displays. Cliff Martin surveys the current state of the technology



The Panasonic Model TX47PT1A rear-projection receiver.

The CRT continues to be the predominant display device for TV purposes, both domestic and industrial. Domestically, there's a growing tendency to turn the front room into a Home Cinema. This means larger-sized screens – typically a 32in. widescreen display.

CRTs of this size for direct viewing are very heavy. Although they provide good brightness and contrast, the definition, in terms of focus, is less impressive – especially when the screen is viewed in the full-scan (Panoramic) mode. The alternative is to use projection TV technology: smaller CRTs are employed as projectors to produce a large-screen display. With a very large TV set this has the advantage of considerable weight reduction.

Early projection TV sets

There is nothing new about the idea of projection TV. In fact back in the early days it was the only way of providing viewers with a picture of size larger than about 12in. Because of light loss within the projection system, the tubes had to be operated at a very high brightness level. This meant that they had a rather short life. Rear projection – the optical projection system was behind the screen – was generally used, with the CRT's picture projected via a lens-and-mirror arrangement (the Schmidt folded-optical system) on to a ground-glass screen. As larger direct-view CRTs were developed, rear-projection TV sets disappeared from the market. Front projection TV continued to be used in pubs, halls etc.

Three-tube colour projection TV displays

A similar method is used today. But as a colour display is required three projection tubes have to be used, one for each colour. With rear projection, still the most common system, the tubes are mounted in-line on a chassis, with the images projected via a lens system and a large angled mirror on to a plastic lenticular screen where they are superimposed. Degaussing is not needed.

The EHT system is arranged as a splitter to supply the three tubes. It also provides the first anode and focus potentials for each tube. In addition an optical focus adjustment is provided. The lenses are set at slightly different heights to allow for the different focal lengths of the three colour images. As the two outer tube/lens assemblies project at an angle, keystone distortion is introduced and as a result convergence errors occur. The keystone distortion is corrected electronically, by altering the shapes of the rasters. A convergence system is also provided, with adjustment either by manual potentiometers or by means of an electronic-screwdriver system. Static convergence can be adjusted by the viewer, as sets usually incorporate a crosshatch pattern generator.

Operating such small tubes at the high brightness level required means that their faceplate dissipation would exceed the maximum permissible level unless some form of cooling is employed. It takes the form of a clear-liquid coolant that's housed in a container between the CRT and the lens system. With some tubes (Philips) the liquid can be replaced: with other tubes the coolant system is a sealed unit.

In order to obtain the maximum light output, the viewing screen has a lenticular surface. As a result the screen has a directional characteristic, the brightness falling off dramatically as the viewer moves off axis. The effect is minimised when the screen is viewed from a distance of say 15ft or more.

When a 625-line picture is magnified in this way to produce a picture of 40in. or more the definition quality is only 'reasonable', even with today's sets.

Servicing

Projection TV sets that use CRTs to produce the display sometimes have a chassis that's also used in direct-view sets. It can thus be tackled in much the same way. It's best to transport a set upright to avoid the risk of coolant spillage. Because of the size of these sets, some manufacturers (e.g. Toshiba) adopt a modular approach to servicing so that a set doesn't have to be taken away. The optics must be kept dust-free and clean. If not there will be poor light output and definition. As the sets are normally short of both, cleaning is important.

CRT replacement is a bit of a lottery. If only one tube has failed, it may be possible to replace just this one – provided the emission of the other two is OK. With an old set however all three tubes will have to be replaced to obtain correct white balance.

Light-valve Projectors

The CRT's tendency to defocus at high brightness and contrast levels is well known. Light-valve projectors use three TFT (thin-film transistor) liquid-crystal panels to modulate the light from a common source – Fig. 1 shows the basic arrangement. So defocusing does not occur.

First-generation models had a relatively inefficient light-box and LC panels with a low pixel count. Because of this their performance is considerably inferior to that of current models. These use a powerful metal-halide lamp as the light source. As a result a very bright, sharp picture that's particularly suited to multimedia-type presentations is produced. Any white surface will serve as a screen, a white wall for example, so there are no viewing-angle constraints. Current models also perform well when used as a video projector, with a horizontal resolution of 400 lines expected. Some models have an interchange-able lens system. The digital inter-polation circuitry used makes the line structure all but invisible.

The metal-halide lamp is basically a mercury-arc lamp in an atmosphere of argon gas that, in its natural form, produces a light output mainly in the blue and ultra-violet regions. This is clearly unsuitable for a colour projection TV display. Correction is achieved by dosing with various metal-halides. As a result, an even light output is achieved over the range 380-730nm. The lamp has a parabolic reflector that absorbs heat while reflecting the visible light forwards.

The lamp is started by applying about 1·2kV between the electrodes. This vaporises a drop of liquid mercury that radiates an intense glow. There is then a low-resistance path between the electrodes, so the drive voltage to maintain the light output can be reduced to about 80V. The life expectancy of the lamp is about 1,000 hours. A complex chopper power supply (lamp ballast) is used to generate the drive voltages – it's best to keep well clear of them!

The light from the lamp passes via a cold mirror and UV- and IR-cut filters, dichroic mirrors being used to separate the light into its red, green and blue components. A dichroic mirror has the property of reflecting one primary colour while letting the other two pass through. The filtered colour light passes through a condenser lens and a polariser then a TFT light valve. A dichroic prism is used to overlay the three colour images, the combined light passing out via a zoom lens. Some models use mirrors instead of a prism to combine the three images.

Some projectors use a light box that's available only as a prealigned unit. With others it's possible to replace individual light valves should they fail. Convergence of the valves is necessary after a replacement, a process that calls for considerable skill. As the three images are overlaid in the prism, any convergence errors that are present will not increase with projection distance.

As with most projectors, considerable heat is generated. Forced-air cooling is facilitated by using fans to circulate air around the light box. These are usually sensed items, which means that the unit will shut down should one of them fail. Resettable heat fuses are also found. Liquid cooling of the light valves is sometimes used with very high-power projectors.

The digital circuitry used in these units is extremely complex – even a block diagram would take up several pages of *Television*. In addition manufacturers are very protective about releasing too much circuit detail. So, regretably, we cannot include any here, at least at this stage. PCB repair is possible, but someone with camcorder repair experience may feel more at home than a TV engineer. Bear in mind that careless servicing will be fearsomely expensive, as the panels cost £1,000 or more.

Most of these units are hired out and are used in conditions that are not helpful to them. Even though they have dust filters, dust can find its way on to the light valves and will eventually mar the picture. Nicotine causes similar problems. So cleaning may be required from time to time. This, and lamp replacement, can be expensive.

The LC projector is still mainly an industrial rather than a domestic device, though a 40in. Sony set uses the principle. Whether there will be increasing domestic use of the system remains to be seen.

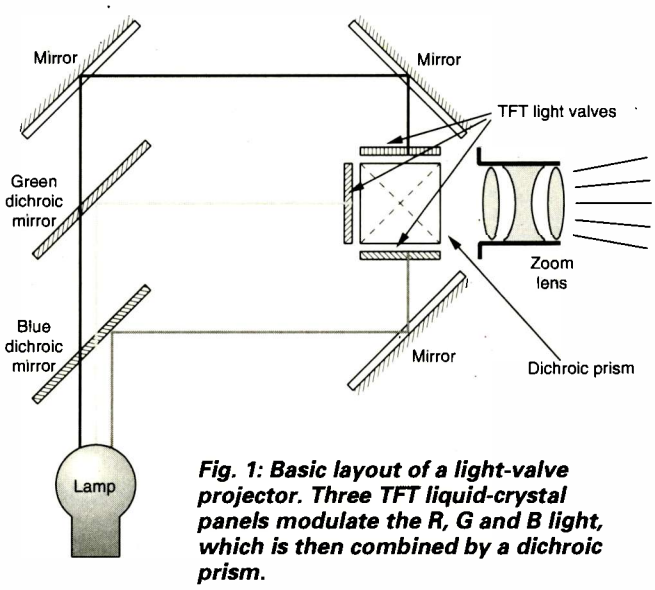


Fig. 1: Basic layout of a light-valve projector. Three TFT liquid-crystal panels modulate the R, G and B light, which is then combined by a dichroic prism.

Film systems

With digital technology the buzz word nowadays it's tempting to think of colour film as obsolete. Development continues in this field as well however, and it remains the preferred medium for some TV productions and the only, except for experimental electronic methods, medium for large-screen cinema use. Modern 35mm film can provide very impressive results, especially with improved projector technology (to remove jump and weave effects).

The use of a single projector in a multi-screen complex means that film is presented on a single reel which is usually laid on its side. It could contain some 10,000ft of film for an average-length movie.

Widescreen films usually have an aspect ratio of 2·35:1, but this is sometimes cropped slightly to fit the space available. It's possible that some standardisation may take place to bring cinema formats more into line with those used for TV. For any electronic device to supersede film on a large screen, it will require a minimum resolution of 1,500 lines with a light output of 20,000 lumens or more. It will be interesting to see whether this is achieved.

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

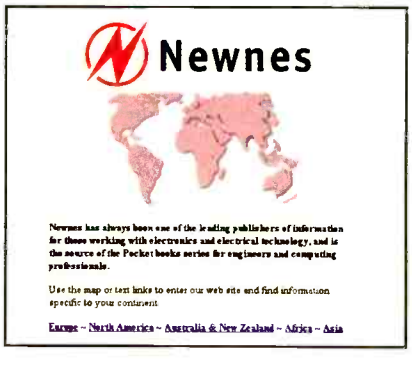
uk.tech.digital-tv

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



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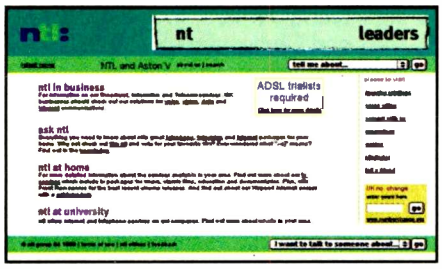
Check out this site for the latest book titles on TV & Video Servicing and Technology and their famous Pocket Book series. You can shop on-line and also register for an Email service to tell you when relevant new titles are published.

NTL

http://www.ntl.co.uk

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



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

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.

Servicing Advice

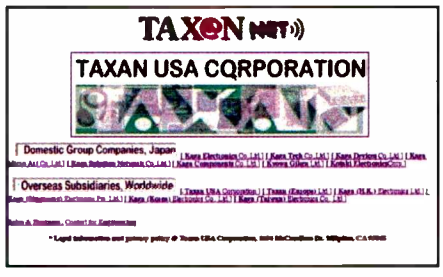
http://www.repairfaq.org/REPAIR/F_Repair.html

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

Data is also available from Texas Instruments where you can quickly search their site for the information you need. 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 quite a few TV stations of US origin available to watch. The video quality isn't very good at the moment, but this is sure to improve. 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

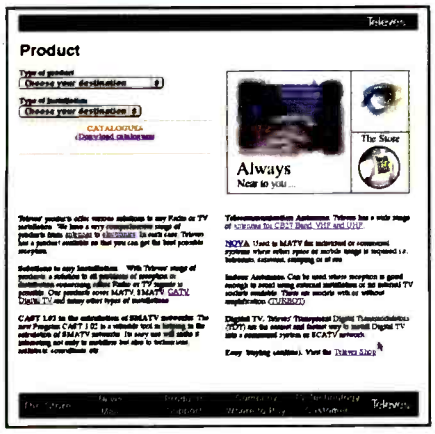
http://www.tvtap.mcmail.com

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".

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Put your web address in front of 21 000 electronics enthusiasts and experts.
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or e-mail: pat.bunce@rbi.co.uk

Company name		Web address		

Answer to Test Case 451

– see page 537 –

The components in this Hitachi set could well have been affected by its lengthy period of disuse. As the oscilloscope revealed, the 112V output from the power supply rose to well above normal during the short time before the supply shut down. The over-voltage protection system was obviously being activated. At Sage's suggestion, Ray checked the values of the resistors in the HT sensing network that biases the base of the error-detector transistor Q951. This transistor drives the feedback isolating optocoupler IC901. Both resistors, R952 (2·7kΩ) and R951 (39kΩ, 5%), had changed value. Once they had been replaced, along with the 1kΩ HT preset VR951, the set stayed on and, at least after a lengthy run, produced a good picture and sound.

There remained the problem of the strange field scan behaviour. The cause was again in the power supply, where the 15V output was low and carried chopper-rate hash. The reservoir capacitor for this feed, C954 (1,000μF, 50V), and the smoothing capacitor C955 (47μF, 25V) were both in need of replacement. Although their capacitance values seemed to be roughly as specified, ESR meter checks showed that their impedance had risen. Replacements, rated at 105°C, cured the symptom. The 15V supply feeds the 9V regulator IC951 which, amongst other things, supplies the field ramp circuit associated with the TDA8361 chip IC201.

Component failures of this type have kept service technicians busy for three-quarters of a century. They continue into the digital age!

NEXT MONTH IN TELEVISION

PSU and Line Output Stage Protection Test Set

Under a fault condition the power supply in a TV set can damage the line output stage and vice versa. When this situation arises, the problem is where did the trouble start? Keith Cummins has devised a test unit that can sort the problem out for you. Simply connect it between the two sections of the receiver to provide protection and an indication of where the trouble lies. The unit is inexpensive and easy to build.

At the Panasonic Seminar

Panasonic and Technics recently held a major seminar where their latest technology developments and products were unveiled. These included DVD-Audio, DVD-RAM and SD memory-card products, new digital camcorders, and the first PAL VHS machines with Extended Play (EP) recording. George Cole reports on these innovations.

The Digital Video Tape Format

In the second part of his series, started in our June issue, Steve Beeching describes the basic format used for digital video tape recording.

Lightning Protection

Lightning-induced EM pulses in the mains supply can cause havoc with consumer electronics equipment. Protective steps can be taken to avoid trouble, as D. Benyon describes.

TELEVISION INDEX/DIRECTORY AND FAULTS DISCS PLUS HARD COPY INDEXES & REPRINTS SERVICE

INDEX DISC

Version 8 of the computerised Index to TELEVISION magazine covers Volumes 38 to 49 (1988-1999). It has thousands of references to TV, VCR, CD, satellite and monitor fault reports and articles, with synopses. A TV/VCR spares guide, an advertisers list and a directory of trade and professional organisations are included. The software is quick and easy to use, and runs on any PC with Microsoft Windows or MS-DOS. Price is £36 (supplied on a 3.5" HD disc). Those with previous versions can obtain an upgraded version for £16. Please quote the serial number of the original disc. See the CD-ROM offer below.

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Each disc contains the full text for television VCR, monitor, camcorder, satellite TV and CD fault reports published in individual volumes of TELEVISION, giving you easy access to this vital information. Note that the discs cannot be used on their own, only in conjunction with the Index disc: you load the contents of the Fault Report disc on to your computer's hard disc, then access it via the Index disc. Fault Report discs are now available for:

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Vol 42 (Nov 1991 – Oct 1992); Vol 43 (Nov 1992 – Oct 1993);
Vol 44 (Nov 1993 – Oct 1994); Vol 45 (Nov 1994 – Oct 1995);
Vol 46 (Nov 1995 – Oct 1996); Vol 47 (Nov 1996 – Oct 1997);
Vol 48 (Nov 1997 – Oct 1998); Vol 49 (Nov 1998 – Oct 1999).

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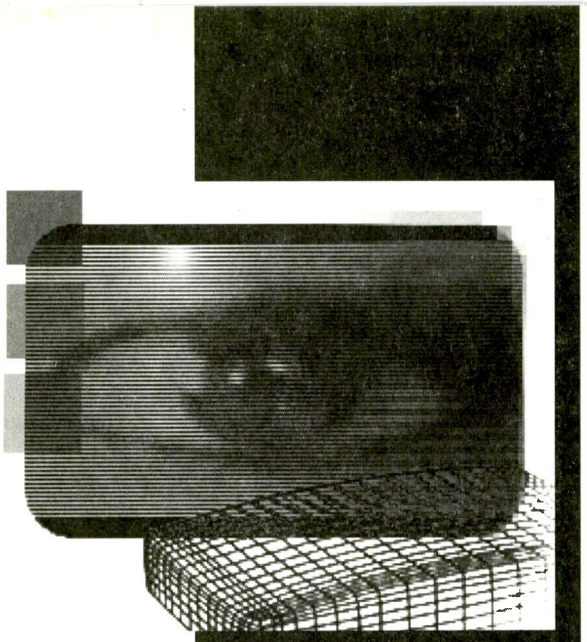

Monitors

Reports from Ian Field and Nick Beer

Dell Ultrascan 15FS-EN

This model is a descendent of the VC5EN which, I think, is a Sampo design. Failure of the line output transistor (usually a BUH715) is fairly common. As anyone who has tried a BU508 will know, the BUH715 has a much higher current rating. The BU508 starts to lose its grip about half way up the linear line scan ramp, the result being severe horizontal cramping over the last 25 per cent of the scan. It also gets very hot and fails in less than about half an hour. The BUH715 has a collector current rating of 10A, but the Vcbo is only 700V. Occasionally these monitors turn up with a BUV48A in the line output stage. This has a current rating of 15A, but the Vcbo is only 450V.

Since the customer who brought this monitor in always complains if the width adjustment isn't capable of producing over-scanning, and it never is with this model, I decided to explore the possibilities. As far as I can see this design has a lot in common with the Thorn 9000 TV chassis, which used an RCA PIL-type CRT and had a high-current, low-voltage line flyback system. All previous attempts to increase the width by using the internal presets have resulted in uncorrectable scan/pincushion errors long before the scan reaches the sides, so I decided to try fitting a higher-current transistor and adjust the flyback tuning – to increase the current at the expense of the flyback voltage. The value of the flyback tuning capacitor C409 is 6·8nF, 1·6kV. By adding capacitance in increments of 1nF, I found that the width peaked at about 10nF. This was sufficient to keep the customer happy – also the flyback voltage had been reduced sufficiently to enable the 15A BUV48A to be used. **I.F.**

AST Vision 5U

This monitor's power supply was pulsing quietly. Some quick voltage checks at the rectifiers and reservoir capacitors on the secondary side of the power supply revealed that the voltage across the reservoir capacitor for the 50V line dipped during the power supply's cut-off period. All the other reservoir capacitors held the same voltage between pulses.

This led to a check on the line and EHT output stages, each of which has its own power transistor with a separate efficiency diode. They were all OK. The output stages also have their own separate flyback B+ PWM MOSFETs. The one for the scan output stage, Q410 (IRF630), was short-circuit. As his component is free-standing with no extra heatsink, I decided to use an IRF640 as a replacement – it's rated at 18A instead of 9A, with all the other specifications the same. If an ISO-TO220 type such as the IRFI63X is used it *must* be the '640, as the insulated types have lower ratings.

When checked the heater voltage was, as usual, found to be low – it was only 6·02V. So I replaced D622 with a Schottky-barrier type diode and upgraded the smoothing electrolytic. This brought the voltage nearer to the correct 6·3V, and restored some contrast to the ailing CRT. **I.F.**

Compaq S700/PE1120T

The LED was on and the CRT's heaters were glowing, but there was nothing else. The line scan and EHT sections use separate transistors. Checks in these areas revealed that the Mitsubishi FS3KM MOSFET in the EHT department was short-circuit. As a result the 1Ω, 1W fusible resistor in the power supply had also failed, but there was no other damage.

As I was unable to find any data for the FS3KM and didn't have any in stock, I decided to try a 2SK1507. This worked, but I was worried about the peak voltage. So I fitted a temporary peak voltage detector circuit consisting of a DTV32-1500 diode and an 0·33µF, 1kV capacitor. The reading obtained was only 702V, and the MOSFET ran almost stone-cold. A period of switching on and off and putting the monitor through all its various possible screen resolutions failed to upset the 2SK1507 transistor, but the monitor was given an extra long soak test to make sure.

I couldn't find any markings on the PCB to identify the chassis manufacturer, but the front-panel micro chip had CTX stamped on it. **I.F.**

Apricot XJ49905

This monitor is similar to the later version of the AST LR14, which has MOSFET-switched additional flyback tuning capacitors. It's a cut-down version, as only one of the two MOSFETs is fitted. The monitor also has something in common with the Viglen version – a Sony Trinitron tube.

As usual, the dead symptom was associated with the flyback tuning capacitor that's permanently in circuit. In this case it had become dry-jointed and had arced. It's interesting that the capacitor concerned was a Philips polypropylene KP high-pulse type, which is more likely to melt than become dry-jointed. As so often, someone had been in there before me. Whoever it was had cleaned and refitted the original capacitor, so the 2SC3886A line output transistor was now short-circuit.

The owner of this monitor always requires full width, so I replaced the 8A 2SC3886A with a

10A 2SC4742 and increased the value of the fixed flyback tuning capacitor from 5·6nF to 6·8nF. Although there are internal presets for increasing the width, these Trinitron monitors always lose pincushion correction before the width anywhere near fills the screen. Although the higher-current line output transistor and higher value flyback tuning capacitor produced some improvement, the pincushion, trapezium and parallelogram presets all needed careful balancing for a full screen without geometric distortion. While I prefer to be cautious about changing component values, on reflection it might have been better to go for 7·5nF. **I.F.**

Samsung Syncmaster 3 (CVM4967T)

This monitor came in with a blown fuse. The STR58041 chopper chip is always suspect when there's random fuse blowing, i.e. cold checks fail to reveal any short-circuits. But the two small electrolytics on the primary side of the power supply are also suspect. They are C612 (10µF, 100V), the error voltage reservoir capacitor, and C610 (47µF, 35V) in the circuitry that controls chopper overrun in off-load conditions.

After testing everything else for shorts and inspecting the posistor in the degaussing circuit I got the ESR meter out. C610 produced an acceptable ESR reading but C612 read between 3-4Ω.

When one of these popular monitors appears on the bench I am always reminded of the S-Pin fault modification – add a 1MΩ resistor between pins 3 and 5 of the LM358 chip IC202. **I.F.**

Data General CM1414T

This monitor was dead with no LED illumination. On inspection I found that the mains input track had vaporised at its narrowest point. All possible causes were checked: the mains bridge rectifier circuit, the chopper MOSFET, the mains filter capacitors – I even dismantled the posistor to check on the condition of the resistive pellets. Once the track had been repaired the monitor powered up and seemed to be all right.

I left it on soak test. When I checked later there was a blank screen though the LED was still on. The tube's heaters were alight, and there was line drive. C823 (470µF, 25V), which smooths the supply for the tube's heaters and the regulation optocoupler in the power supply, is overworked and can cause very odd symptoms when its ESR rises. A replacement improved the regulation and the tracking of the various supply voltages, but didn't restore the picture.

Then I noticed the Panasonic CRT! A quick check confirmed that there was interelectrode whiskering. In this chassis the flyback pulses at the collector of the line output transistor are rectified to produce the first anode supply. They can also be applied to the focus pin to 'flash' an interelectrode short between the first and second anodes. There was certainly a flash in this case – a bright blue arc inside the neck of the CRT. Once the temporary hook-up wires had been removed and the focus lead had been refitted only a small amount of adjustment was required to produce an excellent picture.

Because of the method and uncertainty with this repair, I gave the monitor a full week's continuous soak test before declaring it fit. **I.F.**

Dell D1428LS

The complaint with this monitor was "dim/poor contrast". The condition is often caused by screen savers that result in the beam current being too low for too long – the cathode coatings glaze. There was evidence of interelectrode whiskeing between the first and second anodes (screen/focus) however, so the CRT may have been suffering from this regardless of the type and usage of screen savers. I often use the following method of clearing this fault. Disconnect the tube's focus lead, then fit a flylead to the focus tag on the CRT base. Touch the flylead on some point in the line output stage where flyback pulses are present – often the scan plug or efficiency diode are the easiest points to reach. Success is signalled by a blue flash inside the neck of the CRT.

This obviously involves some risk of damage in the line output stage, though in my experience the risk is very small.

Once the CRT had in this case recovered from the interelectrode short I found that the emission of all three guns was poor. The cathodes required some fairly aggressive drive to restore the emission to a serviceable level – usually running the tube for a few hours with a peak white raster will clean the cathodes.

In any situation where the cathode emission is in question the electrolytic capacitor that smooths the heater supply should be replaced to ensure that its ESR is as low as possible. In this monitor the capacitor is C641 (1,000µF, 16V). **I.F.**

Smile CA6525DL

The power supply was pulsing because the 2SC5297 line output transistor Q105 had failed. Since the B+ PWM regulator is of the flyback type, its MOSFET had not been damaged. Although a line output overload can damage a flyback B+ PWM circuit, this is very much more rare than with a series-chopper Buck regulator.

I'm not sure whether the 2SC5297 line output transistor falls into the dubious category, but a check for possible causes of its demise failed to reveal anything amiss. Its base drive is capacitor coupled however, by C118 (2·2µF, 50V electrolytic). Capacitors in this position can cause trouble, so I checked its ESR. The reading was just under 1Ω. To eliminate the possibility of this being the cause of the failure, I fitted a polycarbonate capacitor of the same value.

Although I couldn't fault the soldering, I gave the line drive circuitry (T101, Q104 etc.) fresh solder, after which the monitor was fine.

If the CRT is beginning to fade, replace C531 (470µF, 16V) and upgrade C540 from a 10nF disc ceramic to a polycarbonate or Mylar capacitor. This should be as large as possible, preferably 1µF, 63V. **I.F.**

Compaq 444

There was no frame scanning. A TDA4866 chip (U601) is used for frame output, but defluxing, inspecting and resoldering the PCB around it made no difference. A new IC had to be fitted. **I.F.**

Daytek DT1531D

This digital 15in. SVGA monitor had a severe EW error and line foldover. The controls had been fiddled with but this wasn't the cause of the trouble. There were dry-joints at every leg of D522. **N.B.**

Escom EM1448LR

"Dead, smell of burning" it said on the job card. In fact the fault was line collapse. The cause was C417 (0·68µF, 250V) in the line scan current path. It was open-circuit – in fact it had split. RS do a suitable replacement. **N.B.**

Letters

We welcome letters from our readers and try to publish as many as we can. You can send them typed, handwritten, or on disc. Address them to the Letters Editor, Room L302, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS.

Internet Business Promotion

In his article last month (page 474) Paul Smith omitted one cheap and effective method of promoting your business. Nowadays your own internet web site can be as effective in promoting a local repair, rental and retail business as it can in promoting a worldwide mail order business.

Martin T. Pickering, B.Eng.,
satcure@netcentral.co.uk

Loss of Nicam

I am at present using an analogue cable box that acts as a frequency changer, altering whatever comes in to channel 44. Its output is connected to the aerial input to two VCRs – out of the first one then into the second – after which there is a three-way split to feed three TV receivers. It all works fine, with Nicam signals passing straight through.

The cable company is now pushing its digital boxes however, and obviously won't want to run two systems. Eventually there will be only digital, and this will present me with a problem. The cable company's Pace digital boxes have baseband video and left- and right-hand audio outputs, but the built-in RF modulator provides only mono sound – as with most VCRs. I do not have enough spare sockets to feed baseband video and audio to two VCRs and the TV. Thus if I change to a digibox I will loose any stereo and, of course, surround sound information. What I require, so that my system will work as before, is a Nicam encoder to precede the RF modulator. Does anyone have a circuit?

The salespeople at the cable company were unable to provide the answer when I asked whether the signal that comes from the digibox is a standard Nicam one. I had to ask Pace.

Mike Harris,
Cheadle, Cheshire.

Registration and the Future

It's all very well for dealers such as Alan H. Goodrick, Ltd. (letters May) to recommend the registration of servicing firms, but at what cost? Many engineers, like myself, who have stopped retailing and get by on servicing alone would not wish to end up with the additional costs and administration work that such a proposal would entail. A CORGI-type registration system sounds like a good idea, but I don't think any customer of mine would want to pay up to £85 per job, or more for a house visit. I wish they would.

Like many people in the trade, I am waiting out my time to retire. Whether or not we want to, it seems unlikely that we will be able to repair the new products being introduced. I doubt whether even those who invest in new service departments will be able to get suitably qualified engineers of an appropriate standard, or a sensible return on the massive outlay required.

I went on a Sharp training course only to have my service contract cancelled because of a change in servicing procedures. I'd say that most manufacturers don't give a hoot about servicing, which to them is a necessary evil. They won't even talk to you. And if a manufacturer does reply saying that they do care, experience proves otherwise – when I phone for technical help most of them put every possible obstruction in the way to avoid giving help.

I know that Brian McPherson means well, but the reality is that nothing can now save this trade, what with Wal-Mart and internet buying. Prices will continue to slide, and most of our goods will become throw-away. The charges that will have to be levied by any new breed of super service centre will in most cases meet with total rejection. I was in the trade in its heyday, when prices were fixed, but customers won't stand for it now. The times they are a changing, but not for the better if you are a servicing engineer.

I totally agree with M. Thorpe's view that cowboys won't just vanish, but don't see them as a threat because we nowadays have much better informed customers who have zero tolerance of bad workmanship. In other words cowboys don't last long.

Dave Naylor,
Spennymore, Co. Durham.

I feel I have to respond to the many letters in *Television* on the trade and its future. Michael Maurice called for licensing and regulation (letters March). Who does he suppose will pay for the testing, inspection and paperwork required? We will of course. How much? Say £500 or £1,000 perhaps. Surely enough to put some people out of business if they are struggling as much as we are led to believe. The same applies to not being allowed to advertise unless you can prove competence. Who would check when you place an ad in the *Yellow Pages* or the local paper? It's not easy for example to check quickly whether a gas fitter is CORGI registered or not: the symbol may be on his van, but that doesn't prove anything. If you are having a £2,000 heating system installed, you would be happy to wait a short time to check a fitter's credentials if you were concerned.

But you probably wouldn't bother if you wanted your £60 Tesco video repaired yesterday.

So, who will check? Changes to the law would be required, and an agency to enforce it would have to be set up. The public already has a well-known organisation for complaints. It's called The Trading Standards Department. I suggest that Michael and others complain to this department if they know of or are concerned about someone doing sub-standard or dangerous repairs.

I work from home and advertise in all the local papers. Yes, I offer free estimates/callouts, but this is how I go about it. When a prospective customer phones I quote, after asking the relevant questions, an expected price for the repair. This is the free estimate. If the fault sounds like dry-joints, defective capacitors, short-circuit transistors etc. I say that the charge will be £35-£40. If the customer is happy to spend this amount I will collect the set. If, on closer inspection, the repair will cost more I phone to report this. If the customer chooses not to go ahead, the set is returned at no cost. This is the free callout.

By adopting this procedure I eliminate the time-wasters and those who want something done for nothing. I charge £35 even if the fault is one dry-joint. This ensures that I stay profitable despite the sets that have more complicated faults, for which I couldn't charge an amount that would fully cover the time/parts involved. Some people may think this unfair, but it keeps me in business and able to look after my customers.

I don't aim to compete with the local repair shops. Some people will go straight to the local papers for service, some will look in the *Yellow Pages* while others will go to a local shop. It all comes down to a customer's idea of charges and how much he/she can afford. Ask anyone which of these three approaches will be the most expensive and they will say the shop, because of overheads etc. Next comes the *Yellow Pages*, because of an expensive ad. Cheapest will be the local paper for someone who works from home with few overheads etc.

I have to say that during the past ten years of being in the trade, part and full time, the only bad repairs I have seen have been carried out by repair shops – the neutral or live terminal of a faulty mains switch being bridged – and would like to know just how bad the "cowboy" situation really is.

I could go on, but enough is enough. My point is that some people choose to work from home and advertise in the local papers. They may not have all the formal qualifications, but are more than competent to carry out repairs, have all the equipment required, have accounts with the well-known distributors, have never bodged a job, and are fed up with feeling that we are grouped together with the so-called cowboys. Oh, and by the way: I would rather spend the registration fee on a hot-air rework station!

Trevor Parker,
Dunstable, Beds.

PCB Repairs

I was surprised by John Halstead's letter (April) in response to my article on dealing with cracked PCBs. Before replying, I decided to see if others shared his opinion. Everyone I know in the repair industry (with the exception of telephone communications) has at some time repaired a damaged PCB. The subject was covered during my training for City & Guilds 224. The letters published in the May issue show that the practice is widespread, as I believed it to be.

It was never my intention to encourage fellow technicians to "bring the service side of the industry into disrepute". John Halstead does however make a valid point about the safety aspects of such repairs. This is something I should have covered in more detail in my original article.

Paul Smith,
Newtownabbey.

Debate is an excellent way of dispersing knowledge. Your follow-up (The PCB Repair Debate, May) to my original letter (April) was a worthy response. Many correspondents went further, offering more suggestions on PCB repair. But they are missing the point. Does the fact that a repair is technically possible make it appropriate? My letter drew attention to a report which mentioned that the incidence of fires caused by TV sets is on the increase, and to a Toshiba Service Bulletin which states that cracked PCBs should in all circumstances be replaced.

Suppose you successfully repair a cracked PCB in a TV set, the customer pays and takes the set home, then there's a fire at the customer's home a few weeks later. A Fire Officer calls at your shop, stating that the repaired set has been identified as the source of the fire. Are you responsible for the fire? You could argue that your repair was safe, that you carried out the work to a very high standard, and that something else inside the set must have caused the fire (this might be true, but impossible to prove). With current Health and Safety legislation you have to prove your innocence, not the courts your guilt.

If you cannot prove that your repair was safe, an impossible task when a major manufacturer like Toshiba bans such repairs, liability is yours alone. The judge would seek "the opinion of an expert". Could you as an individual argue against the opinion of a major manufacturer such as Toshiba? Could you expect anyone else to?

When I started in the industry some sets didn't have PCBs, twisted wire and insulation tape was the most common method of extending a mains lead, unfused 15A plugs were common, shrouded 13A plugs and safety components didn't exist, the open road had no speed restrictions and I had never heard of a seat belt. Times have changed. It's time to move on.

John Halstead,
Lockwood, Huddersfield.

Line Output Transistor Problem

We recently had in for repair a Panasonic set that uses the Euro 2S chassis. The fault was as straightforward as they come – the BU2508AX line output transistor was short-circuit. As a temporary measure I fitted a BU2508AF, which ran cool and confirmed that there were no further problems. But when I rang SEME to order the correct device I was told that it's no longer available: instead, Panasonic supplies a kit of parts at £16 plus VAT.

This seemed a bit excessive to say the least, but in the interests of safety and reliability a kit was ordered. It arrived next day and consisted of two line output transistors, one of which you discard depending on which version of the chassis you have, and a 100Ω resistor which is not used in most versions including the one we had. The one item we required had a total value of about £1.50, but instead we had to buy this so-called kit.

When I phoned to complain I was told that the price had been determined by Panasonic. Perhaps someone at Panasonic would care to explain? I have a shrewd suspicion that the BU2508AF would have worked just fine.

Steve Hague, TransVision,
Redruth, Cornwall.

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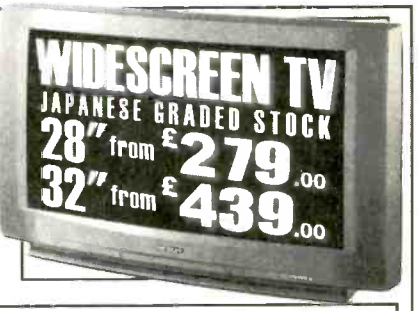

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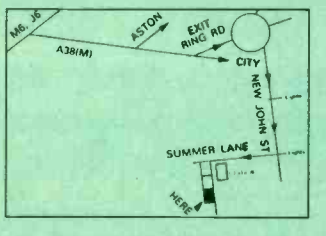

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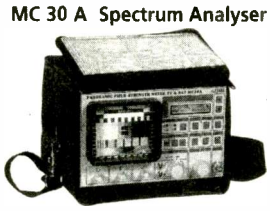

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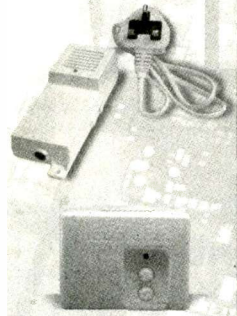

Technical Specification		
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Outputs	6 (+1)	7 (+1)
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2435372, 2435701, 2436773
2436792, 2436795, 2436797, 3216001
243066, 243063
3220029, 3714016, 47003481
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AT2077/81
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DST85B235/47328700 & /40153200
DST88N234/4000086AD, &/47805200L
DST88N234/47320041, &/47317590
DST186N243/473058-00
TFB3035D, TFB3069D, TFB4023AD
TFB4039AD, TFB4066AD

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TX10
TX85, TX86
TX89, TX98, TX99
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