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For more information on the entire Classic range and details of a distributor near you, call 01635 278678, visit us on the web; www.classic-electronics.co.uk or email us at sales@classic-electronics.co.uk

classic

Technical helpline 01635 278678

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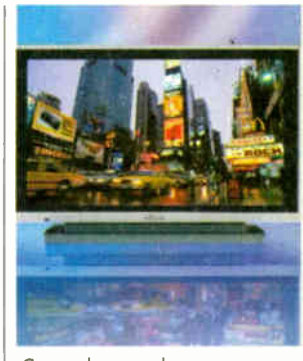
October 2001 Vol. 51, No. 12

Next issue, dated November, on sale October 17th.



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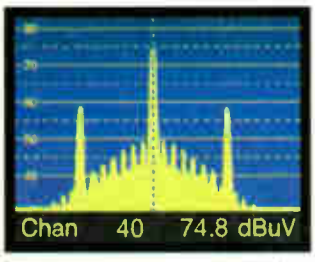
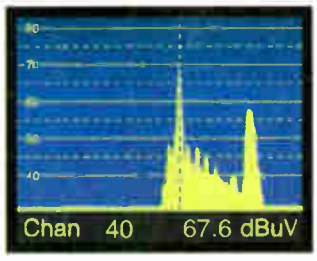
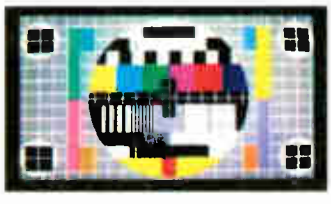
PROMAX

TELEVISION TEST PATTERN GENERATORS



The new pattern generators GV 798 and GV 898 offer advanced features at realistic prices. They produce 16:9 and 4:3 formats, output level set in 1 dB steps, multistandard, VITS, WSS, VPS, PDC, Teletext and much more. GV 898 uses vestigal side band modulation.





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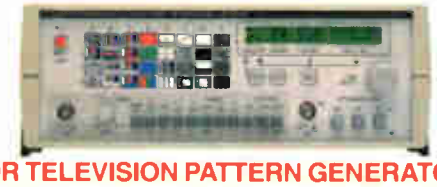

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Seeds of the future

It's interesting how research always seems to continue despite adverse economic conditions. There is much concern at present about the recessionary conditions throughout the world. Yet we are, fortunately, experiencing nothing remotely akin to the worldwide economic slump of the Thirties. It was during those years however that TV as we know it was developed. Progress was taking place in many other fields as well, in particular electrical engineering, the chemical industry and transport. By 1933 RCA had demonstrated a fully-electronic TV system, with 240-line scanning and transmission at VHF from atop the newly-built Empire State Building. RCA had increased the resolution to 343 lines interlaced by mid 1936. Other US firms were active in TV development, but the severity of the depression was such that regular broadcasting did not start until the early Forties.

In the UK EMI had, during the early Thirties, developed the fully-electronic TV system that became the basis of the BBC's TV service from late 1936 onwards. Much work was being done elsewhere, in Germany and France for example. Some suggest that the German 180-line system could claim to have been the first to be brought into service, with its start in 1935. There were transmissions from the Berlin Radio Tower, but these were to 'public viewing rooms'. Hitler was not prepared to allow TV broadcasting to develop freely – in fact it was placed under the jurisdiction of the Ministry of Air just prior to the opening of the 1935 Berlin Radio Show. Initially at least, video origin was by mechanical scanning from film, a technique Baird was by then using. But it seems that an electronic camera had come into use by the time of the Olympic Games in 1936.

Despite the economic problems of the era, research continued and considerable progress was made. Our current economic woes are quite benign in comparison, though certain industries are suffering to an extent to which they are unaccustomed. The electronics industry and, in particular, the semiconductor section is going through a very difficult period. During the last few weeks there have been announcements of huge job losses – 16,400 at Fujitsu, 18,800 at Toshiba and 14,700 at Hitachi, to quote the largest. Clearly this is no ordinary downturn.

August 12th saw the twentieth anniversary of the launch of the IBM PC, which was the start of the process that led to a PC on virtually every business desk. Some 500m PCs are estimated to have been in use worldwide by the end of the year 2000. But the first fall in global PC sales for fifteen years occurred during the second quarter of this year. The fall was to some extent the consequence of the massive purchasing of PCs, and allied equipment, because of the Y2K scare. However that might be, the PC market has become a mature one which is unlikely to boom again.

The second quarter of this year also saw the first year-on-year fall in mobile phone sales. It had to happen eventually, and this too is probably now a mature market. The telecoms companies expected the market to continue to expand as second- and third-generation phones came along. But that third generation has failed to get going: there are limits to what it is convenient to do with a mobile phone.

These two industries account for most of the increased demand for semiconductor devices in recent years. Their reduced sales have clobbered the semiconductor industry, which is not only suffering from reduced demand but also because of excessive investment in production capacity to meet anticipated sales. Semiconductor manufacturers are used to cyclic fluctuations in demand, but have nevertheless experienced a compound annual growth rate of 15-17 per cent. Revenues have now collapsed. From a peak reached last year, revenues have been falling by 25-75 per cent a quarter. Hence those horrendous job losses.

As in the sombre decade of the Thirties however, research continues apace. It has no doubt been reigned back somewhat, but firms that intend to remain in the forefront can't afford to neglect research. In fact interesting results are being produced. For example IBM has just announced a major breakthrough in semiconductor technology. It has long been clear that there are limits to what can be achieved with conventional silicon technology. The next step has to be circuitry at the molecular level. The single-atom gate has been anticipated for some time, and has been demonstrated in laboratories. What IBM has now come up with is a voltage-inverter based on the semiconductor properties of a single carbon nanotube molecule. IBM, and others who have been working on nanotube technology, expect that minute chips using it will eventually replace silicon. The advantages include much higher operating speeds and much lower power consumption.

Data storage is another area that's receiving a lot of research attention. There are limits to the magnetic storage of bits. Below a certain physical size, a bit's magnetic characteristics become unstable. To progress in this field, a new approach to storage technology is required. Organisations that are active in this field include IBM, Hewlett-Packard and Carnegie Mellon University. All three are using new storage surfaces that store bits as a few thousand atoms. The complexities lie in writing and reading such bits: various nanotechnology probes are being studied. Hewlett-Packard has recently been awarded a patent covering molecular technology that could replace conventional semiconductor memory arrangements.

As throughout the electronic age, research continues to produce the seeds of the future – whatever the economic conditions. ■

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INDEXES AND BINDERS
Indexes for Vols. 38 to 48 are available at £3.50 each from SoftCopy Ltd., who can also supply an eleven-year consolidated index on computer disc. For further details see page 760.

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

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TELETOPICS

DVD developments

The Recordable DVD Council, a 66-member body that consists of leading DVD technology developers and users, including Hitachi, JVC, Matsushita (Panasonic), Samsung and Toshiba, has launched a worldwide programme to promote recordable DVD products that comply with the recording standards approved by the DVD Forum, i.e. DVD-RAM, DVD-R and DVD-RW. But the first DVD recorder to appear in the UK, the Philips DVD1000, uses the slightly different DVD+RW format. It's now on sale, at about £1,500, with the rewritable discs at £20 each.

Columbia Tristar and Sony Pictures Entertainment have developed Superbit DVD-Video and are releasing titles that use this technique. It provides higher picture quality than a standard DVD by using a special high bit rate during the encoding process. Superbit titles make use of space that's normally allocated to extra material such as deleted scenes. They are compatible with standard DVD-Video players.

Panasonic has launched a portable DVD player, Model DVD-LA95, which has a 9in. LCD display screen, the industry's largest for a portable DVD player. It's the first portable DVD player that can read DVD-RAM discs. Weight is less than 1kg, including a built-in rechargeable battery and a TV tuner. The display can handle the 4:3 and 16:9 formats. Up to two and a half hours of DVD playback is provided by the battery pack, while use of an optional rechargeable battery pack, to be sold separately, gives up to eight hours of DVD movies or thirteen hours of TV programming. The DVD-LA95 plays DVD-Video, DVD-Audio, DVD-RAM, DVD-R (recorded on Panasonic's DVD video recorder, to be released shortly), CDs, CD-R and CD-RW discs. Panasonic's parent company Matsushita says that portable players currently make up about 15 per cent of the DVD player market in Japan. The DVD-LA95 was launched in Japan on September 1st, at an 'open' price, with shipment to overseas markets scheduled for later this year.

US company Zeros & Ones has developed a new compression system that enables up to five full-length movies to be stored on a single DVD, and has produced a demonstration disc. The compression technology, code-named MC10, uses more than a hundred processes ranging from high-definition image quality enhancements at the sub-pixel level during pre-compression to pixel-by-pixel motion tracking and processing during the compression stages. MC10 is claimed to achieve three to ten times greater compression than MPEG-2, with equivalent or superior image quality. Zeros & Ones intends to develop commercial versions of the technology and license it. The company says that MC10 could be used in DVD players and PVRs (hard-disk personal video recorders), and for videoconferencing systems and broadband applications.

Manufacturing moves

Philips, Europe's largest consumer electronics group, is to contract out manufacture of many of its products. As a first step manufacture of its VCRs is to be subcontracted to Funai Electric of Japan, the world's largest VCR manufacturer. Funai will produce Philips machines at its plants in Shanghai and elsewhere. The Philips VCR plant in Austria will close, with the loss of some 1,000 jobs. In future Philips' in-house production will be focused on newer lines such as flat-screen TV sets and DVD recorders. The company has been making a loss in recent months.

Hitachi plans to close its TV assembly plant at Hirwaun, South Wales, by the end of the year, with the loss of 174 jobs. This will be the end of a long period of set manufacture that started when Sobell moved production there in the mid-Forties.

Matsushita is to close its transformer plant at East Kilbride in November, with the loss of 100 jobs. The plant, built in 1992, manufactured Panasonic-branded LOPTs for TV sets and monitors.

This high-quality dual-board camera module, Model CB60H, has been added to the Pecan range of CCTV camera products. Based on a Sony 1/3in. CCD image sensor, the module provides a horizontal picture resolution of 450 lines with quality images at light levels as low as 3 lux. It's supplied with an integral varifocal lens with a DC-controlled auto-iris as standard, but is compatible with other lens types. The composite and S-video outputs are compatible with PAL or NTSC equipment. There's also a YC output and an RS232 interface.

Operation is at either 24V AC or 12V DC. If AC is used, the unit automatically synchronises to power line zero crossing to ensure roll-free vertical switching and recording. An external vertical phase-delay adjustment provides camera sync with multiphase power installations.

The CB60H can also be supplied in an application-ready form, such as a vandal-resistant or covert housing. For further details apply to Stortech Electronics Ltd., Unit 2, Spire Green Centre, Pinnacles West, Harlow, Essex CM19 5TS. The phone number is 01279 419 913, fax 01279 419 925.

VOD

A report from Frost and Sullivan on video on demand (VOD) in Europe forecasts a substantial growth in the market. It notes that the European roll-out of VOD lags that in the US. Video Networks launched VOD commercially in the UK during the last quarter of 2000, but audiences remain limited. Frost and Sullivan suggest that as the prices of STBs and bandwidth technology falls, network operators will be encouraged to launch viable VOD business models because the services will be affordable to average mass-market consumers. The company forecasts that by 2006 VOD will attract more than 8·5 million subscribers across Europe.

CPC telephone numbers

There are new telephone numbers for component distributor CPC of Preston. The sales office can be reached on 08701 202 530, fax 08701 202 531.

New video equipment

Panasonic has now launched in the UK its 50in. plasma panel display, Model TH-50PHD, which can be used with various TV, video and PC signal sources. For an account of some of the technology employed, see the article later in this issue (page 714). The panel can provide normal video displays at 720 pixels per line resolution and all monitor resolutions up to UXGA (1,600 x 1,200 pixels). Price is about £9,800 plus VAT. Panasonic is also due to launch 15 and 22in TV sets with LCD screens and new 42 and 47in. projection TV models.

Samsung has developed a 40in. LCD panel for use with widescreen TV sets: the resolution is 1,280 x 768 pixels.

Sharp has released two new digital video (DV) camcorders, Models VL-WD250H and VL-WD450H, that incorporate the industry's largest optical zoom at 26x. The range of picture enhancement facilities with the VL-WD250H includes Cat's Eye, which enables recordings to be made at light levels as low as 1 lux, digital gamma correction for improved detail in darker areas of the scene, digital image stabilisation and picture-in-picture effects. Sound performance can be enhanced with an optional zoom microphone which works in conjunction with the built-in microphone to provide a lifelike mix of wide-angle and narrow-band sound that varies with the amount of lens zoom employed. The VL-WD450H (pictured) has additional features: a Super Cat's Eye circuit that provides monochrome recording in complete darkness (0 lux); the ability to record still images and indexing information on a SmartMedia card; and software for downloading images to a PC.

Philex has introduced the AV Hub Plus selector, which makes viewing from different signal sources easier and adds to the versatility of home or office AV equipment. It provides automatic or remote control of up to four different pieces of AV equipment, simplifying cable arrangements with no need for connection/disconnection and thus reduced wear and tear on both the equipment and connections. Viewing programmes from or recording with two different VCRs at the same time is possible, also four-way recording. There are facilities for an additional satellite decoder, a lock function to protect recordings from accidental interruption, and front AV inputs for camcorders and games consoles. For further details apply to Philex Electronic Ltd. – phone 020 8202 1919 or e-mail sales@philex.com

MHP extension

Interactive TV software developer Open TV has completed joint development, with Matsushita, of an extension to the advanced digital interactive TV system MHP (Multimedia Home Platform). The latter was accepted by the DVB (Digital Video Broadcasting) project group as a standard API (Application Programming Interface) for use with services such as games, enhanced TV, shopping and banking – before the MHP standard was set, such applications could have required adaptations to operate with different broadcasting networks and set-top box designs. The MHP standard enables digital interactive content and services to be developed and used by all compatible TV set-top boxes, IDTV sets and multimedia PCs. The new MHP 1.0.1 extension will be available for certification as soon as the DVB releases its MHP Test Suite later this year.

Open TV also says that its interactive TV software will run with the new IBM STB03xxx series of PowerPC-based set-top box chips. These combine a PowerPC processor, an MPEG-2 audio/video decoder, a memory interface subsystem and a range of peripheral interfaces on a single silicon substrate. The chips provide high-speed operation, at 162MHz, and have a 16kbyte instruction cache and an 8kbyte data cache to provide the performance required for a range of new services.

Networked home trial

EA Technology has invited manufacturers of white and brown goods to join a consortium which will, in 2002, run the world's first large-scale field trial of multiple service provision to networked homes. The trial is backed by the International Energy Agency (IEA), which is part of the Organisation for Economic Co-operation and Development (OECD). Projects are also running in Australia, Canada, Finland and the Netherlands.

A key item in the UK trial will be a gateway unit developed EA Technology, called FlexGate, which provides communication between any domestic appliance or system and any external system, regardless of the protocols involved or the communications channel (phone line, cable TV, wireless, fibre etc.). EA Technology's commercial manager Robert Davis says "the unit is totally platform-independent and extremely flexible. It's a simple, low-cost black box that will be available from a growing number of manufacturers and is equally suitable for existing and new homes."

Networked home applications will include: remote monitoring of energy and water use, meter readings and faults; the ability to control heating and cooking remotely and shop for the best energy spot prices; monitoring emergency situations; and remote diagnosis of faults in domestic appliances with in-built intelligence and some maintenance.

EA Technology is based at Capenhurst near Chester and was formerly the research arm of the electricity industry. It became independent following a buy-out in October 1997.

For further information on the trial, EA Technology can be contacted on 0151 347 2460 – or check at the website www.eatechnology.com

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3300uF	CAP62	£10.00	5
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VALUE	CODE	PRICE	PER PACK
50 Volts continued			
33uF	CAP141	£0.85	10
47uF	CAP65	£0.85	10
68uF	CAP142	£0 90	10
100uF	CAP66	£0.85	10
220uF	CAP67	£1 75	10
330uF	CAP68	£2.45	10
470uF	CAP69	£4.35	10
680uF	CAP70	£4.90	5
1000uF	CAP71	£5.25	10
1500uF	CAP143	£4.50	5
2200uF	CAP72	£3.25	2
3300uF	CAP144	£3.25	2
63 Volts			
0 22uF	CAP145	£0.45	10
0 47uF	CAP73	£0.35	10
1uF	CAP74	£0.35	10
2.2uF	CAP75	£0.35	10
3.3uF	CAP76	£0.50	10
4.7uF	CAP77	£0.35	10
10uF	CAP78	£0.50	10
15uF	CAP79	£0.95	5
22uF	CAP80	£0.75	10
33uF	CAP81	£0.85	10
47uF	CAP82	£0.95	10
68uF	CAP83	£1 30	5
100uF	CAP84	£1 20	10
150uF	CAP85	£2.80	5
220uF	CAP86	£2.80	10
330uF	CAP87	£4.00	10
470uF	CAP88	£5.25	10
680uF	CAP89	£5 00	10
1000uF	CAP90	£5.40	5

VALUE	CODE	PRICE	PER PACK
100 Volts			
0.47uF	CAP91	£0.50	5
1uF	CAP92	£0.85	10
1 5uF	CAP93	£0.70	5
2 2uF	CAP94	£0.50	5
3 3uF	CAP95	£0.50	5
4.7uF	CAP96	£0.50	5
10uF	CAP97	£0.95	10
22uF	CAP98	£1.05	10
33uF	CAP99	£1.55	5
47uF	CAP100	£1.75	10
100uF	CAP101	£2.10	10
220uF	CAP102	£6.00	5
470uF	CAP103	£6 00	5
160 Volts			
2 2uF	CAP146	£0 45	10
10uF	CAP147	£1.40	10
22uF	CAP148	£1.80	10
33uF	CAP149	£2 30	10
100uF	CAP150	£3.25	5
200 Volts			
100uF	CAP151	£3.25	5
250 Volts			
1uF	CAP152	£0.60	10
3.3uF	CAP104	£1.75	10
10uF	CAP105	£2.60	10
22uF	CAP153	£2.30	10
47uF	CAP106	£4.35	10
100uF	CAP154	£4.50	5
220uF	CAP155	£2.00	2

VALUE	CODE	PRICE	PER PACK
350 Volts			
1uF	CAP156	£0.70	10
3.3uF	CAP157	£1.50	10
10uF	CAP158	£2.25	10
22uF	CAP159	£3.40	10
400 Volts			
1uF	CAP107	£2.15	5
2.2uF	CAP108	£2.25	5
4.7uF	CAP109	£3.15	5
10uF	CAP110	£4.00	5
22uF	CAP111	£2.50	2
47uF	CAP112	£3.50	2
100uF	CAP160	£4.00	2
220uF	CAP161	£7.00	2
450 Volts			
1uF	CAP113	£2.80	5
2.2uF	CAP114	£3.20	5
4.7uF	CAP115	£4.95	5
10uF	CAP116	£5.50	5
22uF	CAP117	£4.15	2

Fuses

20mm Glass

TIME LAG

CURRENT RATING	ORDER CODE	PRICE
100mA	FUSE36	75p
160mA	FUSE01	75p
250mA	FUSE02	75p
315mA	FUSE03	75p
400mA	FUSE04	75p
500mA	FUSE05	75p
630mA	FUSE06	75p
800mA	FUSE07	60p
1A	FUSE08	60p
1.25A	FUSE09	60p
1.6A	FUSE10	60p
2A	FUSE11	50p
2.5A	FUSE12	50p
3.15A	FUSE13	55p
4A	FUSE14	55p
5A	FUSE15	60p
6.3A	FUSE16	60p

QUICK BLOW

CURRENT RATING	ORDER CODE	PRICE
100mA	FUSE37	60p
160mA	FUSE17	60p
250mA	FUSE18	60p
315mA	FUSE19	60p
400mA	FUSE20	60p
500mA	FUSE21	60p
630mA	FUSE22	60p
800mA	FUSE23	60p
1A	FUSE24	60p
1.25A	FUSE25	60p
1.6A	FUSE26	60p
2A	FUSE27	60p
2 5A	FUSE28	60p
3.15A	FUSE29	50p
4A	FUSE30	50p
5A	FUSE31	50p
6.3A	FUSE32	50p

All above Fuse prices are for a pack of 10

Wickman Fuses

FAST BLOW

CURRENT RATING	ORDER CODE	PRICE
0.04A	FUSE53	60p
0 05A	FUSE54	35p
0.063A	FUSE55	35p
0.08A	FUSE56	35p
0.1A	FUSE57	30p
0.125A	FUSE58	30p
0 16A	FUSE59	30p
0.2A	FUSE60	30p
0 25A	FUSE61	30p
0.315A	FUSE62	30p
0.4A	FUSE63	30p
0.5A	FUSE64	30p
0.63A	FUSE65	30p
0.8A	FUSE66	30p
1A	FUSE67	30p
1.25A	FUSE68	30p
1 6A	FUSE69	30p
2A	FUSE70	30p
2.5A	FUSE71	30p
3.15A	FUSE72	30p
4A	FUSE73	30p

SLOW BLOW

CURRENT RATING	ORDER CODE	PRICE
0.05A	FUSE74	65p
0 063A	FUSE75	5p
0.08A	FUSE76	65p
0.1A	FUSE77	5p
0.125A	FUSE78	35p
0.16A	FUSE79	35p
0.2A	FUSE80	30p
0.25A	FUSE81	30p
0.315A	FUSE82	30p
0.4A	FUSE83	30p
0.5A	FUSE84	30p
0.63A	FUSE85	30p
0.8A	FUSE86	30p
1A	FUSE87	30p
1.25A	FUSE88	30p
1.6A	FUSE89	30p
2A	FUSE90	30p
2.5A	FUSE91	30p
3.15A	FUSE92	30p
4A	FUSE93	30p
5A	FUSE94	30p

All above Wickman Fuse prices are for single units

CERAMIC PLUG TOP (MAINS) FUSES

RATING	CODE	PRICE
3A	FUSE33	£1.00
5A	FUSE34	£1.00
13A	FUSE35	£1.00

Soldering Irons and Solder

Antex Soldering Irons

Description	Order Code	Price
25 watt 240 VAC Iron	SI01	£12.50 + vat
25 watt Spare Element	SI03	£6.00 + vat
15 watt 240 VAC Iron	SI02	£12.50 + vat
15 watt Spare Element	SI04	£6.00 + vat

Solder

Solder Gauge & Weight	Code	Price
18 SWG 500 grammes	SI10	£ 5.00
20 SWG 500 grammes	SI11	£ 6.50
22 SWG 500 grammes	SI12	£ 7.00

Grandata Ltd

distributor of electronic components

Transistors / Linear IC's

TRANSISTORS

2N 2218A	24p
2N 2222	23p
2N 2369	15p
2N 2484	15p
2N 2646	40p
2N 2904	20p
2N 2905	20p
2N 2906	18p
2N 2907	18p
2N 3019	28p
2N 3053	18p
2N 3054	40p
2N 3055	38p
2N 3055H	50p
2N 3440	45p
2N 3441	175p
2N 3442	85p
2N 3771	85p
2N 3772	90p
2N 3773	100p
2N 3819	29p
ACY 18	48p
ACY 19	48p
AD 149	60p
AF 127	100p
AF 139	30p
BCY 33	200p
BCY 70	16p
BCY 71	16p
BCY 72	16p
BD 131	25p
BD 132	25p
BD 133	50p
BD 135	20p
BD 136	20p
BD 137	20p
BD 138	20p
BD 139	20p
BD 140	20p
BD 244	50p
BD 245	50p
BFQ 162	100p
BFQ 232	75p
BFQ 235A	75p
BFQ 252A	60p
BFQ 255A	75p
BFQ 262A	75p
BFX 84	15p
BFX 85	20p
BFX 87	15p
BFX 88	15p
BFX 89	40p
BFY 50	14p
BFY 51	14p
BFY 52	14p
BU 1506DX	130p
BU 1508AX	130p
BU 1508DX	105p
BU 180	100p
BU 204	65p
BU 205	70p
BU 206	100p
BU 207	150p
BU 208A	75p
BU 208AT	200p
BU 208D	130p
BU 2506DF	90p
BU 2506DX	100p
BU 2508A	100p
BU 2508AF	110p
BU 2508AX	130p
BU 2508D	130p
BU 2508DF	120p
BU 2508DX	150p
BU 2520AF	170p
BU 2520AX	140p
BU 2520DF	225p
BU 2520DX	200p
BU 2522AX	150p
BU 2525A	325p
BU 2525AF	220p
BU 2525AX	190p
BU 2525D	240p
BU 2525DX	175p
BU 2527AF	400p
BU 2527AX	250p
BU 2532AL	325p
BU 2722AF	330p
BUF 405A	200p
BUF 405AF	300p
BUH 1215	450p
BUH 315	200p
BUH 315D	175p
BUH 515	200p
BUH 515D	250p
BUH 517	275p
BUH 517D	175p
BUH 715	425p
BUL 310	125p
BUT 11A	30p
BUT 11AF	35p
BUT 11AX	50p
BUT 12A	80p
BUT 12AF	90p
BUT 18A	80p
BUT 18AF	65p
BUT 56A	65p
BUZ 77B	250p
BUZ 80	135p
BUZ 80AF	200p
BUZ 90A	180p
BUZ 90AF	280p
BUZ 91A	260p
IRF 510	70p
IRF 520	75p
IRF 530	75p
IRF 540	100p
IRF 610	80p
IRF 620	100p
IRF 630	75p
IRF 640	150p
IRF 710	150p
IRF 720	85p
IRF 730	125p
IRF 740	90p
IRF 820	90p
IRF 830	85p
IRF 9610	95p
IRF 9620	85p
IRF 9630	130p
IRFBC 30	120p
IRFBC 40	210p
IRFP 150	240p
IRFP 240	300p
IRFPC 40	300p
IRFPC 50	450p
IRFZ 44	160p
MJ 11015	250p
MJ 11016	300p
MJ 15003	250p
MJ 15004	300p
MJ 15015	250p
MJ 15016	350p
MJ 15022	400p
MJ 15023	400p
MJ 15024	400p
MJ 15025	300p
MJF 16206	450p
MJF 18004	175p
MJF 18006	200p
MJF 18008	175p
MJF 18201	350p
OC 28	350p
S 2000A3	175p
S 2000AF	90p
S 2000N	150p
S 2055A	175p
S 2055AF	175p
S 2055N	150p
TIP 121	35p
TIP 122	30p
TIP 125	30p
TIP 126	40p
TIP 127	35p
TIP 145	50p
TIP 147	80p
TIP 2955	50p
TIP 29A	22p
TIP 29C	25p
TIP 3055	50p
TIP 30C	25p
TIP 31A	22p
TIP 31C	27p
TIP 32A	21p
TIP 32C	28p
TIP 33	50p
TIP 33C	60p
TIP 34	65p
TIP 34C	60p
TIP 35C	65p
TIP 36C	65p
TIP 41A	20p
TIP 41C	22p
TIP 42A	20p
TIP 42C	22p

VOLTAGE REGULATORS

7805	18p
7806	18p
7808	25p
7809	18p
7812	18p
7815	25p
7818	25p
7824	25p
7905	25p
7912	30p
7915	30p
7918	30p
7924	30p
LM 309K	100p
LM 317T	100p

LINEAR IC's

AN 5151	200p
AN 5265	80p
AN 5512	100p
AN 5515	160p
BA 5402	180p
BA 5406	180p
BA 6209	85p
HA 13150A	1150p
HA 13151	875p
HA 13152	800p
HA 13153A	900p
HA 13157	950p
HA 13158	800p
KIA 6210AH	400p
L 200	200p
L 272	200p
LA 4440	200p
LA 4445	200p
LA 4446	170p
LA 4450	330p
LA 4451	500p
LA 4460	120p
LA 4461	120p
LA 4705	400p
LA 7830	90p
LA 7831	85p
LA 7837	150p
LA 7838	200p
LA 7840	175p
LA 7850	225p
LA 7851	200p
LM 2405T	625p
LM 2406T	400p
LM 2416T	650p
LM 2419T	800p
LM 301	26p
LM 324	30p
LM 339	35p
LM 380	80p
LM 381	150p
LM 382	130p
LM 386	60p
LM 387	100p
LM 389N	105p
LM 3900	40p
LM 3909	100p
LM 3914	160p
LM 3915	160p
LM 3916	270p
LM 393	45p
LM 723	40p
LM 741DIL	18p
LM 747	55p
MB 3730	900p
MC 44602P2	250p
NE 5532P	140p
NE 555	20p
NE 556	40p
SAA 1293	850p
SAA 3004	400p
SAA 5000	200p
SAA 5010	220p
SAA 5012	400p
SAA 5020	350p
SAA 5030	440p
SAA 5050	650p
SAA 5231	170p
SAA 7000	550p
STK 0049	510p
STK 0050	1200p
STK 0059	1000p
STK0080	1000p
STK015	900P
STK025	650p
STK084	600p
STK1039	460p
STK1040	640p
STK1049	700p
STK1060	700p
STK2025	620p
STK2030	1000p
STK2101	1050p
STK2110	550p
STK2230	1300p
STK2240	1800p
STK2250	1600p
STK3044	500p
STK3082	550p
STK3152 II	900p
STK3156	500p
STK4017	400p
STK4019	480p
STK4021	380p
STK4024 II	550p
STK4025	530p
STK4026	480p
STK4026II	480p
STK4028	550p
STK4036	800p
STK4038	680p
STK4042 II	800p
STK4044	950p
STK4046	950p
STK4050 II	1600p
STK405-050A	1200p
STK4060	510p
STK4065	650p
STK4101	500p
STK4111	400p
STK4112	500p
STK4121	480p
STK4122	560p
STK4130 II	700p
STK4131	480p
STK4132 II	600p
STK4133 II	750p
STK4140 II	800p
STK4141 II	420p
STK4141 V	480p
STK4142	530p
STK4150 II	1200p
STK4151	680p
STK4152	650p
STK4161	650p
STK4162	550p
STK4171	900p
STK4172 II	680p
STK4181	680p
STK4182 II	750p
STK4191	900p
STK4192	700p
STK4197 II	950p
STK4199 II	1050p
STK4204 II	1050p
STK4211 V	800p
STK4221 II	1200p
STK4231 II	1050p
STK4231 V	1400p
STK4272	500p
STK4273	700p
STK4274	500p
STK4301	500p
STK4311	650p
STK433	400p
STK4332	365p
STK435	375p
STK4352	500p
STK436	430p
STK4362	450p
STK437	600p
STK4372	490p
STK439	500p
STK4392	500p
STK441	680p
STK4412	450p
STK4432	600p
STK457	470p
STK459	560p
STK460	660p
STK461	600p
STK463	950p
STK465	900p
STK4773	820p
STK4803	1300p
STK4813	800p
STK4833	850p
STK4873	1100p
STK501	550p
STK5314	475p
STK5315	500p
STK5323	600p
STK5324	300p
STK5325	370p
STK5326	750p
STK5330	850p
STK5331	300p
STK5332	180p
STK5333	650p
STK5335	350p
STK5336	350p
STK5337	500p
STK5338	295p
STK5339	400p
STK5340	350p
STK5342	245p
STK5343	380p
STK5352	500p
STK5353	400p
STK5361	375p
STK5362	400p
STK5364	250p
STK5371	350p
STK5372	260p
STK5373	375p
STK5383	300p
STK5391	375p
STK5392	500p
STK5431	550p
STK5434	570p
STK5436	500p
STK5441	350p
STK5443	575p
STK5446	350p
STK5451	390p
STK5461	500p
STK5462	350p
STK5464	300p
STK5466	500p
STK5467	400p
STK5468	300p
STK5471	900p
STK5472	375p
STK5473	480p
STK5474	500p
STK5476	350p
STK5477	700p
STK5478	250p
STK5479	300p
STK5481	470p
STK5482	285p
STK5483	440p
STK5486	450p
STK5488	480p
STK5490	450p
STK561	400p
STK563	415p
STK5632	300p
STK5720	400p
STK5725	350p
STK5730	300p
STK583	400p
STK6316	300p
STK6324B	500p
STK6327	1200p
STK6328A	400p
STK6431	600p
STK6607	400p
STK6722	650p
STK6732	1000p
STK6822	750p
STK6875	650p
STK6922	1500p
STK6932	450p
STK6962	275p
STK6972	300p
STK6981B	500p
STK6982	600p
STK6982H	600p
STK7216	420p
STK7217	250p
STK7225	500p
STK7226	1700p
STK730-060	650p
STK730-080	600p
STK7308	700p
STK7309	400p
STK7310	320p
STK73405 II	550p
STK73410	350p
STK73410 II	500p
STK7348	400p
STK7356	425p
STK7358	440p
STK73908	550p
STK7402	560p
STK7404	600p
STK7406	650p
STK7408	675p
STK7410	1500p
STK7562	1000p
STK7563	800p
STK7573	300p
STK760	500p
STK770	400p
STK7707	900p
STK780	480p
STK78603	750p
STK795	325p
STK79917	800p
STK8260	1200p
STK8280	1850p
STR 10006	450p
STR 11006	325p
STR 12006	350p
STR 17006	500p
STR 20015	400p
STR 2005	400p
STR 2012	350p
STR 30110	330p
STR 30115	275p
STR 3135	250p
STR 370	300p
STR 371	400p
STR 380	350p
STR 381	390p
STR 383	410p
STR 384	350p
STR 40090	350p
STR 40115	600p
STR 4090A	650p
STR 4211	315p
STR 440	800p
STR 44115	475p
STR 450A	700p
STR 451	800p
STR 45111	550p
STR 452	475p
STR 453	500p
STR 454	1300p
STR 455	550p
STR 456	470p
STR 457	600p
STR 470	300p
STR 50020	350p
STR 50103A	260p
STR 50112A	650p
STR 50113	500p
STR 50115	500p
STR 50213	400p
STR 50330	475p
STR 51424	700p
STR 53041	400p
STR 54041	320p
STR 5412	280p
STR 55041	450p
STR 56041	550p
STR 58041	250p
STR 59041	300p
STR 60001	525p
STR 6020	270p
STR 61001	475p
STR 80145	475p
STR 81145	375p
STR 83145	500p
STR 83159	700p
STR 9005	400p
STR 9012	300p
STRD 1706	360p
STRD 1806	360p
STRD 1816	350p
STRD 6008	575p
STRD 6108	450p
STRD 6202	400p
STRD 6601	650p
STRD 6801	500p
STRM 6511	750p
STRM 6559	850p
STRS 6707	1000p
STRS 6708	575p
STRS 6709	600p
STV 2102B	800p
STV 2110B	800p
STV 2116A	750p
STV 2118B	1000p
STV 9379	400p
TA 7205A	400p
TA 8200AH	325p
TA 8207K	175p
TA 8210	260p
TA 8211AH	200p
TA 8215	300p
TA 8215H	300p
TA 8216H	300p
TA 8217P	120p
TA 8218AH	425p
TA 8220H	500p
TA 8221AH	600p
TA 8227	250p
TA 8251AH	700p
TA 8255AH	1050p
TA 8256H	450p
TA 8427K	200p
TA 8659AN	900p
TA 8659CN	800p
TA 8690AN	700p
TA 8701AN	275p
TBA 120S	40p
TBA 520	120p
TBA 530	100p
TBA 540	90p
TBA 560	90p
TBA 810AS	40p
TBA 820M	35p
TDA 1170N	85p
TDA 1170S	85p
TDA 1175	175p
TDA 1524A	200p
TDA 1541A	400p
TDA 1557Q	300p
TDA 1670A	200p
TDA 1675A	200p
TDA 16846	200p
TDA 2002	50p
TDA 2003	65p
TDA 2004	150p
TDA 2005	150p
TDA 2006	70p
TDA 2007	120p
TDA 2008	100p
TDA 2009	160p
TDA 2010	150p
TDA 2020	120p
TDA 2030	80p
TDA 2030H	100p
TDA 2050V	200p
TDA 2051V	450p
TDA 2052V	525p
TDA 2530	300p
TDA 2532	100p
TDA 2578A	700p
TDA 2579A	210p
TDA 2581	100p
TDA 2593	80p
TDA 2595	200p
TDA 2653A	450p
TDA 3190	200p
TDA 3560	600p
TDA 3561	300p
TDA 3562A	260p
TDA 3651	200p
TDA 3652	500p
TDA 3652TX10	800p
TDA 3653B	80p
TDA 3654	80p
TDA 3654Q	85p
TDA 4500	300p
TDA 4565	150p
TDA 4600	200p
TDA 4600II	160p
TDA 4601	120p
TDA 4601D	65p
TDA 4605	190p
TDA 4610	370p
TDA 4950	100p
TDA 6101Q	120p
TDA 6103Q	225p
TDA 6106Q	125p
TDA 6107Q	300p
TDA 8138A	130p
TDA 8139	200p
TDA 8170	170p
TDA 8171	230p
TDA 8172	200p
TDA 8179S	750p
TDA 8350Q	275p
TDA 8351	200p
TDA 8362AN3	750p
TDA 8702	275p
TDA 8703	500p
TDA 9102C	250p
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Panasonic's Plasma Display TVs

How would you like a TV set that has perfect colour purity, perfect convergence and perfect focusing across the whole screen? Would you like it to have a viewing angle of 160°, and be able to mount it on the wall? These are the inherent advantages of using a plasma display panel to present the TV picture. Brian Storm investigates the Panasonic approach to PDP technology, in the form of the GP2D chassis

I recently had to evaluate a Panasonic GP2D chassis plasma display panel, as used in TV Model TC37PD1, for technical training purposes. The most striking feature initially is the weight difference between the 37in. plasma display panel and say the Panasonic Model TX36PF10, which has a 36in. CRT. I could manoeuvre the panel with no difficulty at all, lifting and carrying it to a suitable bench with ease. In comparison, movement of a TX36PF10 set requires at least four fit people or the use of a fork-lift truck.

Panel configuration

Panasonic plasma display panels (PDPs) consist of a plasma cell matrix with 480 rows of 2,556 RGB cells, i.e. 1,226,880 cells in total. They are currently produced in 37 and 42in. sizes, with a 50in. version in prospect. As the cells are alternately red, green and blue, the display resolution is 852 x 480 pixels. The RGB cells are arranged so that they form vertical stripes – in this one respect the display is similar to a CRT screen. But with Panasonic PDPs the RGB cells/stripes have different widths, to improve colour rendering and brightness. This is referred to as an asymmetrical cell arrangement, see Fig. 1.

Each cell has a phosphor lining and is filled with a weak mixture of neon and xenon gas, which is activated in a similar way to a fluorescent tube – by applying a specific trigger voltage. Once activated, the gas produces a burst of wideband electromagnetic radiation (ultra-violet). This energises the phosphor to produce light. The ultra-violet radiation is the main cause of phosphor energisation and thus illumination. Brightness is determined by the gas energisation (discharge) time. Control of this is known as sub-field drive, see below.

Fig. 2 shows the basic arrangement of a plasma display cell. Fig. 3 provides greater detail. There are three electrodes, a vertical data electrode at the rear and, at the front, horizontal scan and sustain electrodes. The cell contains two thirds

of an atmosphere that consists of a mixture of xenon and neon gas, and is coated on its sides and rear with coloured phosphor. 1,226,880 of these cells are precisely arranged between glass sheets. As mentioned above, the cells are arranged to provide vertical stripes, 2,556 across the panel.

In addition to the front glass sheet there's a front protective screen to help filter out the wideband electromagnetic radiation generated by the activated cells. A supporting cast aluminium sheet at the rear gives strength and support.

What is plasma?

The term plasma is used for the type of display device described above. But what actually is plasma? It consists of positive free ions and negative free electrons and has properties that are fundamentally different from those of solids, liquids and gases. Because of this, plasma is considered to be a fourth state of matter.

Plasma is rare in the terrestrial environment, occurring naturally in lightning and flames. Elsewhere in the universe however plasma is the predominant state of matter – in fact 99 per cent of the known universe seems to consist of plasma. The stars consist of dense, high-temperature plasma, and very low-density plasma is present as tenuous gas clouds in the vast voids between them. It is only on temperate planetary bodies that matter exists in its more familiar physical states.

Plasma technology has for many years been used in fluorescent lighting. The principle here is that a low-density inert gas is triggered to a plasma state. When in its plasma state the gas generates ultra-violet light, which activates the phosphor coating on the inner surface of the sealed glass tube to provide light. This is precisely the principle employed by plasma panels, but there is of course the considerable additional complexity involved in controlling the instantaneous brightness of each cell.

The scanning system

Specially-generated scan and sustain waveforms, and a data-drive system to select, sequentially, the cells that require selection and sustaining, are needed to drive a plasma panel.

Fig. 4 shows the waveforms that are present at a cell's scan and sustain electrodes respectively. The high-amplitude, two-level pulses in the scan-drive waveform are initialisation pulses. They are applied to the cell, between the scan and sustain electrodes, to neutralise any charge that may remain from previous activation and prepare the cell for its next operation. The initialisation process basically ensures that each cell has a consistent light output each time it is selected. Following initialisation, a large positive write pulse is applied to the cell's data electrode. The action of this combines with a negative pulse applied to the scan electrode to activate the cell. A series of opposite-polarity sustain pulses is then applied between the scan and sustain electrodes, to keep the cell lit for a certain length of time: the longer the cell is lit, the brighter its output.

This process of cell initialisation, write and sustain is the basic principle of plasma panel operation. It's known as the sub-field drive system. See Fig. 5.

Panasonic plasma panels use a complex multiple split sub-field drive system known as Plasma AI drive. Traditionally, an eight sub-field drive system based on the power of 2 has been used to drive plasma panel cells, see Fig. 6. Each TV field period is divided into eight sub-field periods. The first sub-field has one sustain cycle, the second has two, the third has four and so on. Thus we have 1, 2, 4, 8, 16, 32, 64 and 128, which provide 256 different brightness levels from a cell. This is done by selecting any or all of the possible sustain periods. Thus the 1 and 2 sustain periods, i.e. three sustain cycles, may be used in a very low-brightness area of the display. In a high-brightness area the 16, 32, 64

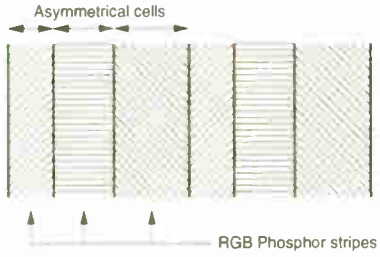


Fig. 1: The asymmetrical cell arrangement used to improve colour rendering and brightness.

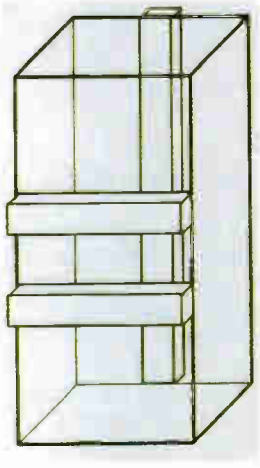


Fig. 2: Basic plasma cell construction.

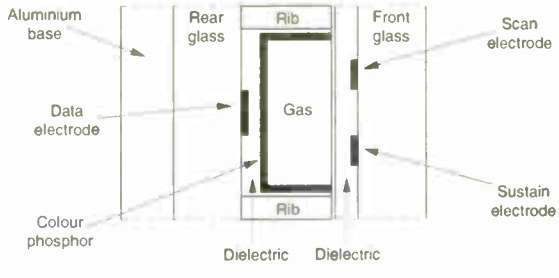


Fig. 3: The cell sandwich arrangement between the front and rear glass.

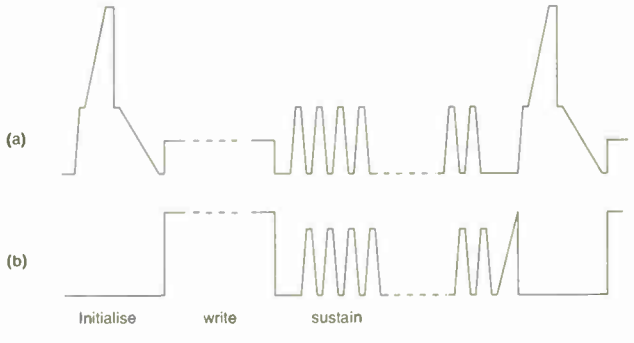


Fig. 4: Scan drive (a) and sustain drive (b) waveforms.

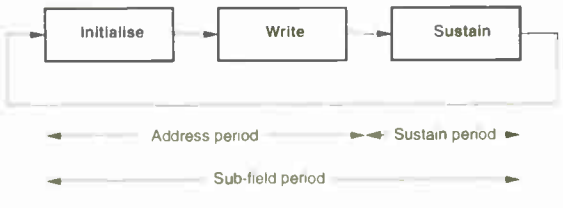


Fig. 5: The sub-field drive sequence.

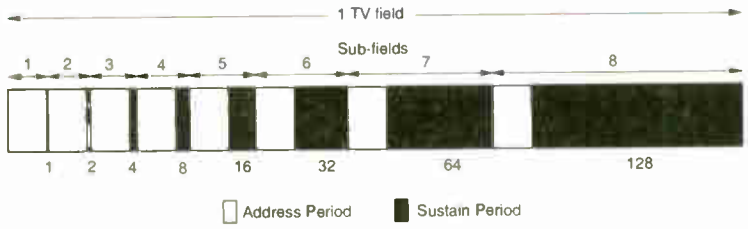
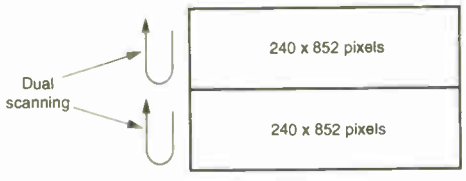


Fig. 6: The traditional eight sub-field drive during a field period. The length of the sustain period used determines the brightness level produced by a cell.

Fig. 7: The dual-scan system is used to increase the light output produced by a panel.



and 128 sustain cycles, a total of 240, might be used.

The problem with this system is timing. We are not increasing the actual cell brightness but the time during which the cell is illuminated. The main problem occurs between 127 and 128 sustain cycles. For 127 1 + 2 + 4 + 8 + 16 + 32 + 64 + 0 = 127 are used, while for 128 0 + 0 + 0 + 0 + 0 + 0 + 0 + 128 are used. This timing difference produces edge artefacts, especially with lateral movement. Typically, an object moving to the right develops a black edge at the left, with vertical red lines within the object. An object moving to the left develops a white edge at the right, with vertical green lines within the object. In these days of high-quality display panels such motion artefacts clearly need to be reduced or eliminated. Hence the Panasonic Plasma AI drive system.

Panasonic Plasma AI drive

AI stands for adaptive intensification, and is used with many Panasonic TV sets to maintain good black and white levels with a wide range between, thus making blacks blacker and whites whiter. Plasma AI redefines the traditional eight-bit sub-field drive system by using a linear-coded 10, 11 or 12 sub-field drive system. A high-brightness scene uses 12 sub-field drive to improve the dynamic range. A low-brightness scene uses 10 sub-field drive, as this improves the lighter part of the scene. Anywhere in between uses 11 sub-field drive. Because this is a linear coded system (1, 2, 4, 7, 11, 16, 24, 31, 42, 52, 66 etc.) there are no immense timing errors, as in the eight-bit system, and motion artefacts are greatly reduced.

Even within this linear system there are certain sustain values that could produce motion artefacts. This is overcome by programming the software to avoid certain combinations of numbers. The result is that this Plasma AI system can produce moving pictures of excellent quality, without any of the problems that were associated with previous plasma displays.

Line scanning

There's another problem that has to be solved, panel brightness. As a plasma cell emits only a fairly feeble glow, normal successive pixel scanning as used with a CRT would produce a weak picture. To overcome this problem, complete lines of cells are illuminated.

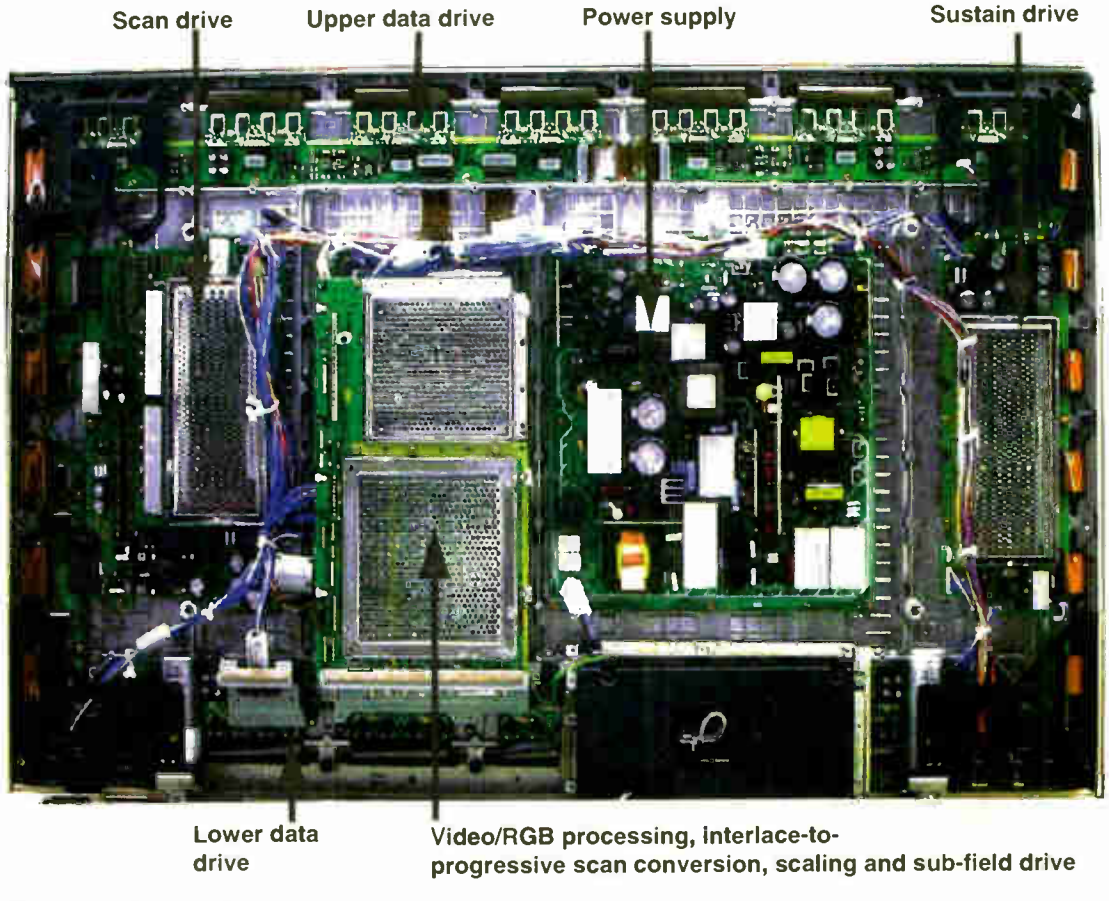


Fig. 8: Panel layout, rear view.

Line one is illuminated completely, then line two completely and so on. This process is known as line-sequential scanning and provides a good light output level.

Panasonic takes this a step further by employing a dual-scan system to double the light output. The plasma panel in effect consists of two horizontal panels joined together in the middle, see Fig. 7. The two panels are scanned simultaneously. What we have is two separate displays of 240 x 852 pixels giving, together, 480 x 852 pixels.

The combination of this dual-scan system with Plasma AI produces a display that rivals the CRT in brightness and contrast. This is clearly important with a display that has to compete at the top end of the domestic TV market.

Real black level

One of the deficiencies of plasma displays is the lack of a black level. Black is never truly black, as the initialisation of each cell before write and sustain results in a very low background illumination. In a newer panel Panasonic has increased the display blackness by initialising only once during a complete sub-field cycle, i.e. once in 10, 11 or 12 depending on the Plasma AI analysis. This increases the black-to-white ratio from about 250:1 to about 3,000:1, which is far in excess of a standard CRT.

It's possible that visual artefacts could arise because of the less frequent initialisation process, but the subjective increase in picture quality seems worth the risk.

Energy recovery

A major problem with plasma display panels is their capacitance. There's a tiny capacitance between the electrodes of each cell: multiply this by 1,226,880 and you have a large capacitance. The drive waveforms therefore require considerable power to overcome the initial charging of each cell.

To compensate for this, Panasonic uses a power-factor controller in the main feed to the switch-mode power supplies and an energy-recovery circuit that works alongside the scan-drive system.

Use of the power-factor controller results in greater than 90 per cent efficient regulation of the high-voltage supplies. As a result, a great deal less heat is generated throughout the regulation processes.

The energy-recovery circuitry recovers some of the capacitive charge energy from the panel. This can be used to assist the scan-drive circuit.

These techniques reduce the power consumed by the panel and, as a result, the heat generated by the panel-drive circuits and power supplies. The reason for all this additional processing is to remove the need for internal cooling fans and reduce the energy demand on the mains supply.

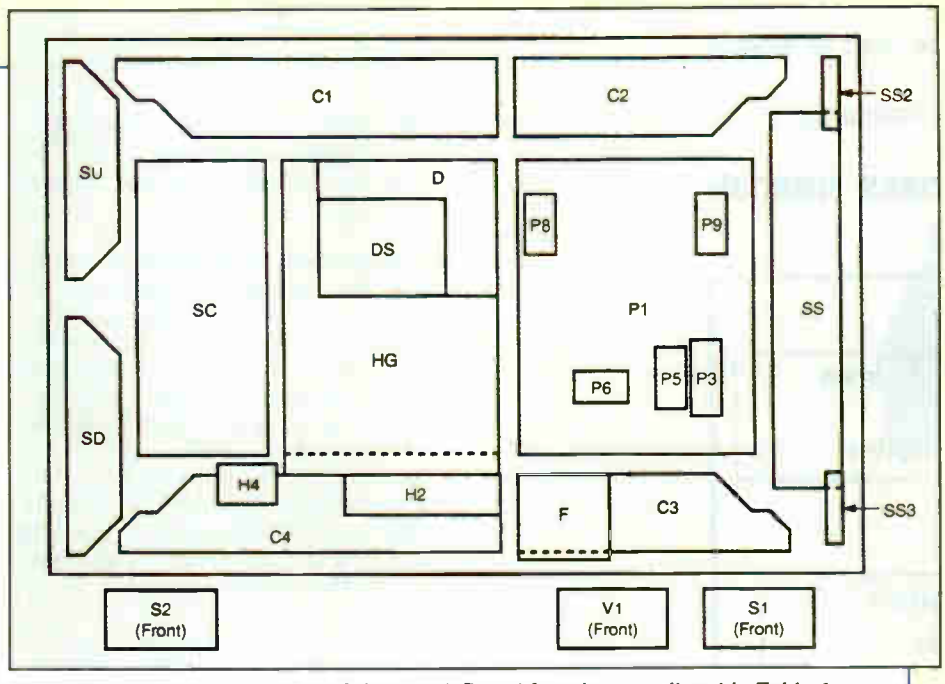


Fig. 9: Board layout at the rear of the panel. Board functions are listed in Table 1.

Panel layout

Fig. 8 shows the layout at the rear of the Panasonic plasma panel. Fig. 9 illustrates the board layout. Table 1 lists board functions.

Input connections

A plasma display panel is not itself a TV set: it's a display device. It has no built-in tuner unit, or scart inputs. Panasonic does however have a tuner box with three scart sockets at the back and RCA audio/video inputs at the front.

The plasma panel itself has three difference input sections, see Fig. 10. The AV section has BNC composite video and 4-pin S-video (separate luminance and chrominance) inputs. The centre section has component-video inputs as used in broadcast-quality applications. The third section is for PC use.

In Japan, a tuner/games console can be connected to the large port in the PC

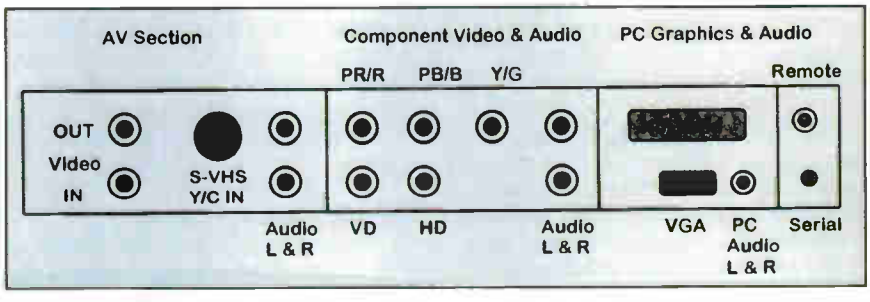


Fig. 10: Input connections to the panel, European version.

Table 1: Board functions (see Fig. 9).

Board	*Function*	*Board*	*Function*
C1	Data drive (upper left)	P6	Primary voltage control
C2	Data drive (upper right)	P7	Sustain voltage protection
C3	Data drive (lower right)	P8	Processing voltage protection
C4	Data drive (lower left)	S1	Power switch and remote-control receiver
D	Digital processing/control	S2	Factory use
DS	Input converter	SC	Scan drive
F	Line filter	SD	Scan output (lower)
H2	PC input terminal	SS	Sustain drive
H4	Speaker terminal	SS2	Sustain connection (upper)
HG	Interface	SS3	Sustain connection (lower)
P1	Power supply	SU	Scan output (upper)
P3	Sustain voltage control	V1	Front switch
P5	Processing voltage control		

section, but this is software-disabled for Europe. The European tuner's output is connected to the BNC inputs. Be careful when making this connection. If the 'out' BNC video connector is used there will be an over-white, crushed-video effect.

Each section has its own audio inputs: RCA for the AV and component-video sections and stereo jack for the PC section.

Handling precautions

The internal pressure within a plasma panel is at two thirds of an atmosphere. At above 3,000m the internal pressure will exceed the external pressure and there will be loss of cell integrity at the centre of the screen (a bulge), with the gas from a number of cells being released and combining. The panel is ruined of course. A replacement panel is typically half the cost of the entire unit – about £4,000.

Another way of damaging the cell integrity of a plasma display panel is to transport it on its face or back, because a bump or jolt may flex the panel, again releasing and combining cell gases. Panels should be transported and stored as you would watch them, i.e. vertically upright. I have transported many panels without problems simply by placing them upright on the back seat of my car and securing them with the seat belts.

Video processing

The video/RGB/drive processing carried out in a plasma panel is extremely complex. The following is a brief summary of what's involved.

Video decoding and digitisation: Any large-screen display must use a high-quality digital comb filter to separate perfectly and clean up the luminance and chrominance components of the signal while maintaining their full bandwidth. Plasma panels are no exception. A high-quality comb filter is incorporated in the digital decoder chip. It provides Y, U and V outputs for the component interface sections that produce digitised Y, U and V signals.

Interlaced-to-progressive converter: The first complex processing stage converts the interlaced video or RGB signals to progressive-scan signals. This complex processing uses complete frame memories to store successive fields of information. The processing must also analyse picture movement for the adaptive motion processing, by considering past, present and estimated future lines of information. This section also provides picture noise reduction and auto/manual aspect ratio control.

Format converter or scaler: The plasma panel has a 480 x 852 cell address system or, more correctly because of the dual-scan system, a 240 x 852 x 2 format. All incoming formats must be converted accurately to this one. The processing is again complex, and requires memories for storing and converting picture information while being careful not to affect natural motion in the picture.

Plasma AI: This section analyses the overall picture information and selects the 10, 11 or 12 sub-field drive system depending on picture content. The complex analysis works through millions of convoluted calculations a second.

Sub-field drive generator: This section generates the sub-field drive information and the scan/sustain timing and data drive signals, depending on the information provided by the Plasma AI section.

Display panel defects

It's not unusual to find that a plasma display panel has one or two dead cells. As three coloured cells contribute to each pixel, this may not be obvious until a single red, green or blue raster is displayed. These single-colour rasters are built into the normal service menus to enable a panel to be checked for defects. During manufacture single cells that flicker annoyingly may be produced. These are burnt out with a laser, as a dead cell is far less noticeable than a flickering one.

A customer may query the number of dead cells allowed with any one panel. Panasonic publishes a specification chart at its technical internet site

www.panasonic.co.uk/dealer

This specification allows three dead red cells and three dead blue cells within the central viewing area of the display and six each dead red, green and blue cells in the outer viewing area. The mathematically astute will realise that a good panel may have 24 dead cells. But, as production has improved over the last two years, I've seen panels that are almost perfect. Very rarely will you find more than a couple of dead cells in a modern panel. The pre-production sample I used when preparing this article had five dead cells, three red and two green.

Image burn

One problem that plasma panels can suffer from is after-image burn. It would obviously be the result of leaving a bright, stationary image on screen for some time. The Panasonic panel has a built-in burn removal system that can be accessed from the service menu. Basically, a thick white bar (scroll bar) repeatedly moves across the screen, helping to bring the affected cells back to normal emission.

Image burn can be caused by two things. First, activated or energised gas. This effect can take half an hour to occur. After considerably longer times there may be phosphor damage. Activated gas can be cured by using the scroll bar, but phosphor damage creates a permanent burn. ■

The various videotape and optical-disc recording formats have now been joined by hard-disk recording systems such as TiVo and Sky+. George Cole describes the technologies and products available in the UK and elsewhere

Hard-disk video systems

Until recently all domestic video recording formats used magnetic tape as the storage medium. It's easy to appreciate why: videotape is cheap, reusable and provides high-density recording. With VHS you can get up to four or five hours' recording time from a single cassette in the standard-play mode, even longer in the long- and extended-play modes. The data-VHS format uses compression technology to extend the recording time to up to 21 hours with an E-240 cassette. VHS uses ferric-oxide tape, while camcorder formats like Hi-8, Digital-8 and MiniDV use metal-particle or metal-evaporated tape that gives even higher storage density.

Despite its benefits videotape can be a frustrating medium to use, especially when it comes to searching for a particular scene or recording. Developments like turbo-drive decks, which provide fast tape winding, and the VHS Index Search System have helped. But because tape is a linear format it can never provide fast random access like a disk or disk-based format.

This year will see the launch of the first domestic DVD recorders in the UK. They record video on a 4·7Gbyte optical disc and provide random access and other features that are beyond the capability of VHS. But even this format will struggle to match the functionality of the new generation of video recording systems that reached the UK market last year: hard-disk video recorders.

These devices use hard-disk technology as the storage medium, and bring new features and functionality. So far, three hard-disk products have been introduced in the UK: the TiVo and Sky+ set-top boxes, and JVC's HM-HDS1, an S-VHS-ET VCR combined with a 40Gbyte hard-disk drive. Many more hard-disk products will arrive during the next year or two. Datamonitor, a market-research company, forecasts that by the year 2005 48 per cent of the set-top boxes in Europe will incorporate some form of hard-disk technology.

Hard-disk basics

What follows is a very basic description of a hard disk, which is best-known as a storage device that resides somewhere inside every PC. The advantages of hard-disk technology are high storage capacity, relatively low cost and the fact that, unlike RAM memory, data continues to be stored when the power is

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switched off. Over the years computers have used a variety of data-storage media, including punch cards, magnetic tape and floppy discs, but the hard disk is at the heart of today's PCs.

IBM invented the hard disk in the Fifties, as a replacement for punch cards. The first hard disks had a diameter of about 20 inches and stored only a few Mbytes of data. But this was equivalent to tens of thousands of punch cards, while data could be accessed very quickly in comparison with the older medium. These hard disks were very, very expensive however. Storage cost was about £7,000 per Mbyte! In the Seventies IBM developed a new type of hard disk, code-named Winchester. These new disks were smaller yet offered higher storage capacity. Storage cost was down to about £70 per Mbyte. These disks are the basis of the modern type. Today some hard disks are the size of a ten-pence piece and can store tens of Gbytes of data.

Hard disks have a magnetic recording layer similar to that used by audiocassette tape. But whereas audio tape uses a plastic base film, with a hard disc the layer is formed on a glass or aluminium disk called a platter. To increase storage capacity, most hard disks have several platters that are stacked on top of each other, with spaces in between for the read/write heads – these are mounted on actuator arms.

Data is stored on the surface of a platter as a series of tracks and sectors, the latter being pie-shaped sections of the platter. Hard disks rotate at high speed, typically 3,600 or 7,000 r.p.m., the data being read or written by record/playback heads that skim over the surface of a platter – if a head touches a platter, the disk suffers a crash.

Hard discs are stored inside an airtight aluminium case to protect them from dust and vibration. A PCB contains the electronics for interfacing with other devices, such as the motor that spins the platter.

Home PCs have for many years been able to store text, data, games and audio on a hard disk, but video has been more of a problem. This is because video files are very large and, even when compressed, can require Gbytes of storage capacity for high-quality video. In the Eighties and early Nineties most domestic PCs had a hard disk whose storage capacity was measured in Mbytes. Over the past few years however the capacity of hard drives has increased and they have become cheaper. Today, most home PCs have a hard disk with a capacity of 10Gbytes or more.

It now costs less than 1p to store 1Mbyte of data on a hard disk, and a typical hard-disk drive costs about £70. According to NDS, the capacity of hard drives will double by next year, while by 2005 it will be possible to store 1,000 hours of video on a hard disk.

A PVR developed by Pace, with hard-disk drive for data storage.

DVRs, PVRs and PTRs

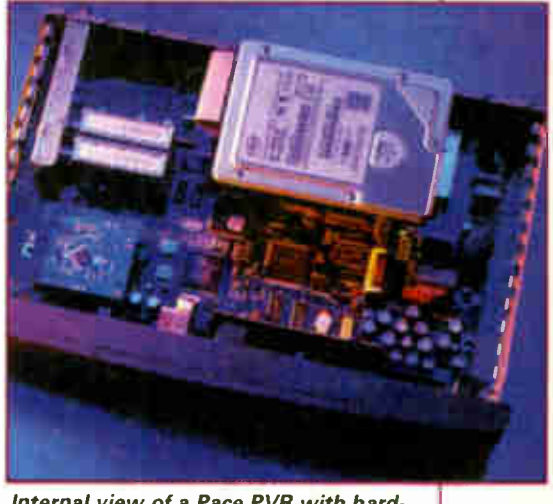
Incorporating a hard disk in a consumer electronics product like a digital set-top box presents many challenges. These include coping with the heat generated, the noise from the motor and fan, and vibration. But the latest hard-disk drives, sometimes called 'whisper drives', are no noisier than a VCR. One issue is reliability, and whether a hard drive is likely to crash. In fact most hard-disk 'crashes' are caused by a software problem: they often involve a breakdown in the PC's operating system, insufficient RAM, or a software conflict. Many hard-disk video products use the Linux operating system, which is more stable than Windows, and according to Pace the mean time before failure (MTBF) with a modern hard disk is typically more than 500,000 hours.

The inside of an integrated hard-disk/set-top box is similar to that of a conventional STB. The main differences are the presence of the hard drive, an interface card, an additional tuner, a cooling fan, some additional circuitry and the need for a power supply with greater power-handling capability. These are all fairly standard items. Perhaps the greatest challenge is to ensure that the software operates in the required manner.

But why use a hard disk to store video when there's cheap and cheerful VHS tape? The answer is that hard-disk recording provides new features that are impossible with VHS and that even the new DVD recorders will struggle to match.

The most obvious benefit of disk over tape is the fast access provided by the former: you can find a specific recording quickly and easily without having to wind through metres of tape. Hard-drive read/write heads also make it possible to pause a live TV broadcast while the remainder of the programme is being recorded. So, if the phone rings while you are watching your favourite TV programme, you can pause until the interruption ends then continue watching where you left off. The rest of the programme will have been recorded on the disk. It's even possible to record two different programmes at the same time, then watch them on the screen together – so far however this feature is available with only one hard-disk video system.

There are two basic hard-disk recording devices. A digital video recorder (DVR) simply records video on a hard disk. Over the next few years we are likely to see many TV sets with a built-in DVR. The personal video recorder (PVR) or personal television recorder (PTR) is a smarter version of the DVR: it combines a hard-disk video recorder with smart software. Products in this latter category include TiVo and Sky+.



Internal view of a Pace PVR with hard-disk drive.

TiVo

The first PVR, TiVo, was launched in the US in 1999 by the company of the same name. It came to the UK in October last year, and was marketed initially by BSkyB. Sony and Philips, which have invested in the TiVo company, manufacture the US version. TiVo is also built into some DirecTV digital satellite receivers in the US.

The TiVo PVR looks like a large VCR. It's designed to work with most TV systems, terrestrial, cable and satellite, and with both analogue and digital signals. There are one or two exceptions however, see below. TiVo uses MPEG-2 video compression and a Power PC processor that runs Linux.

The Sky+ remote control unit.

US consumers can choose TiVo products that provide up to 20, 30 or 60 hours of storage capacity. Prices start from the US equivalent of about £150.

The UK version of TiVo is made by Thomson. It has a 40Gbyte hard drive that can store about 40 hours of video. Picture quality in this mode is quite poor however. So many viewers prefer to use a lower compression ratio. TiVo offers four settings: best, which gives up to fourteen hours' recording time and close to DVD picture quality; high, which gives up to 22 hours' recording time at a lower picture quality; medium, which gives up to 28 hours' recording time; and basic which provides a recording time of 40 hours plus.

TiVo works with most analogue and digital TV systems, the exceptions being analogue satellite and digital cable. TiVo plans to make its PVR compatible with the latter later this year.

The TiVo PVR can be connected to a TV set, set-top box, VCR and telephone line. There are connection sockets for RF in/out; three scart sockets for TV, VCR (with RGB loop-through) and set-top boxes (auxiliary); twin phono audio sockets; and a serial data port jack. There's also an IR blaster, for controlling an STB, and an internal V90 (56kbits/sec) modem. The telephone connection is used for downloading programme data, which TiVo needs to be able to operate, and software updates.

In the UK TiVo currently costs about £400. In addition there is either a £10 monthly subscription, or a £199 lifetime subscription, for downloads that provide software updates and channel information. TiVo uses the latter for various features, such as being able to record all the episodes of a favourite series. It can also 'learn' which programmes the viewer likes to watch and automatically record them. TiVo has struck deals with Channel 4 and UKTV, which will download programme trailers on to a TiVo hard drive. These trailers can be used to ensure that a TiVo unit records the programmes as they are broadcast. TiVo lacks some useful features however, such as PDC which automatically adjusts the timer recording switch-on should a programme's published start time alter, for example when the previous programme overruns. A planned software update will enable viewers to extend the recording by five-minute increments.

In May TiVo reported that in the three years since its US launch the number of subscribers worldwide had reached 200,000. This does not sound a lot but, as TiVo points out, the figure exceeds the number of VCRs sold during the first three years after launch – some 120,000 worldwide.

The TiVo PVR box with remote-control unit.

Since the launch of Sky+, some have questioned the long-term viability of TiVo in the UK. TiVo costs £100 more than Sky+, but the price gap narrows when you take into consideration the £50 (or £100) installation charge for Sky+ – TiVo has a self-installation system. And while TiVo is compatible with a range of TV systems, Sky+ is a dedicated digital satellite system. In the long term TiVo looks more likely to become a feature found in set-top boxes, VCRs and TV sets rather than a standalone format.

Sky+

BSkyB unveiled its Sky+ PTR in July, and it should now be on sale. The product is aimed at SkyDigital viewers and, unlike the digibox, is unsubsidised. It can be used with free and pay-TV services.

The Sky+ PTR uses a blend of technologies developed by Pace, NDS, OpenTV and NEC. Pace provides the hard-disk technology, NDS the XTV (Xtended TV) technology (see below), OpenTV the middleware and NEC the chipset. The Sky+ box contains a 40Gbyte hard drive, an MPEG-2 decoder, a V90 modem, and a twin satellite tuner/demodulator. It has two RF outputs, an S-video output, phono audio outputs, an optical digital audio output that provides Dolby Digital sound, a high-speed data interface and two smart card slots – one for a Sky viewing card and the other for an interactive card. The hard drive can store up to 40 hours of video, but in practice BSkyB quotes about 20-22 hours. This is because, unlike the TiVo unit, Sky+ stores, records and displays a TV programme at the same data rate at which it's being transmitted. Sky often uses statistical multiplexing to improve bandwidth efficiency: as a result, the bit rate may vary with programme content.

The Sky+ box works with a new quad LNB that has to be installed professionally. It provides many features, such as live pause; one-touch recording; the ability to record one digital TV broadcast while watching another; the ability to record one programme while watching a prerecorded programme; recording and playback of subtitles; full VCR-type functionality; automatic recording of favourite programmes; and an extended version of the Sky Guide EPG. BSkyB says that its EPG interface is to digital TV viewers what the Windows interface is to a PC user, i.e. very familiar.

Sky+ doesn't use PDC, but its timer recording system is linked to the Sky EPG. If the broadcaster shifts the programme time and this data is sent to the Sky EPG, Sky+ boxes automatically adjust the recording time.

A novel feature is the ability to record a

programme by name rather than by time and channel number. An A-Z feature displays all the programmes being broadcast during the next 24 hours. Programmes can also be searched by type, such as drama, comedy, thriller and romance. By simply scrolling down the programme list and clicking on any of interest, the user programs Sky+ to record these.

Other useful features of the Sky+ boxinclude the ability to 'lock' programmes so that they cannot be over-written accidentally, and a horizontal bar display that tells the user how much hard disk space remains available. Users can also bookmark scenes, and a disk management system automatically carries out housekeeping tasks such as disk defragmentation. The latter means rearranging programme material that has been stored by the disc in different sectors, so that the material is in one place and is thus more readily accessed.

The Sky+ box has an impressive list of features, but earlier reports on the capabilities of XTV had led many industry observers to believe that it would provide new and advanced features, such as software wizards which could, for example, automatically find and record all programmes featuring your favourite actor. XTV can provide personalised TV by 'learning' what a viewer likes to watch. This information could be used to 'target' programmes and advertisements for individual viewers so that material selected by the PVR is available for them on the hard disc. But many of these features rely on new broadcasting standards being set.

NDS is a member of the TV Anytime Forum, which is at present developing standards for PVRs and other devices. The Forum is working on a standard for metadata – data that can be added to enable programme material to be identified by type, and could thus be used by a PVR to provide services such as those mentioned above. Once metadata standards have been agreed, broadcasters could start using them to tag their programmes.

Features like personalised TV raise the question of privacy – a broadcaster could know what you watch and when. BSkyB can already interrogate a Sky+ hard-disk directory and collect personal information, but says it has no plans to do this. The Data Protection Act should prevent this happening without a viewer's permission.

The price of the Sky+ box surprised many observers, who had expected it to retail at about £400-500. In fact the price is £300, which Sky says is unsubsidised. The answer to this puzzle lies in the installation charge (£50 for existing BSkyB subscribers, £100 to non-subscribers) and a £10 monthly subscription fee. BSkyB says that the fee pays for programme data and software updates, but admits that this was the only way of getting the hardware price below £300.

The TiVo Lifestyle image.

VCR archiving

Suggestions that PVRs and PTRs will make the VCR redundant are unfounded. Neither TiVo nor BSkyB expects its units to make the VCR obsolete. While a hard-disk is ideal for watch-and-wipe recording, once the hard disk has been filled up something has to be overwritten – or transferred elsewhere.

Both units are designed to be connected to a VCR for the transfer and storage of recordings The Sky+ box has a batch recording system that enables the user to preselect the recordings he wants to be transferred to tape. The box transfers them to a VCR automatically – provided a VCR with a blank tape has been connected of course.

ReplayTV

ReplayTV is another PVR system that's available in the US. The ReplayTV company originally marketed hardware PVR products but subsequently became a software and services provider. At present the only manufacturer that supplies ReplayTV products for the US market is Panasonic, which has a stake in the company.

ReplayTV offers similar features to TiVo, but there's no monthly subscription fee. Panasonic has launched several ReplayTV PVRs in its Showstopper range. Model PV-HS2000 provides up to 30 hours' recording. Model PV-HS3000, with a 61·4Gbyte disc, can record up to 61 hours of video in its extended mode, 30·5 hours of video in its medium mode and 20·5 hours in its high mode. Panasonic has also launched a TV set with a built-in ReplayTV PVR, Model PV-SS2710. It has a 27in. screen and can record up to 30 hours of video.

Ultimate TV

Microsoft bought the WebTV service, which offers viewers enhanced TV, interactive TV and internet services, in 1997. One version of WebTV, known as Ultimate TV, has a PVR that can store up to 35 hours of video. It can also record two different programmes simultaneously, and has a picture-in-picture facility for watching two programmes together on a single screen, and in addition 300x picture search.

Ultimate TV is currently available only with the DirectTV service. Sony and RCA have launched combined DirecTV receiver/Ultimate TV digital set-top boxes.

Dish PVR

US digital satellite broadcaster EchoStar offers new subscribers the Dish PVR 501. The PVR can record up to 35 hours of programming and has a skip forward feature that advances playback by thirty seconds to bypass advertisements.

Pace

Pace has developed hard-disk products that extend the scope of the digital set-top box. One product is the Games Gateway, which uses technology derived from Sega's Dreamcast 128-bit games console. It has a 40Gbyte hard disk that can store up to 60 games, and will

The Pace Games Gateway, which uses technology derived from Sega's Dreamcast games console.

include graphics and sound cards or chips to provide enhanced performance.

Pace believes that the STB/PVR will evolve into a domestic gateway, a networking device that links the TV to lots of appliances around the home and services outside it.

Nokia Media Terminal

Nokia has developed what it calls the Media Terminal, a network box that includes a PVR with a 40Gbyte hard drive. Other features include an Intel Celeron processor running Linux and 64Mbytes of RAM. The Media Terminal is expected to be launched in Sweden later this year.

Games consoles

Microsoft's Xbox games console, which is due for release in Europe next year, has an internal 8Gbyte hard drive for storing games. Sony has developed a 40Gbyte external hard drive for the PlayStation 2 console. It's currently available in Japan.

PC video recorders

We've now come full circle, with home PCs turning into PVRs and digital video recorders thanks to large-capacity hard disks, compact TV tuners and video editing software. MGI (formerly called Diva) markets software that turns a standard PC into a PVR. It requires a PC system with a minimum specification that includes a 500MHz Pentium III processor, Windows 98, 128Mbytes of RAM and 8Gbytes of available hard-disk space.

Packard Bell's Dre@am Machine PC has a 40Gbyte hard drive and a DVD-R recorder. The product is designed so that the user can edit video footage on the hard disk then transfer it to a DVD-R disc.

Apple's latest G4 computer has a built-in DVD-R drive, while Hewlett-Packard and Dell plan to launch PCs with built-in DVD+RW drives. These machines may offer similar features to the Packard Bell product.

Hard-disk combi products

Hard disks are being combined with other video equipment. The JVC HM-HDS1 for example is a combined S-VHS-ET recorder and 40Gbyte hard-disk drive. Its HD drive offers several recording modes from SP to SEP. SP operates at 6·4Mbits/sec to provide about 14 hours of DVD-quality recording. SEP operates at 2·2Mbits/sec to provide a recording capacity of about 40 hours. The hard disk can be used as a PVR or for non-linear and random-assemble editing, with the results transferred to S-VHS or VHS tape.

Toshiba has produced the RD-2000, a DVD-RAM recorder combined with a 30Gbyte hard drive that can store up to 33·5 hours of video. ■

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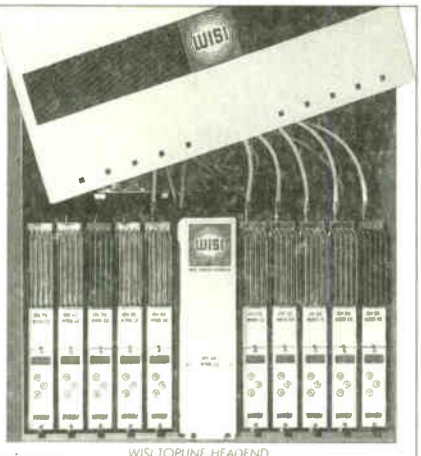

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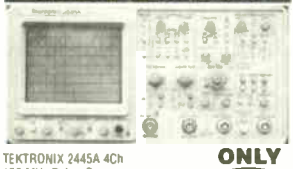

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Servicing

the NEI CE25/CE28 series chassis

These chassis, made in Spain or Turkey, were used in a number of different models. Alan Dent provides a detailed guide to fault conditions you could encounter

There were three main versions of this chassis. The first was manufactured by Clarivox in Spain. It's easy to identify: the single-sided board is made of biscuit-coloured material. Version two was made by Vestel in Turkey. The board has double-sided copper and is made of green-coloured material. Version three was introduced in early 1994. It's similar to the basic Vestel version but the audio output stages use a different IC with associated alterations to the layout. It has facilities for adaptation to include a satellite receiver, scart sockets and mono audio.
Models fitted with these chassis include the NEI 2571, 2591, 2871, 2891, C25F1TFXZ and C28F1TFXZ, and the Nikkai TLG2501, TLG2801, 5959 and 6666.

The power supply

The chassis use a conventional chopper power supply, though the control chip IC100 (type TDA8380) is an uncommon device. Fig. 1 shows the primary side of the power supply circuit, Fig. 2 the secondary side. Regulation feedback from the secondary side is via optocoupler IC101. Fusible resistor R102 (0·22Ω, 2%), which provides current limiting, is a key item.

No output because R102 has failed or is out of tolerance can result in base-collector breakdown in the chopper transistor TR100. The following components will probably have to be replaced: TR100, R102, IC100, IC101, R109, C107, C108 and D104.

If C109 is 2·2µF, change it to 3·3µF. D104 should be a BZX85 series 1·3W zener diode. If a 300mW zener diode is fitted, uprate it.

Multi-component failure can also be caused by components in the snubber network: check whether C105 is dry-jointed or leaky or R328 is open-circuit.

If there's no output because of failure of TR100 and a replacement fails immediately, R107 or C122 could be low in value or R112 high in value. If TR100 gets very hot (100°C) before it fails, L100 could be dry-jointed or open-circuit. The normal heatsink temperature for TR100, measured at its case, is approximately 50-60°C.

If there's no output with no major failures, check whether R101, R103, R112, R115, R116, C110, C111, C122, D104 or D106 is open-circuit, C112 is short-circuit or IC101 is short-circuit between pins 3 and 4.

If there's no output and the power supply is tripping, the line output transistor TR128 could be short-circuit. Also check the values of R109 and R111, and that D104 is a BZX85 type. The earth track to pin 4 of IC100 could be open-circuit, especially after a power supply blow up.
Here's a summary of other power supply faults I've come across:

Low HT (64V nominal): The ripple voltage at pin 5 of IC100 must be in millivolts. If the ripple is higher, C110 is probably open-circuit.

Low HT (139V) and no raster, with the power supply chassis line at 7V relative to the signals chassis: You will also find that the I^2C bus appears to fail, i.e. the set seems to be OK in standby but there is no control after coming out of standby. Earth link LK172, top to bottom, is open-circuit. It's under C130.

High HT (180V with no control): IC101 could be faulty or there could be no feedback to IC101 or IC100. Check TR102/3/4 and the associated components, R124/5 which could be open-circuit and C125 which could be short-circuit. If C114's voltage rating (160V) has been exceeded, replace it.

HT is OK in standby but drops at power up: The voltage fall may be from 154V to

120V depending on power requirement. R112 is open-circuit.

Set will not switch to standby: TR130 is probably short-circuit. The symptoms are that there's a raster and audio but the standby LED is on.

Noisy chopper transformer (high-pitched squealing): R117 or C113 is open-circuit.

In normal operation the power consumption should be as follows:

HT supply 300mA nominal, 400mA at maximum beam current. 26V supply 70mA quiescent, 1·13A at maximum volume. 12V supply 40mA quiescent, 400mA typical.

Line driver and output stages

The line drive signal is generated by a TDA4504B IF/timebase generator chip, IC001, which is mounted on the jungle subpanel. Its line drive output at pin 29 is AC-coupled by C151 (0·1µF) to a two-transistor driver stage (TR106 JC501P and TR105 BC337), with DC restoration by D123 (1N4148). Fig. 3 shows the circuit. The output is transformer-coupled (TX101) to the base of the BU508AF line output transistor TR128.

The line output stage is conventional, with a diode modulator (D116, D117) for EW correction. The line output transformer, TX102, generates the tube's EHT, focus, first anode and heater voltages, a 200V HT supply for the RGB output stages, a 28V supply for the field output and EW chips, and a 5V supply for teletext and other functions. The 5V supply is stabilised by IC103 (7805).

A short-circuit line output transistor will cause power supply tripping. Before fitting a replacement check the tuning capacitor C134 (1·2nF, 1·6kV) which could be open-circuit, the result being excessive flyback pulse voltage. In this event the TDA8145 EW correction chip IC107 may be damaged. Other causes of failure of TR123 are shorted turns in the LOPT (TX102) or a drive fault. In the latter case check the value of R174 (6·8Ω fusible) which feeds the line driver stage, and R123 (1Ω, 1W) which is in series with the base of TR128 – also see note below on TR128 failure after five minutes.

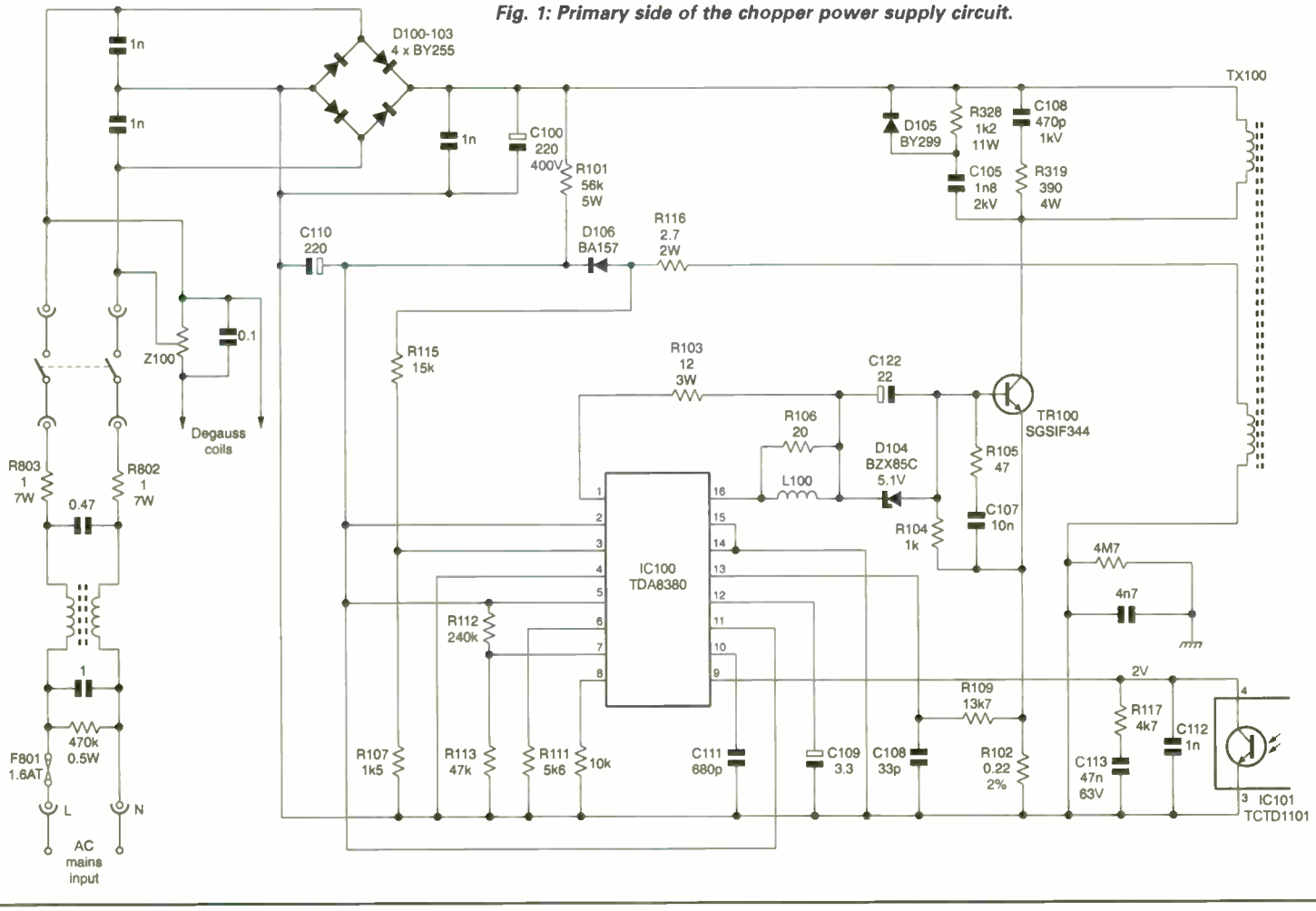
If a replacement line output transistor goes short-circuit immediately, check the components in the EW modulator circuit: D116 (BY228) or D117 (BY299) might be short-circuit or C131 (9·1nF, 1·6kV, 5%) or C132 (27nF, 400V) could be open-circuit.

If a replacement output transistor goes short-circuit after about five minutes the line drive voltage could be low, not turning TR128 off fast enough. The usual cause is that TR105 (BC337) in the drive stage is open-circuit, though TR106 (JC105P) could be faulty. It might be that the track from pin 1 of the LOPT to the junction of R121/C312/R122 is broken – this will remove the feedback pulses to IC001. Another possibility is that R371 (1Ω fusible) in the scan current path is open-circuit – this is a side-effect of no EW correction. The line drive could be low or of the wrong frequency because the earth for the module that houses IC001 is broken: this usually occurred with the early Clarivox PCB.

Some causes of no raster because of loss of line drive are: R174 (see above) open-circuit, the DC restorer diode D123 short-circuit or connected the wrong way round, and the IC001 module earths open-circuit.

Line collapse with possibly arcing or a squealing noise occurs when L116 in the line scan current path shorts to D121.

Fig. 1: Primary side of the chopper power supply circuit.



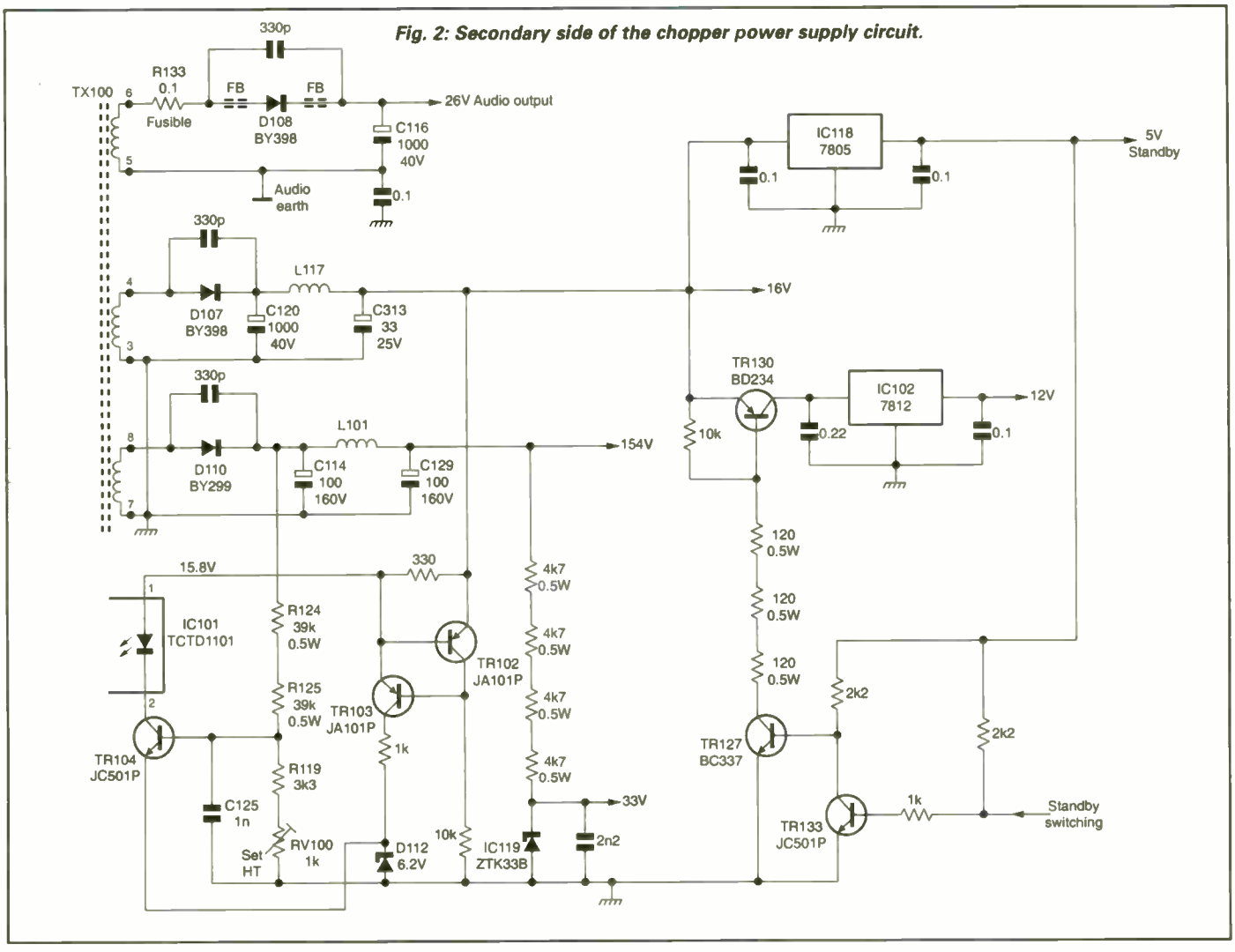


Fig. 2: Secondary side of the chopper power supply circuit.

Replace D121 (BA157) and C140 (10µF, 250V) – these two components form the rectifier circuit for the 200V RGB HT supply.

Here are some other possible line scan faults:

Excessive width: D117 (BY299) in the EW modulator open-circuit or low EHT because the tuning capacitor C134 (1·2nF, 1·6kV) is faulty. See also the EW modulator section.

Non-linear scanning: If the temperature of TR128 is OK, the linearity coil L104 is fitted the wrong way round. If TR128 is getting hot (it may be destroyed) TR105 (BC337) is open-circuit.

Picture breathing: The symptoms are width variation with beam-current changes, also non-linear line scanning. Check C132 (27nF, 400V) in the EW diode modulator. It's likely to be open-circuit.

Picture disturbances: For striations/line ringing check the line linearity coil damping resistor R135 (1kΩ, 1W fusible), C610 (10nF) on the CRT base panel, and the damping network on the Nokia deflection yoke. Any of these items could be open-circuit. For ragged/wavy verticals refer to the jungle chip (IC001) section. Picture disturbances of these sorts can be caused by the earth link LK174, which is adjacent to C130, when it's high-resistance or dry-jointed.

EW modulator

The EW diode modulator is in the line output stage: various faults have been referred to in the section above. It's driven by the TDA8145 chip IC107. Note that the width control affects the parabolic waveform to some extent. Here's a summary of some possible EW fault conditions.

Excessive width: If the controls have no effect, check the supply (about 27V) at pin 6 of IC107. If this is missing the fusible resistor R154 (27Ω) could be open-circuit. If there's no voltage at pin 7, check whether C160 (22nF) is short-circuit or R153 (220kΩ) is open-circuit. There should be about 7·5V at pin 8: check C159 (3·3nF) if this voltage is low. IC107 could be faulty. If R368 (2·2Ω fusible) is open-circuit there will be no EW modulator drive.

If the width control works but not fully, check whether the fusible resistor R371 (1Ω) is open-circuit. In this situation TR128 overheats and fails. If there is no control and R371 is open-circuit check D117 (BY299) which is probably short-circuit.

Underscanning: If there's no foldover and the controls have some effect, check whether D109 (1N4148) is short-circuit. There will be excessive voltage at pin 8 of IC107. If there's foldover and no effect from the controls, R181 (10kΩ) or D116 (BY228) could be open-circuit. In the latter case R154 and IC107 could fail.

Bottom half bowing: If the bottom half of the raster is bowed out, the top half is OK and the controls work partially, IC107 is faulty.

Controls have partial effect, with ringing on verticals: C134 (1·2nF, 1·6kV) in the line output stage is faulty.

Pincushion control acts as a width control with the width control working normally: Check that there's a field ramp waveform at pin 1 of IC107. If missing, the link from PL102 or the track is open-circuit.

The jungle module

The TDA4504B IF/timebase generator (jungle) chip IC001 is mounted on a separate subpanel, which also houses the TDA2545A sound IF chip IC002. So

various IF and timebase faults can have their origin here. The following is a summary of various faults I've encountered.

It might be thought that a picture shifted 10cm to the left has its cause in this area. In fact the component that causes the fault is D734 (1N4148) in the RGB shift circuit on the text panel: it produces this symptom when it goes short-circuit.

Ragged verticals: Can be caused by a poor soldered connection to the jungle module. R022 (3·3kΩ) or C017 (2·2µF) could be open-circuit. These two components are connected to pin 27 of IC001 and act as the APC filter in the line timebase generator circuit.

Top pulling with video playback: Change R022 to 1·5kΩ, R023 to 82kΩ, C017 to 4·7µF and C021 to 68nF.

Line frequency drift: Check whether C022 (2·7nF) is leaky

No horizontal shift: R016 (36kΩ), which is connected to pin 31 of IC001, is open-circuit. This removes the feed from the horizontal shift control RV003. There is also an anti-breathing feed to this pin.

Field roll/picture cogging: C009 (10µF) is open-circuit. This affects the AGC action.

Field roll: With signals from a local relay station, or TV games, increase the value of R013 from 1kΩ to 1·5kΩ. There could be a weak input to the sync separator (IC001 pin 28) from IC110 in the teletext circuit because R211 (1·2kΩ) has gone high in value.

Field cramping: The exact symptom is bottom half OK, top half severely cramped but with no foldover. Check R018 (15kΩ) and R019 (43kΩ) which can go high in value. R019 can rise to about 80kΩ. The junction of these resistors is connected to pin 5 (field feedback) of IC001.

Height jitter: Check R027 (1·3MΩ) and C013 (220nF) in the field ramp circuit connected to pin 3 of IC001.

Patterning on video: C012 (2·2nF) is open-circuit. It decouples the field feedback at pin 5 of IC001. The symptom appears as instability.

Weak picture: This symptom occurs when R010 (2·2kΩ) is open-circuit.

Video muted by IC117: IC001 is faulty. IC117 is the microcontroller chip. It receives an ident input from IC001 (pin 14) at pin 29.

No picture, no OSD, raster if first anode voltage increased: This occurred with early (Clarivox) chassis when the earth connections to the jungle module were poor. These connections are rather fragile with a single-sided PCB. Repair using tinned-copper wire to strengthen the joints.

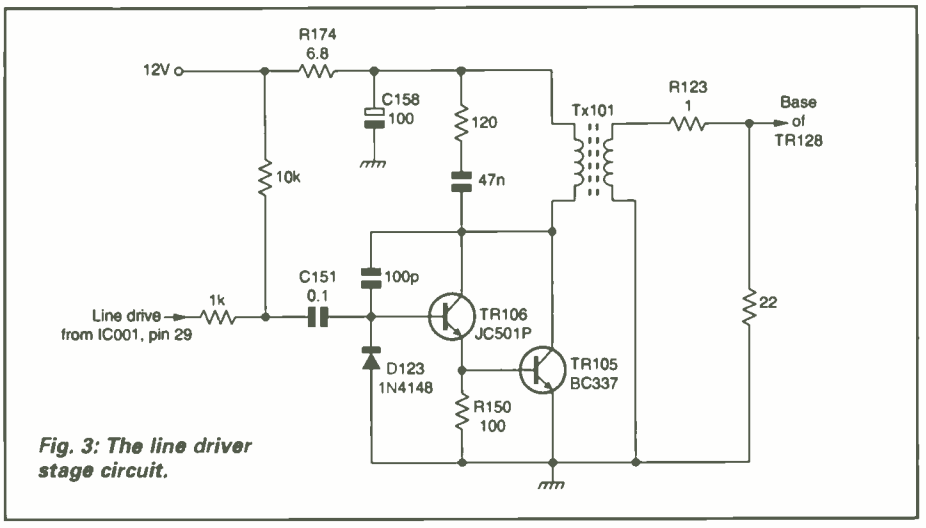


Fig. 3: The line driver stage circuit.

Negative picture: If there is excessive video (2V p-p) at pin 6 of the module, the preset contrast control RV004 (1kΩ) is high in value or open-circuit. If the video level is OK, check whether link LK107 on the main panel is open-circuit.

Field timebase

The field generator circuit is in IC001 on the jungle subpanel. Its field drive output at pin 4 is fed to pins 1 and 2 of the TDA3654 field output chip IC106 on the main board. There is feedback between the two ICs. See relevant fault notes above.

Field collapse: IC106's supply pin 9 is fed with 28V via fusible resistor R140 (1Ω), which may be open-circuit. If so IC106 could be short-circuit. Check the components in the field scan current path: R147 (0·33Ω), C146 (3,300µF) and R141 (0·68Ω). Field collapse can be caused by a short-circuit in IC107 (TDA8145) – the field output at pin 5 of IC106 is fed to pin 2 of IC107. This can cause failure of IC106. If so, replace IC106 but disconnect the link to IC107. If the field scanning is OK, IC107 is faulty.

Near full field collapse: Check the 33V zener diode D124.

Line pairing at top of screen: Instability caused by R148 (0·5W), which is connected in parallel with the field scan coils, being open-circuit. It's value depends on CRT type, 120Ω with a Nokia tube, 390Ω with a Philips tube or 220Ω with a Videocolour tube.

CRT base panel

IC601 (TEA5101A) on the CRT base panel contains the RGB output stages. It also incorporates auto grey-scale circuitry. Preset resistors are, unusually, added to balance the RGB drives, which come from the TDA8391 chip IC111 on the main board.

It is important that the correct series heater resistor (R614) is fitted should the CRT be replaced. The value of R614 is 3·9Ω with a Nokia or Philips tube, 1·6Ω with a Videocolour tube. R614 is fusible.

Fault conditions associated with this panel are as follows.

Uncontrollable brightness: There is no HT supply to IC601. Check the fusible resistors R625 (100Ω) and R137 (10Ω) – the latter is on the main board. Another possibility is D121 (BA157) which is also on the main board.

No raster: The 12V supply at pin 2 of IC601 is missing. Check fusible resistor R612 (10Ω). This assumes that the tube's supplies are present, in which case a raster will appear when the setting of the first anode control is advanced.

One primary colour missing: IC601 could be faulty. The cause could be the relevant feedback resistor being open-circuit – this upsets the dark-current signal and cuts off the drive. The feedback resistors are R604 (blue), R605 (red) and R617 (green). They are 47kΩ, 1W.

Coloured tint – any primary colour: IC601 is faulty.

Coloured flashing lines: IC601 is faulty.

Washed out pictures/slow to warm up: This is usually after the tube has been replaced or in an early production set, where the value of R614 is incorrect (see above).

Striations: Check C610 (10nF) which decouples the tube's first anode supply.

Next month

In part 2 we will cover faults that can arise in the audio circuitry, the signal processing and switching circuitry, the tuner, the microcontroller system, and the teletext section.

AUDIO FAULTS

Reports from
Robin Beaumont
Geoff Darby
and Russell J. Fletcher

We welcome fault reports from readers – payment is made for each fault published. See page 746 for details of where and how to send reports.

Technics SLHD51E CD player

This player is part of a four-unit system, all linked together by ribbon cables. The customer's complaint was that after several hours the controls would lock up – neither the front-panel nor the remote-control buttons had any effect, but if the CD unit was unplugged the rest of the system worked normally. I tested the system for a week. As the fault didn't show up, the equipment was returned to the customer.

Shortly afterwards another identical system came in with the same symptoms, but this time permanent. I confirmed that disconnecting the CD player would solve the problem, also that the eject button on the player always worked, and that taking off the CD player's front control panel enabled the tuner and tape deck to work normally.

The CD player's front control panel uses a resistive-ladder arrangement. The switches short different resistors in the chain to chassis, the resistance change being detected by the control circuit. The control line should read open-circuit when no buttons are pressed, but my meter detected a resistance of a few kΩ. Further investigation ceased when the fault disappeared!

I inspected the panel for liquid or other contamination, but found nothing. This meant that either one of the switches or the 1,000pF capacitor must have an intermittent leak. As these items are inexpensive, I replaced all nine switches and the capacitor. This provided a permanent cure.

The CD eject button is the switch that shorts the control line to chassis, so it was always detected correctly. **R.B.**

Sony TC-TX333 cassette deck

This was one of those increasingly rare faults that tests your ability to read a circuit diagram, understand it and reach a rapid and correct diagnosis. The front-panel keys FF, Rew, Rec, CD Sync and Eject did nothing, while all the other keys just turned the unit on and off. The first-mentioned set of keys are all connected to the microcontroller chip's key-0 line, while the others are connected to the key-1 line. The chip uses a clever technique to interpret the effect of so many keys linked via just two lines. Key-0 and key-1 are in fact inputs to DA converters in the chip. A network of resistors is connected around the key switches, and as a result different voltages appear on the key lines with different key presses. The chip compares these voltages with an internal look-up table to determine what's required.

In this case the key-0 line had only 0·5V on it with no keys pressed. As a result the chip thought that the on/off key had been used when any key connected to this line was pressed and, because it looked as if a key was permanently in use, the key-1 line was locked out, rendering all the keys connected to this line inactive.

A new microcontroller chip got the unit working normally. **G.D.**

Sony CD turntables

Many Sony hi-fi models, for example those in the HCD-XBxx series, have a mainly metal CD turntable with a soft plastic coating on the disc-contact surface. Over a period of time this coating tends to pick up debris from discs. This can have two effects. First, if particles much larger than dust are picked up the disc may not sit flat, and thus wobble as it rotates. The result is poor 'playability' in general, with the symptoms generally worse on later tracks. Secondly, the grip between the turntable and the disc can be reduced significantly. You can hear the disc sort of skid to a halt after the TOC reading, rather than coming to the more normal controlled stop.

The cure is to clean the turntable with a cotton bud soaked in isopropyl alcohol. **G.D.**

Musical Fidelity A1, A100, A120 and MA60

We've had several of these class A hi-fi amplifiers in for attention recently. They have either failed or have come in for general service – usually because the function switch is noisy – and seem to be on the point of failure. The unreliable function switch is a Lorlin type with silver-plated contacts. The other problems are associated with components that appear to be underrated. Look out for component and PCB discoloration. Replace faulty 400mW zener diodes with 1W devices. Faulty zener diode load and output stage bias resistors should also be suitably uprated. Some electrolytics fail because they are mounted close to hot-running components. Uprate any that have to be replaced. **R.J.F.**

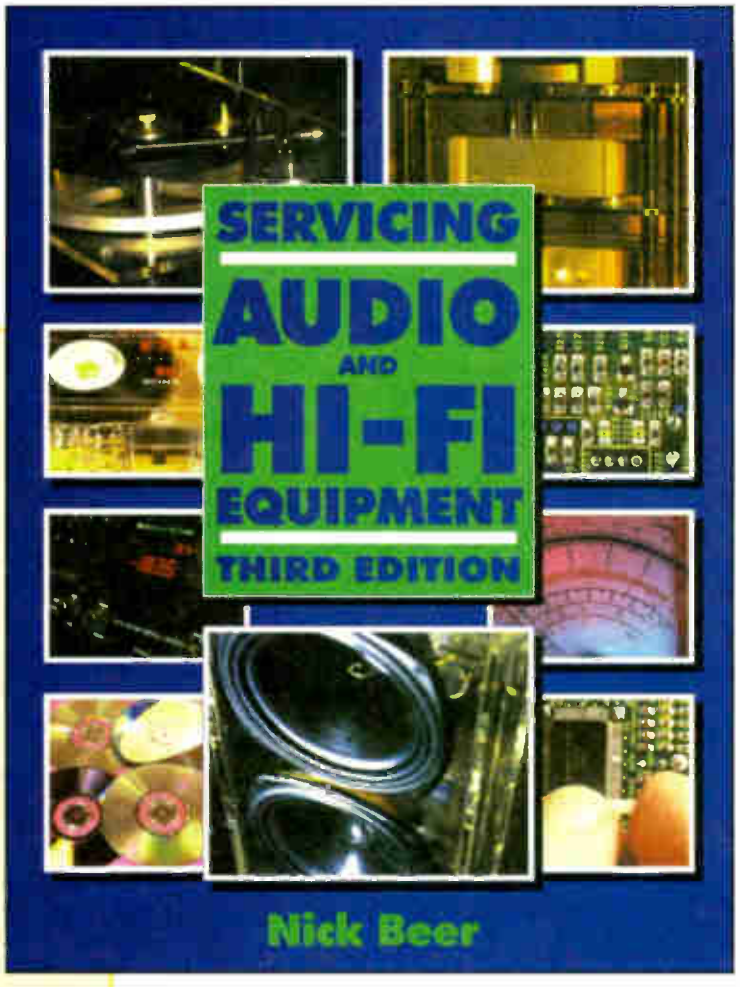
Trio KT5550 tuner

The owner of this tuner said there was no output from the left channel. With no service information and very little else to go by for this elderly unit I decided to replace the LA3350 stereo decoder IC. Lucky guess! **R.J.F.**

Sony CDP-M20 and similar models

We get lots of these CD players in with the complaint that the tray opens immediately after the close instruction. The cause is no more complex than a faulty loading belt. **R.J.F.** ■

Servicing Audio and Hi-Fi Equipment



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WHAT A LIFE

The joys of tench fishing. An early start then a mixed bag of TV faults – and a camcorder problem. Donald Bullock's servicing commentary

I suppose I brought it on myself. There's no fishing like tench fishing, and I've sung its praises so often to Paul and Steven that they are now hooked on it. That's why I sometimes have to open and look after the shop on my own. At times it can be a bit much for one person.

Arrival

Three people were waiting outside when I arrived the other morning. I knew them all. There was Quiet Norman Glutton, who was sitting on a huge Ferguson TV set eating a pasty. The others were a regular oriental customer, Mr Bakwa Ng, and the domineering Mrs Runner with her son Clarence. If they hadn't all seen me drawing up I think I'd have fled past and hammered on the door of the Red Lion to ask for a large brandy.

"Hi Don" said Quiet Norman as I got out of the car. "Take the old girl's set in, will you? While I pop along to Crubbs Foodstore to see what they've got to eat. I'm famished."

The telephone rang as we entered the shop. "Joo do calls the same day" a voice said.

"We do our best" I replied, "where are you?"

"Baker's Way" the voice continued.

"Sorry" I said, "where's that?"

"First left at New Zealand, just past Australia" said the voice. There was frenzied laughter, then he hung up.

I looked at the phone, then hung up too.

"Good morning, Donald, I am being glad to see you" said Mr Ng with a smile. "There's a loose wire in my set. It's giving me only a line."

He presented me with a Goodmans Compact 110, and I wrote 'field collapse' on the card as he departed. I looked at Mrs Runner.

"Tell Mr Bullock about our telly, Clarence" she ordered.

Clarence looked up and made to speak.

"It's gone wonky, ain't it Clarence?" she cut in. "Tell Mr Bullock what was on 'im when 'e went".

Clarence opened his mouth but wasn't quick enough.

"It was that fat woman, that Whimpey Opera, wasn't it, Clarence? Now tell Mr Bullock."

Clarence made another attempt.

"Cat's got 'is tongue I think" she continued. "it's our Bush, Mr Bullock. Dead. Now Clarence, shut up and get the set outa the car for Mr Bullock."

Norman's Fergie

As they left Quiet Norman returned, paring at a pie with his pen-knife.

"Ain't bad pies" he announced. "The Fergie belongs to my new girlfriend. Dopey and loaded, 'er is. I likes 'em that way."

"What's wrong with it?" I asked him,

"Nuthin', 'er's all right" he replied.

I leaned forward. "The set, Norman, the set."

"Aw. Silly picture."

I wrote 'silly picture' on a job card as he departed, still busy with his pie.

The set was a Ferguson D68N, which means the ICC9 chassis. When I got it on the bench and switched it on I found that the sides of the picture were bowed. I've had EW trouble before with these sets, and it didn't take me long to home in on the BD675 EW diode modulator driver transistor TL40. It was warm – and short-circuit.

Starting the day with an easy repair is always cheering. I fitted a replacement transistor and switched on again. But what's this? Still a silly picture!

I applied a fingertip to the new transistor, which was warm. It was also short-circuit. What had blown it? My gaze settled on CL42 (4·7µF, 160V), which generates the collector supply for TL40. When I removed and tested it I found it was dead short. Once a new capacitor and transistor had been installed there was a sensible picture.

No zoom

As I struggled to get the Fergie TV off the bench, ready for collection, the lovely Cassandra Grant came in with her Panasonic camcorder and W.D., her dim boyfriend.

"It won't zoom, Mr Bullock" she purred. "It was all right until W.D. used it, wasn't it, dear?"

"Huh?" said W.D.

"What did you do to it?" I asked, turning to W.D.

"Nuthin', I dunno, just nuthin'."

The camcorder was a Panasonic NVG2. Its lens had zoomed in but was reluctant to zoom out. As Cassandra and her boyfriend had ambled off, I began dismantling the camcorder to get to its lens assembly. The zoom motor has an attached reduction gearbox, to give a slow and smooth zoom action. This had seized up, and I couldn't free it. SEME supply the motor and gearbox as a single unit, part no. VEM0408. I ordered one and put the camcorder aside.

Only a line

I decided to tackle Mr Ng's little set next. Field collapse, eh? When I tried the set the fault was nothing of the sort. It was line collapse. So I followed the line scan coil wires from the yoke and came to the coupling capacitor CH01 (4·7µF). It was a bit of a gooey mess, and proved to be open-circuit when I removed and tested it.

I cleaned around the area and fitted a replacement. This did the trick, restoring the line scan action.

Then the phone rang. I answered it.

"Is that the television shop?" an anxious voice asked. "Here, the top of your roof's ablaze. I've just driven past in my car."

I dropped the phone, ran out and looked up a the roof. No sign of any fire. I ran back in and picked up the phone. Frenzied laughter.

"Who's that?" I yelled, but the line was dead.

The last time I'd had some silly phone calls it had been Ribby Ellis, the self-styled practical joker. Was he back in town I wondered?

The dead Bush

Ah well, time to have a go at Mrs Runner's set. It was a Bush 2169, and was indeed dead. I took the back off and checked for DC voltages. Nothing. So I moved back to the chopper circuit. No voltage anywhere, not even AC.

I then saw that the mains fuse had died a violent death. The P3NA990 chopper transistor Q1 could well have been the cause, and a check showed that it was dead short. Did it just die or was there a cause? I peered about in the area and saw some pappy high-value resistors. I don't trust high-value resistors, so I unsoldered and checked the ones here. Sure enough, two had gone high in value. R5 had risen from 680kΩ to 830kΩ while R4, which should have been 270kΩ, was virtually open-circuit.

I replaced the P3NA990 and the two resistors, gritted my teeth and switched the set on. To my relief an excellent picture appeared.

Once I'd boxed the set up and got it on to the floor I peered out of the window. It was a gentle, sunny day, just right for tench fishing. I looked at my watch. Time the boys were back. Why should I be slaving here while they were lolling about the banks? Then their car drew up and in they came.

"Had a nice time?" asked Steven.

"Not one bit" I replied, "and I think I'm

going mental. I've had over thirty idiots in and four crazy telephone calls. How many tench did you get?"

"Didn't get one bite" came the reply.

A huge Sony

Just then Mr Macquater came in. He doesn't see straight. He looked at Paul with one eye and Steve with the other.

"Hello Don" he said, "it's a big 'un, I'm telling you."

"Never mind" I replied, "let's take a look at it."

Steven and Paul went out to his car and returned with a huge 29in. Sony set, Model KV29F1. It's fitted with the BE3D chassis.

"Picture's all right at first" said Macquater, "then goes like this." He pulled himself into an arc.

Steven took the set on. "It'll probably be dry-joints" he commented, looking around the line output section. He found some around the 2SC4793 EW modulator driver transistor Q801. Once they had been resoldered the set was OK.

Church Hall set

An enormous old car bounced to a stop outside. The rotund Reverend Goode eased himself out at one side while his curate, Deacon Blande, alighted from the other. They came in.

"Ah Donald" sang the Reverend, "I trust you are well. Now then, I have this massive television set in the boot. It's from the Church Hall. Been frightening the old folks it has. Ticking, or something, they say."

We all went outside to get the TV, which was a 29in. Daewoo GB2898ST (CP775 chassis). The reverend gentlemen then went on their way as we struggled to get the set in and on to the bench.

"The Reverend Goode" he said. "Very upset. Seems his curate tried to phone us to see if they'd left their remote control unit. Got a wrong number and suffered terrible abuse. He fainted. Whoever would have done such a thing?

It was tripping. Paul took the back off and started to look around inside. A check on the 2SD1880 line output transistor Q401 revealed that it was short-circuit. So was the BY228 diode D403 in the EW modulator circuit. After replacing them, Paul switched the set on again. A picture came up, but there was severe EW distortion.

He decided that D403's demise could well have damaged the 2SB546 EW driver transistor Q403, and was right. He also checked the associated 6·8µF, 50V bipolar electrolytic C302, which was also short-circuit. But replacements failed to cure the fault.

Q403, a pnp transistor, had no voltage at its emitter. What else was there around here? A series resistor, R406 (4·7Ω, 0·5W fusible). But where was it? After some searching it was discovered in a hideaway position, behind a heatsink close to C302. It was open-circuit, presumably the result of Q403's failure. Replacement of this item completed the repair. The set then produced a picture with normal scanning – and excellent quality.

A Roberts Radio

Our next visitor was old Stan, who was carrying an ancient Roberts portable. Steven gave him a smile.

"This wireless o'mine's stopped working" he croaked. "I reckon there's someone in there."

"Shouldn't think so" Steven said, "but I'll take a look for you."

It was the battery of course. Once a replacement had been fitted the set sprang to life.

"Wonderful" said old Stan, "only I thought there was someone in there."

Confusion

Steven slipped next door for some cigarettes. Then the telephone rang. I answered it, expecting more jokery.

"Nyahhy wah, nyn wouh trol" said the earpiece. Just what I'd been waiting for. I'd give him a piece of my mind.

"Just get off the phone and stay off it" I said calmly. "A Godless oaf whose idea is to mess busy people about needs his mind seeing to. To hell with you, and that's final." Then I slammed the phone down and sauntered out the back to put the kettle on.

"I sure told him" I said to Paul.

The phone rang again as Steven returned with his cigarettes. He answered it.

"Why, hello Reverend. What? Good gracious, how terrible. Yes, I agree, too awful. Yes, it is here. It was left on the counter. See you later, Reverend."

As he hung up he had a puzzled expression. "The Reverend Goode" he said. "Very upset. Seems his curate tried to phone us to see if they'd left their remote control unit. Got a wrong number and suffered terrible abuse. He fainted. Whoever would have done such a thing? And I wonder what he said." ■

DVD player servicing

In this second part of his new series K.F. Ibrahim starts an account of how DVD players work. The basic block diagram description is followed by an investigation of the laser unit then the derivation of error signals and the operation of the servo system

Last month's instalment dealt with the characteristics of DVD discs and the way in which the recorded video and audio signals are first digitised, encoded and then stored on the disc as channel data. This time we'll concentrate on how a DVD player functions.

Basic player block diagram

A simplified, basic DVD player block diagram is shown in Fig. 9. The optical unit (OPU) generates the laser beam that scans the disc, and also detects the reflected beam, thus reading the data pattern (pits and lands) recorded on the disc. Its output consists of a varying RF signal, which is produced by the pits and lands, and error signals for servo control (focusing and tracking). The next block amplifies the RF signal to a level suitable for feeding to the RF processor, and processes the error signals which are passed to the servo control section.

The functions of the RF processor are as follows: RF signal conditioning; clock signal extraction; 16/8 demodulation (EFM+); frame/sector sync detection; and error correction. Its output is the programme data stream, which consists of the video, audio and other PES data, and a disc speed control signal. The associated DRAM stores recorded data sectors as they arrive, enabling the processor to rearrange them as the original blocks for error correction. Demultiplexing separates the video and audio PES data for feeding to the A/V decoder block. This operates with a DRAM that stores picture information so that inter-frame decoding can be carried out, and also serves as a one-second audio delay for lip sync.

The function of the video buffer is to store video frames to ensure a seamless video display when the OPU is re-reading or searching for a disc sector. This is followed by an NTSC/PAL encoder which incorporates a digital-to-analogue decoder. It produces an NTSC or PAL encoded output suitable for feeding to the TV monitor in use.

How these blocks are integrated in IC form depends on the chip set used. There has already been some increased integration to reduce the chip count. Philips for example has introduced a system-on-chip (SoC) IC that integrates the functions of system control and AV decoding, while Sanyo has developed a chip that integrates the functions of RF processing, demultiplexing and AV decoding.

Note that the RF signal produced by the OPU is an analogue signal that has to be converted to digital form by the RF processor. It's an irregular waveform that can be properly observed only by using a digital storage oscilloscope. If an analogue oscilloscope is used, a pattern known as the eye – because of its shape – can be observed. The minimum analogue oscilloscope bandwidth for this purpose is 40MHz (20MHz for CD playback use). The amplitude of the eye pattern represents the laser strength and is specified by the manufacturer.

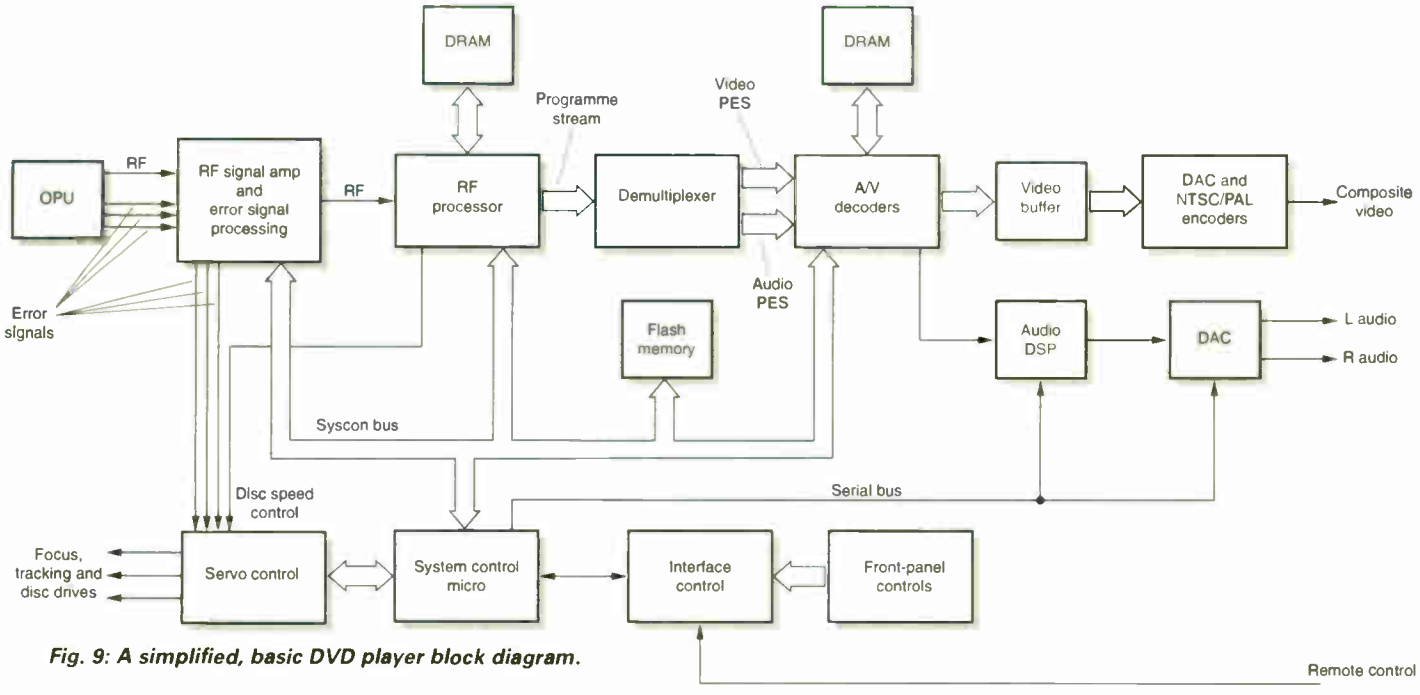


Fig. 9: A simplified, basic DVD player block diagram.

The OPU

This is probably the most critical part of a DVD player. It generates the laser beam, reads the recorded data which is fed out as an RF signal, and produces outputs to ensure that the beam is focused and tracks correctly.

The OPU is mounted on an arm that positions it physically with respect to the disc, moving the unit in and out to follow the spiral track or read different sectors of the track. The OPU must be able to read SL and DL DVD discs and also conventional audio CDs. This means that it must be able to generate laser beams at different wavelengths, 650 or 635nm (red laser) for DVDs and 780nm (blue laser) for CDs. It must also be able to focus at different depths (to cater for dual-layer discs). This can be achieved in three different ways: by using a single-lens holographic arrangement, with an aspherical lens to focus at different depths; by using a twin-lens arrangement with two different lenses; or by using a twin-laser arrangement which has two separate laser and lens assemblies.

Fig. 10 shows the main components of a laser optical pickup unit. The laser beam is generated by a low-power aluminium-gallium-arsenic (AlGaAe) semiconductor diode. The collimator lens adjusts the beam so that it follows a parallel path on its way to the optical grating lens, which bends the laser beam so that there are then two beams, a main beam for reading the data stream and a side beam for tracking purposes. This is followed by the beam splitter. Before it reaches the disc, the beam is focused by the objective lens.

The laser beam penetrates the disc surface and is reflected back towards the objective lens by the record layer. Provided the beam is precisely focused, the reflected beam returns along the same path as the incident beam, towards the beam splitter. This turns the reflected beam through 90°, directing it towards the photodiode detector assembly via the detector lens.

Focal depth and numerical aperture

Since the track pitch is only 0·74µm with a DVD and the minimum pit length is only 0·4µm (see Table 4 for a comparison with CD track characteristics), the size of the spot that reaches the disc's information layer has to be very small – so that it can distinguish the pits and avoid reading adjacent tracks. For DVD reading the laser spot diameter is set at 0·54µm (the figure for a CD is 0·87µm).

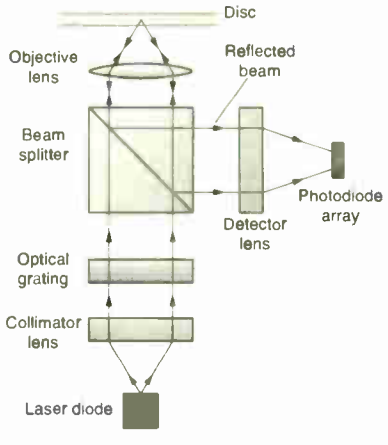


Fig. 10: The main components of a laser optical pickup unit.

Spot diameter is directly proportional to the wavelength of the laser beam and inversely proportional to the numerical aperture (NA) of the objective lens. Mathematically, this is expressed as W =

Table 4: Comparison between CD and DVD parameters.

Parameter	*CD*	*DVD*
Track pitch	1·6µm	0·74µm
Min. pit length	0·84µm	SL 0·40µm DL 0·44µm
Linear velocity	1·21m/s	3·49m/s
Channel bit rate	4·3218Mbits/s	26·16Mbits/s
Objective lens	plastic	glass
Numerical aperture	0·45	0·6
Wavelength	0·78µm (red)	0·65µm (blue)
Spot diameter	0·87µm	0·54µm

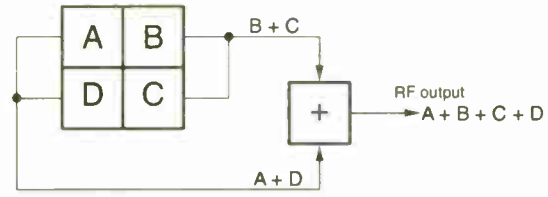


Fig. 11: The photodiode detector array.

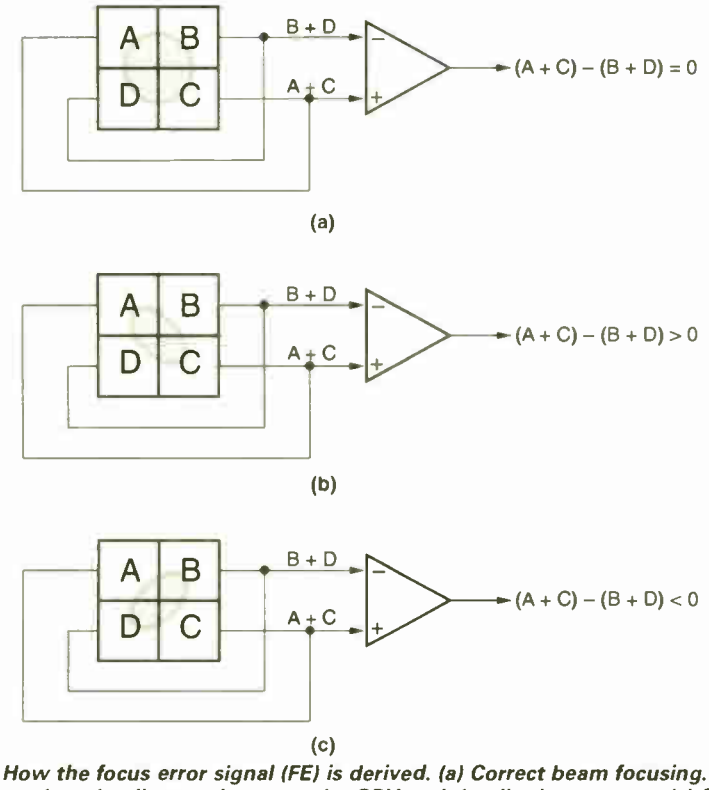
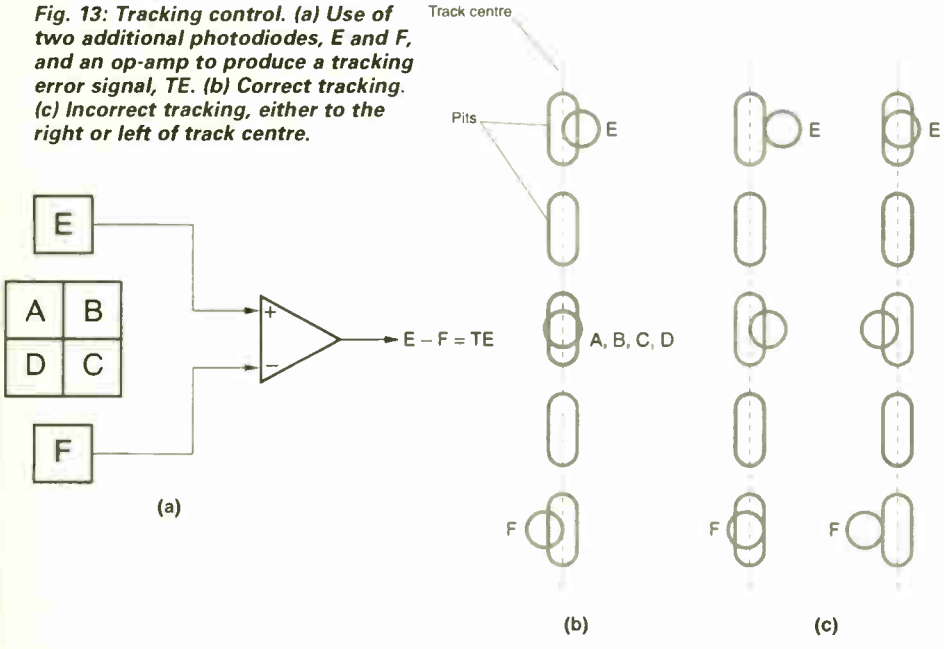


Fig. 12: How the focus error signal (FE) is derived. (a) Correct beam focusing. (b) Situation when the distance between the OPU and the disc is too great. (c) Situation when the OPU and the disc are too close.

Fig. 13: Tracking control. (a) Use of two additional photodiodes, E and F, and an op-amp to produce a tracking error signal, TE. (b) Correct tracking. (c) Incorrect tracking, either to the right or left of track centre.



k/(2 x NA), where W is the spot diameter and k is the wavelength. The numerical aperture works out at 0·6 (compared with 0·45 with a CD).

The effect of this larger NA is to reduce the focal depth, which in turn means that the readout is more sensitive to disc thickness and other irregularities. The first problem is overcome by making the thickness of the disc substrate 0·6mm, the latter by increasing the disc's stiffness through gluing two substrates together (see Fig. 1 last month).The optical head is still sensitive to disc warping however – this tilts the disc. As the optical head moves across the disc during playback a changing tilt angle produces what's known as a skew error, which affects the reading of the data. For this reason a tilt or skew sensor is mounted on the surface of the optical unit. It produces a skew error signal, which is used to ensure that the optical head moves in parallel with the surface of the disc.

The photodiode detector assembly

An array of four photodiodes is used to detect the strength of the reflected beam. Fig. 11 shows the arrangement: the outputs from the photodiodes (A, B, C and D) are added together to provide the RF output signal. Since the pits and land reflect the beam at a different strength, the output represents the recorded ones and zeros.

Obtaining a focus error signal

When the laser beam is correctly focused its reflection forms a circular pattern at the centre of the four photodiodes, as shown at (a) in Fig. 12. To obtain a focus-error signal (FE) for servo control, the photodiode outputs are also fed to the inverting and non-inverting inputs of an operational amplifier. With correct focusing A + C = B + D and the output from the op-amp is zero, as shown at (a). If the beam is incorrectly focused it takes on an elliptical shape at the diodes, as shown at (b) and (c).

When the distance between the OPU and the disc is too great, output A + C is greater than output B + D. As a result a positive-going output signal is obtained from the operational amplifier, see Fig. 12 (b). The opposite situation, when the OPU and the disc are too close, produces a negative-going output from the op-amp as shown at (c).

Tracking error signal

In addition to the main beam, which is used to generate the RF and FE signals, the grating lens produces two side beams. After reflection these are directed to two separate photodiodes, E and F, at the

sides of the main photodiode block, see Fig. 13 (a). When the tracking is correct, as shown at (b), the outputs from photodiodes E and F are equal. They are fed to the inputs of an op-amp which thus produces zero output. If there's mistracking, i.e. the main beam is slightly to the right or left of track centre, the output from E will greater than F or vice versa. As a result the tracking op-amp will produce an output (E – F = TE) which is either positive- or negative-going depending on whether the mistracking is to the right or left. This is illustrated at (c).

The two-axis tracking and focus actuator

The objective lens is mounted between two separate coils (focus and tracking) which are at right-angles to each other and are within the magnetic field produced by a permanent magnet, see Fig. 14. This assembly can move the lens in the horizontal and vertical directions to provide tracking and focusing correction respectively.

Current through the tracking coil A moves the lens horizontally while current through the focus coil B moves the lens vertically.

Because of the smaller pit size and closer tracks, the two-axis actuator used with DVDs is smaller than that used with CDs.

Servo control

Fig. 15 shows the basics of a DVD player servo control system in block diagram form. The RF amplifier receives the OPU's RF output signal, which it passes to the RF processor via a low-pass filter. It also receives separate signals from the various photodiodes, including skew sensor diodes G and H. These are processed to produce four error signals: focus error (FE), tracking error (TE), pull-in (PI) and tilt (or skew) error.

The servo DSP (digital signal processor) receives these signals and also a spindle control signal from the RF processor. This spindle control signal depends on the data flow rate and thus the speed of the disc. The outputs from the DSP are fed to drivers which, in turn, control the relevant actuators and motors. The servo DSP is fully programmed and controlled by the syscon microprocessor chip.

Start up

When the tray is closed or when play is selected a servo start-up routine is initiated. It carries out the following operations: disc diameter identification; disc type identification (DVD or CD and SL or DL for DVDs); and auto adjustments.

The following action will thus be observed: the spindle motor rotates the disc at a relatively high speed; the sled motor moves the OPU across the disc, from the centre to the circumference and back again, to determine its diameter; the two-axis actuator moves the objective lens up an down, a process known as focus search; simultaneously the objective lens is moved sideways to establish accurate tracking.

If the tracking error voltage is low, i.e. 0·4V or less, the inserted disc is a DVD. A CD, with its wider track pitch, will produce a higher TE voltage of around 2V. This distinction provides CD/DVD detection

The difference between a single- and a dual-layer DVD is indicated by the intensity of the reflected beam. The pull-in (PI) signal supplies this information. It's obtained during the focus search process. A high PI signal of about 1V indicates that the data layer is highly reflective, i.e. it's a single-layer disc. A low PI of about 0·5V means that the disc is of the dual-layer type.

Tracking control

Accurate tracking is ensured by the two-axis device's horizontal actuator for small adjustments and the sled motor for larger adjustments. The sled motor keeps the OPU moving along the spiral track and, where necessary, introduces a jump when a different sector of the track is to be read.

The sled error (SE) is calculated within the servo DSP, which monitors the tracking error (TE) signal. The low-frequency component of the TE signal, the result of the gradual spiralling of the track towards the outer circumference of the disc, is used to control the sled motor. The high-frequency component, caused by the jerky track itself, is used to control the tracking actuator.

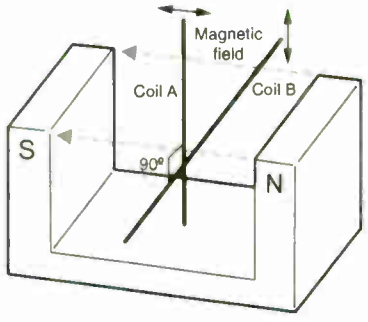


Fig. 14: Operating principle of a two-axis tracking and focus actuator.

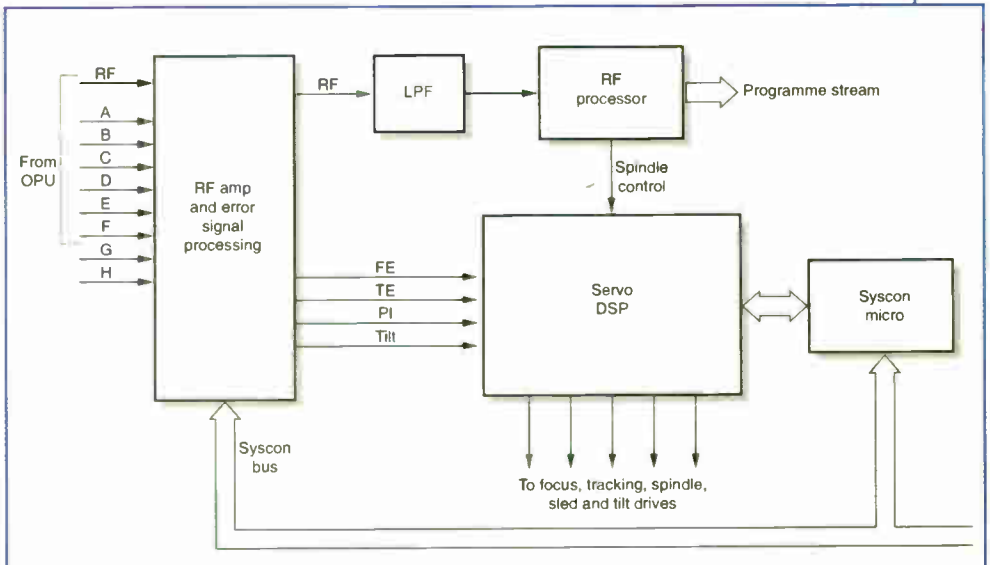


Fig. 15: Block diagram of a DVD servo-control system.

Tilt/skew control

The skew sensor uses two photodiodes (G and H), one at each side of the disc, to detect disk tilt or skew. If the disc is not parallel with the OPU, the reflected light at each photodiode will be unequal. The tilt motor is then activated to make a correction. This correction is made once only, at the beginning of disc playback.

Next month

Next month's instalment will complete our examination of the DVD player. Subjects covered will include system control, the user interface, the AV decoder and DVD audio processing. ■

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Terrestrial DX and satellite TV reception reports. News on broadcast TV and satellite band changes. International DTT update. Aerials for Band I reception. Roger Bunney reports

DX and Satellite Reception

Terrestrial DX-TV reception varied a lot during July. Early in the month things were really humming then, towards the middle of July, Sporadic E propagation died away. Finally there was a lift at the end of the month, with a welcome flourish across Bands I and II.

Dramatic VHF action in the radio amateur bands has been reported. First there were transatlantic 50MHz (6 metre) multiple-hop SpE openings on May 25th and 31st, with communications between the UK and both the US and Canada. Unusually, both openings occurred during day-time hours, from approximately 1200-1600. And on May 26th there was, during the evening to about midnight, two-way tropospheric communication at 144MHz (2 metres) between the UK and the Canary Is, a distance of some 3,000km.

During a multiple-hop SpE opening a few days earlier, on May 18th, there was two-way amateur radio communication between the UK and stations in Jordan, Israel and Egypt. Amateur callsign VQ9IO was heard during this opening and several contacts have been confirmed between VQ9IO and amateur radio stations in the southern UK. Station VQ9IO is on the Chagos Archipelago in the Indian Ocean, about 1,500km south west of Sri Lanka. This is an amazing distance, about twice that of the main UK-Jordan/Egypt propagation skip. My thanks to the RSGB bulletin *Radcom* for this information.

Shot from an outside broadcast report on talks at Smithsburg, Maryland, relayed via the NSS K Reuters Atlantic lease.

My own experiences of transatlantic SpE TV reception have always occurred between about 1900 through to late evening, as the MUF has risen to ch. A5 (77·25MHz video), with many co-channel signals present on the lower channels and less interference on the higher ones. N. American SpE TV can occur between late July and mid-August. A good indication is to check for ch E3 reception from RUV (Iceland) first.

Here's the collated SpE TV log for July:

2/7/01 TVE (Spain) chs. E2-4; RAI (Italy) chs. IA, B; TVA (Italy) ch. E3–; TeleA (Italy) ch. E2–; Canal + (France) ch. L3; RTL Klub (Hungary) ch. R2; RTP (Portugal) ch. E3.
3/7/01 RAI IA, B; RTP E3, 4; TVE E2-4; RTL R2;TVA E3–; TeleA E2–; ORT (Russia) R2.
4/7/01 RAI IA, B; TVA E3–; TeleA E2–; TVE E3; RTP E3; ORT R1, 2; NRK (Norway) E2-4; SVT (Sweden) E2, 3; TVR (Romania) R3; ETV (Estonia) R2.
5/7/01 RTL R2; RAI IA; TVA E3–; TVE E2; RTP E3.
6/7/01 NRK E3, 4; LTV(Latvia) R2; RTL R2; RTP E3;TVE E2-4; RAI IA; TVA E3–; HRT (Croatia)E4.
7/7/01 TVE E2, 4; C+ L4; RAI IA; RTP E3.
9/7/01 TVE E3.
10/7/01 TVE E2; RTP E2-4 (see note below).
11/7/01 RTL R2; TVE E2, 3; RTP E3; RAI IA, B; TVA E3–; C+ L3.
12/7/01 NRK E4; RAI IA; RTL R2.
14/7/01 RAI IA.
17/7/01 TVA E3–; RAI IA.
19/7/01 TVE E3.
21/7/01 RTP E3; SVT E2.
22/7/01 RAI IA; RTL R2; LRT (Latvia) R2; UT (Ukraine) R2.
26/7/01 NRK E3; SVT E2.
28/7/01 LRT R2; NRK E2, 3.
29/7/01 RAI IA, B; TVA E3–; TeleA E2–; TVE E2-4; RTP E3; RTL R2; TVR R2.
30/7/01 RAI IA, B; TeleA E2–; TVA E3–; C+ L3, 4; TVE E2.

RTP ch. E4 received on the 10th by Peter Schubert, Rainham is either a mainland 50W relay or a 180W transmitter in the Azores.

The 2001 Sporadic E season was reasonably active though short-lived. Propagation was mainly on a north-south axis, bringing Scandinavian and Iberian signals to the UK. The Italian shopping channels TVA (53MHz video) and TeleA (47·9MHz video) were received quite often: reception of the main RAI transmitters was less frequent – strange.

Satellite sightings

Though most satellite TV signals are now digital, analogue ones are still present. They are confined to main-line programming, and are often duplicated in digital form somewhere. The Albanian TVSH channel continues to provide a strong analogue PAL signal across the UK. It comes up during the evenings via Eutelsat II F3 at 21·5°E. Check at 11·556GHz horizontal – the audio is at 6·5MHz. On July 18th the channel carried live OB football from 1900 hours.

At the same time, just up the tuning scale, horse-racing was being uplinked by SISLink. This was a digital feed at 11·686GHz H (SR 5,632, FEC 3/4), with the identification "8MHz basic". Afternoon and evening horse racing can often be seen at the top end of II F3's Ku-band coverage. Various sports events are at present being carried. Late on Sunday morning, the 22nd, a locked-off shot appeared via SIS02 UKI-27. It appeared to be an almost deserted circular running track and was interspersed with colour bars. This was at 11·663GHz H (SR 5,632, FEC 3/4).

July 22nd was during the course of the G8 summit talks at Genoa, with the attendant demonstrations. That morning Jonathon Hunt of Sky News transmitted a live report from Italy, using 'SIS26 coder 1 UKI-257 Genoa Sky News'. This was at 11·041GHz H (5,632 + 3/4). Unlike other uplinkers, SISLink tends to use different frequencies. For example the SISLink-13 UKI-147 truck that covered the riots in Bradford on the 9th for Sky News used 11·692GHz H. On the 26th it covered premier Blair leaving a field in Cumbria via helicopter, this time at 11·047GHz H.

Eutelsat II F3 resembles a busy railway station, with activity constantly changing over the course of a day. If I scan down from 11·750GHz at say 1700 hours it will be worth doing a second scan twenty minutes later. Various transmissions pop up, do their bit, then cut and run.

The Americans took a great interest in the Tour de France this year, with a daily edited report of the day's cycling for the US networks. This was carried by Channel 1 in the Globecast multiplex at 11·590GHz V (SR 20,145, FEC 3/4) via NSS K (21·5°W). On the 24th a teleport Stateside switching error occurred. The Outdoor Life Network caption appeared inlaid over colour bars via the Reuters 11·462GHz V lease. The transmission was suddenly cut, reappearing a few minutes later within the Globecast channel package at 11·590GHz V. The transmission originated from Stamford, CT.

The Digichat web site (see satellite news) had said that the Tamil TV Network is carried in the clear via Hot Bird (13°E). Following the Tamil Tigers raid on the Sri Lankan airport on July 24th I checked at 12·245GHz H (SR 27,000, FEC 3/4) and found about eight channels, including the Tamil TV Network (TTN), but unfortunately encryption had arrived. A mass of international programming is now available at 13°E.

A couple of reports have drawn attention to the fact that the BBC is using Telecom 2A (8°W) and Telecom 2B/D (5°W) for regional feeds. Edmund Spicer (Littlehampton) and Roy Carman (Dorking) have both found that BBC OBs are active between 11·569GHz V and 11·690GHz H. Edmond noted that UKI-16 was using an SR of 6,111, while Roy saw another UKI-16 feed that used the more common 5,632 SR. A few BBC uplink trucks now use an SR of 4,898 and FEC 7/8. One of the feeds to London was encrypted.

Roy found an Italian channel, Tell you your fortune, via Telecom 2A at 12·702GHz V, with SR 2,500 and FEC 2/3. He describes it as doubly appalling. The male presenter defies description, and the OB is rebroadcasting an analogue feed with heavy hum on both the video and audio.

Several sat-zappers noted test transmissions in mid-July from the newly launched Astra 2C, then at 32·5°E. This was prior to its move to 19·2°E to provide back-up for the ancient Astra 1A.

Following a couple of reports in *TeleSatellite* magazine I have, over the past few weeks, been intermittently checking the 245-270MHz band for reception of Asian and American studio-to-transmitter links (STLs) that use the 300MHz band (i.e. 50MHz higher). The 300MHz signals travel out into space and are received by US military satellites which provide 50MHz down-conversion and 'inadvertent downlinking'. It's these downlinks that provide reception of the STL signals. Basic equipment and a scanner does work – signals are present. More on this next time!

Shot from an ORT (Russia) PTP channel programme.

Broadcast news

Isle of Man: A local station, Manx TV, is to open in early 2003, based in Douglas. It will provide local entertainment, news and sport. As part of the *Your TV* local TV group it will operate around the clock, like the Isle of Wight RSL station TV 12. At present Manx TV is establishing a channel in conjunction with NTL.

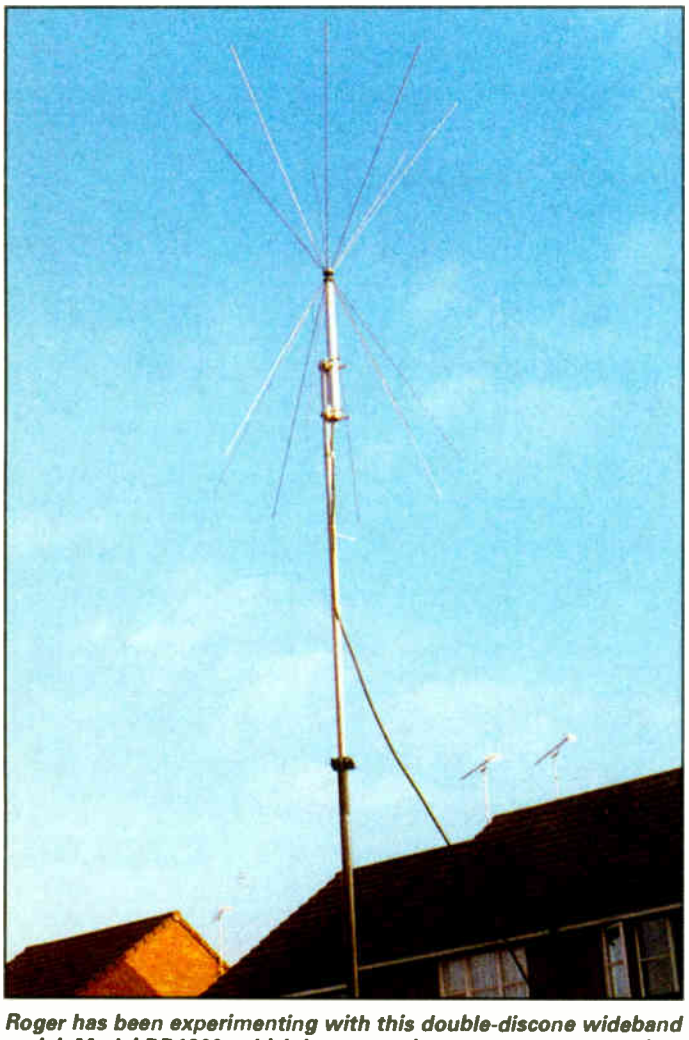
All UK-TV RSL details, both on-air stations and planned allocations, are listed at

http://www.itc.org.uk/divisions/eng-div/trans/r-s-l.htm

New Zealand: A Maori-language TV channel is being considered as part of the TV4 network. About a million households can at present receive the commercial terrestrial TV service TV4, out of a total household count of 1·2m.

China: The Beijing-based CCTV national TV service has opened two new channels, CCTV-10 which is broadly educational and CCTV-11 which provides classical music, dance and opera. These analogue channels will be available in the Beijing area initially then extended to other population centres.

Crossed wideband Band I dipoles with, above, a discone aerial, chimney-mounted at Roger's home.



Roger has been experimenting with this double-discone wideband aerial, Model DD1300, which is mounted on a temporary mast in the garden.

International DTT update

RTE (Ireland) is to open four DTT channels by the end of 2003: a 24-hour news channel should be on air by the end of 2002. The first Portuguese DTT services should already be on air, run by the Plataforma de Televisao group. They will include the RTP and SIC networks. The Czech Republic intends to open DTT services in late spring 2003, aiming for 90 per cent coverage within three years and an analogue switch-off in 2012: public service broadcaster CST and the commercial channels Prima and Nova are guaranteed coverage. Sweden is encouraging rapid take-up of DTT by the public, with a proposed analogue switch off in 2003, though this short timetable is thought to be impractical. There's already a rapid expansion of DTT programming and more services are signing up for the available multiplexes.

Australian DTT is expanding, with services in Darwin, regional Queensland, Victoria and Tasmania due to be in operation by March 2003. All main areas are to have dual analogue and digital services by early 2004.

DTT is to start in the three main Japanese cities by the end of the year, with nationwide coverage expected by 2006 and an analogue switch-off in July 2011. Vietnam has just started DVB-T test transmissions, using the COFDM modulation technique.

Aerials for Band I reception

The Band I aerial system I've been using recently is quite modest compared with previous years, consisting of two horizontal wideband dipoles mounted at 90° to give either north-south or east-west reception. An external Nevada Communications VHF relay unit is used to select the output from one dipole or the other, feeding it to a single downlead. On the same mast, though not too clearly visible in the accompanying photograph, there's a D160 wideband discone aerial. It's a standard discone with an inductively-loaded vertical whip to enhance low-VHF performance. A discone provides wideband coverage with low gain. Out of interest, I used the discone aerial one torrid evening to check a TeleA signal. Remarkably, reception was stronger with the discone aerial than with either of the wideband dipoles. The results I obtained during several SpE openings encouraged me to experiment further.

Nevada Communications also supplies a double-discone aerial, Model DD1300, which has a second, upper array of longer cone elements. This suggested improved VHF performance and, as the offer price was very reasonable at just under £40, I decided to buy one. I mounted it at about 14ft (aerial centre) on a temporary mast in the garden. In this position there's clear signal pick-up from the south but the aerial is otherwise screened by nearby buildings. This situation provides an unfair and demanding test for comparison with reception via the Band I dipoles, which are at 30ft and clear to the horizon all round. The output from the DD1300 is taken indoors via a coaxial tieline (CT125), with a switcher for selection of the output from either the DD1300 or one of the dipoles.

The results I've obtained with the DD1300 are startling. In many cases the DD1300's signal output is far higher than that from either of the wideband dipoles. A TeleA signal often provides a visible picture when no signal is apparent from the dipoles. The situation is similar with TVE signals from Spain.

The improvement is greatest with shorter-skip signals, which suffer from polarisation shift. It seems that a horizontally-polarised (when transmitted) signal twists along the propagation path to become vertically polarised. With longer-skip signals, say 800 miles plus, the tendency is for the original horizontal polarisation to be retained. Certainly a long-hop horizontally-polarised signal remains in the same plane at the reception site.

I anticipate that reception via the vertically-polarised DD1300 aerial would be improved by raising it to a similar height to the Band I dipoles, thus clearing obstructions.

Incidentally the temporary mast on which the DD1300 aerial is mounted consists of a modified Hills rotary washing line, upside down, with a 6ft by 1in. standard alloy mast sleeved and inserted inside to increase the height.

Satellite news

There are problems with Gorizont 31 at 40·5°E. As a result some Russian analogue TV services are not at present available in western Russia and eastern Europe. Cable systems that have previously taken the services are now using other downlinks, such as Express 2A (80°E) and Gorizont 26 (11°W). The difficulty with this is incorrect time zoning.

The EBU has leased capacity until the end of 2002 aboard PAS-9 over the North Atlantic for the carriage of sporting events. Both the 2002 Winter Olympics at Salt Lake City and the Edmonton World Athletics Championships have been booked and there are options on other sports action.

There are rumours that London may be used as the base for production facilities by another Iraqi opposition group operating a satellite channel. The group hopes to be transmitting programmes to the Middle East during the autumn, using a Lockheed Martin satellite.

A remarkable-looking satellite, Thuraya, is now in operation at 44°E with coverage of Europe, the Middle East, Africa and Central Asia. It provides voice, fax, data and GPC connection via a handmobile that's similar to the standard mobile GSM phone but costs $US995, with calls at 55c a minute. Subscribers can "roam" the area covered, accessing fixed and mobile units in the L band. The transmit/receive aerial includes a 40 x 52ft mesh "saucer". For further information and pictures, refer to

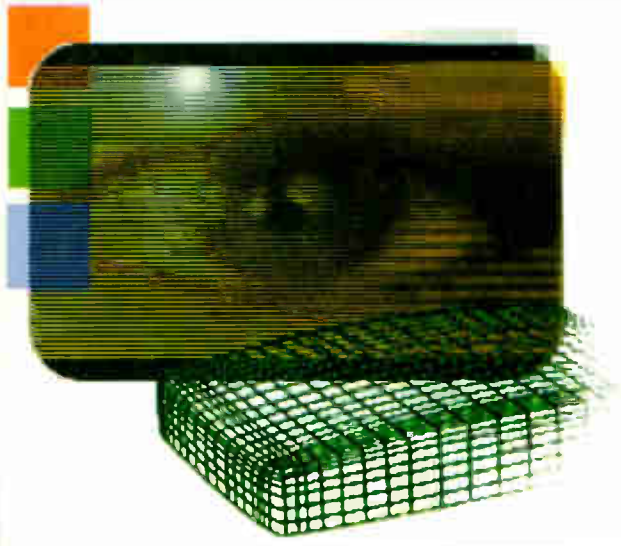
http://www.hsc.com/factsheets/geomobile/thuraya/thuraya.html – or just THURAYA.

Eutelsat is now operating as a limited reliability company called Eutelsat S.A., based in Paris. The change should mean greater commercial freedom to develop new products and services and "greater flexibility for striking strategic alliances and joint ventures".

There's a new digital satellite web site, in English, with news on latest channel changes, technical information, letters etc. It's called Digichat, and I found it while scrolling down for RSD Communications. The internet address is

http://homel.stofanet.dk/kjoge/indexl.html

If anyone requires a new, cheap analogue satellite system for 13 or 19·2°E, check with the grocery chain Lidl. In late July the company had on offer an 80cm dish with LNB, 20m of coaxial cable, plugs and a receiver with 999 memory locations, three scart sockets and DiSEqC 1.0 for £39.99, with installation instructions. It's badged Welltech. A wall bracket set was available at £1.99. The receiver's IF tunes across 900-2,150MHz, with audio tuning over 5-9·5MHz. ■



Reports from
Michael Dranfield
Eric Oliver
Graham Richards
Gary Laidler
Eugene Trundle
Mike Leach and
Roger Burchett

TV FAULT FINDING

We welcome fault reports from readers – payment for each fault is made shortly after publication. See page 746 for details of where and how to send reports.

Matsui 2092T

I have come across two different versions of this set. Although the model number is the same, they are fitted with different microcontroller chips and have different line output transformers. In addition a different remote-control unit is required. The grey Philips LOPT fitted in one version goes short-circuit between the primary winding and chassis. The black LOPT is more reliable, but this version suffers from dry-joints at the line driver transformer. As a result, the 2SD1555 line output transistor fails. Circuit protector SOC2000, which is next to the chopper transformer, sometimes goes open-circuit when the line output transistor dies. **M.D.**

Sharp 59CS03H

There were no teletext or on-screen displays. As the text and on-screen display signals come from the same chip, IC401 (SDA5273C26), I carried out scope checks here. The clock crystal was operating correctly at 20·48MHz, video entered the chip at pin 10, there were field and line sync pulse inputs at pins 4 and 5 respectively, and the power supplies were OK – 3V at pin 23 and 5V at pins 11, 12, 16, 21 and 25. There were blanking pulses at pin 64, but there was no RGB information at pins 61, 62 and 63. In view of this I decided that the chip must be faulty and ordered a replacement. Good job it cost only £7, because the fault was still present when it had been installed.

I then studied the electrical adjustment manual and discovered that there are two NVM adjustments, one relating to the OSD contrast and the other the teletext contrast. But the problem was how to navigate through the service menu without an on-screen display – only a black box was present on the screen when a button was pressed. Fortunately the service manual lists the adjustments in the order in which they come up on the screen, so I was able to step through to the OSD contrast adjustment. Bingo, up came the OSD. I was now able to see the service screen. Moving on to the text contrast, I found that this was also set at zero.

New values couldn't be stored however. When I moved on to the next adjustment the text and OSD contrast settings were reset to zero. I was beginning to wish I'd changed the NVM in the first place. Then I noticed, in the electrical adjustment manual, that the OSD and text contrast are set by the user menu. Using the instruction book, I managed to scroll down to the text and OSD and turned them up. The personal settings could then be stored.

To complete the repair I cleaned around the anode cap, in case an EHT flashover had been responsible for the problem. An odd thing I discovered is that with the Megatext chip removed the set fires up then trips out with a two-second cycle. **M.D.**

Bush BTV170T

This 14in. TV/VCR combi unit had no TV sound, though there was sound when a tape was played. The customer also mentioned that teletext had stopped working some time back. I had to buy the service manual to reprogram the EEPROM. Don't buy the EEPROM, as it comes blank and you will still need the service manual.

The sound fault was cured by changing the data at address 0D to B3. For teletext, address 08 needs to be 44 and address 09 needs to be 61. For the **Tatung-badged** version of this set without teletext, address 08 needs to be 40 and 09 needs to be 60. Apart from this the other NVM data is the same. This information will help if you have the wrong manual for the job. **M.D.**

Samsung CI5373T

This set had a dead power supply. I found the cause in the snubber network, where C803 (2·2nF, 800V) was short-circuit. The two series-connected resistors R802 and R803 were open-circuit: both are 100Ω safety resistors, though my manual shows the value as 10Ω. Unfortunately IC801, HC801 and DZ801 had also been destroyed. **M.D.**

Tatung 190 Chassis

The picture was rippling when this set was switched on from cold. Checks on the power supply lines showed that everything was OK, but a scope connected to pin 26, line drive output, of the TDA4505 IF/timebase generator chip IC101 revealed all. The mark-space ratio of the drive waveform was wrong. The fault cleared as the set warmed up. A new TDA4505 chip restored normal operation. **M.D.**

Sharp 59CS03H

This set was dead. The cause, as so often, was failure of the TDA8375A IF/video processor/timebase generator chip IC201. There was a low resistance between pin 56, the line drive output, and chassis. A replacement brought the set back to life.

I mentioned this problem to an electronics engineer who designs recording studios. He came up with a novel solution. The output at pin 56 of the TDA8375A is open-collector, with two Schottky protection diodes, one connected to the internal supply rail (cathode to the rail) and the other to the internal earth (anode to earth). As a Schottky diode has an 0·5V forward voltage drop, he suggested applying a 2V battery to forward bias the shorted diode and blow it open-circuit! I haven't tried this, but he assures me that it will work as has done it in the past. **M.D.**

Ferguson ICC7/8 Chassis

There have been problems with the supply of field output chips for use as replacements in these chassis. If you fit a Phoenix Modkit 8F and find that there is cramping at the bottom of the screen, fit a 2·7V zener diode instead of the 2V zener diode supplied in the kit. It's connected from pin 7 to chassis, with its anode to chassis.

If you fit the new type of TDA8178FS chip made by S.T. Sing and find that there is still no field scanning, fit a 3·9kΩ resistor between pins 2 and 7 and a 2·7V zener diode from pin 7 to chassis, anode to chassis. **E.O.**

Goodmans 286NS/05 (Philips L6.3 chassis)

The problem with this set was lack of

width, with the EW adjustments having no effect. These sets have separate line scan coupling and EW coupling capacitors (instead of using a single capacitor to do both jobs). C2915 provides the line scan coupling and C2913 the EW coupling. They are both 390nF, 250V capacitors. The cause of the problem was that C2915 had gone open-circuit.

The set had been in a week or so previously because it was dead with the line output transistor faulty. Now we know why the transistor had failed! A new capacitor plus adjustment of the width etc. controls restored normal scanning. **G.R.**

JVC MX and MX II chassis

If the HT starts to come up and then shuts down, don't overlook D521 (BY228) in the rather complicated EW diode modulator circuit. It's partly hidden by a large pulse capacitor behind the line output transformer.

Models fitted with these chassis include the **AV25/AV28GS1EK** and **AV25/AV28S1EK**. **G.R.**

Bang and Olufsen 7730

This set's problem was no sync and weak video. My problem was that I didn't have a circuit diagram! But scope checks brought me to TR1 (BC547C) on the AV/scart board. There was plenty of video at its base, but nothing at its emitter. When I removed it for test I found that it was leaky collector-to-emitter. A replacement restored this old set's performance to new. **G.R.**

Ferguson C51F (ICC6 chassis)

This set tripped nine times then there was nothing (the LED didn't always blink). I carried out checks around the microcontroller chip IR01 and found that the conditions at the line and field sync pulse input pins 26 and 27 were incorrect. Further investigation brought me to TL90 (BC848B) which monitors the beam current. It's closely connected to TF01 (another BC848B), which I also replaced. The originals read OK when checked out of circuit, but replacements cured the fault. **G.R.**

Akai CT2137UKT

There was no audio, just hiss. The sound was OK via the scart connector. Not thinking about set-up menus etc., I replaced the 6MHz filter 30F2 next to the TDA8362A jungle chip. This made no difference. There was an empty place for another filter, 30F1, so I fitted a 6MHz resonator here. This produced perfect sound. **G.R.**

Goodmans GD2880A (Ferguson ICC9 chassis)

The job card listed three faults. No remote-control operation was cured by replacing the IR detector on the front PCB. The second fault was "intermittently dead". Checks in the supply/reset circuitry for the microcontroller chip IR01 revealed incorrect voltages around TR85 (BC848B) and TR87 (BC858B). Two new transistors sorted this problem out. The final fault, a blank raster but video via the scart connector OK, was cleared by replacing TX16 (BC858B) in the scart processing section of the receiver. **G.R.**

Bush 2863NTX/A (11AK19 chassis)

This set came in with the line output transistor short-circuit. When I fitted a replacement and switched on again the bottom two inches of the picture were badly cogged and the new transistor was running hot. The capacitors in the line output stage all seemed to be OK, so I carried out a close inspection with a magnifier. This revealed an almost invisible dry-joint at wire link J613, which is connected to the emitter of the line output transistor. Once this had been attended to, a long soak tested proved that the set was now OK.

I've since had two more of these sets with the same fault. **G.L.**

Sanyo CBP2180A (A5 chassis)

If the picture is shifted towards the right-hand side of the screen, replace the horizontal centring potentiometer VR411 (50kΩ). The fault is sometimes intermittent. Don't try to clean VR411, as the set will nearly always pay you a return visit. **G.L.**

Ferguson C51F (ICC6 chassis)

This set's picture was affected by what can only be described as line twitch. It got worse as the set warmed up, but use of freezer failed to locate the culprit. After much checking with an oscilloscope I found that TV71 (BC858B) was the guilty party. It's in the line pulse feedback path to pin 13 of the STV2110 colour decoder/video processor/timebase generator chip IV01. When it was checked with a meter it produced perfect readings, but a replacement cured the fault. **G.L.**

Bush 2868NTX (11AK19 chassis)

This set was brought in because it was dead. But there were no short-circuits or signs of distress. In view of the number of these sets I've repaired recently, I really ought to get a circuit diagram! Checks in the power supply revealed that R825 (2·2MΩ) was open-circuit. So I fitted a replacement and, in hope, switched on. Nothing – the set was still dead. After a lot more checks I found that R806 (22kΩ) was open-circuit. Its replacement finally restored normal operation. Has anyone got an 11AK19 circuit diagram going cheap?! **G.L.**

Daewoo DMQ2159 (CP315 chassis)

For the first thirty minutes or so after switching this set on the picture was excessively bright with low contrast and field flyback lines visible. The cause was C426 (3·3µF, 250V), which is the reservoir capacitor for the 190V supply to the RGB output stages. It's at the rear of the main PCB. **E.T.**

Bang and Olufsen MX3000

Many of these sets are still going strong after more than a decade. At this stage in their lives a common problem is dry-joints. When these are at thyristor DL21 the result is intermittent field collapse; when they are in the tube heater circuit on the main PCB the picture disappears; and when they are around the line output transformer the result may, for example, be spasmodic line underscanning. Always scrape, flux and tin the affected pins or leads before resoldering. **E.T.**

Hitachi C28300TN (A5 chassis)

If the picture takes a long time to appear and/or has heavy white bands across it from cold, replace C954 (1,000µF, 35V). It's the reservoir capacitor for the 12·6V supply, on the secondary side of the chopper transformer. You'll find it on the power/deflection panel. **M.L.**

Nokia 6361 (D-E FST chassis)

After carrying out resoldering in the line output and power supply sections to cure the usual intermittent problems I found that the picture was quite badly shaded, dark at one side and light at the other. The culprit was C525 (10µF, 50V), which smooths the output from the 12V regulator. **M.L.**

Matsui 1455

This set was stuck in standby. My first checks were on the transistors in the HT switching circuit, Q605 and Q606, as they have given a lot of trouble in the past. Not this time however. The cause was R624 (100kΩ), which links the on command to the base of Q605. **M.L.**

Samsung CI5061 (P68SA chassis)

The customer said that the brightness varied. But on the first two occasions when this set came in the fault didn't appear. On the third occasion the picture was very dark at switch on, but the brightness returned after about a minute. The set didn't repeat this performance.

I pondered and decided that the line output transformer was probably the cause, with a dodgy first anode potentiometer. But, to my embarrassment, the set came back a fourth time. On this final occasion the fault was almost permanent. The brightness was actually fluctuating very fast. It did this in all modes, including text and AV. The cause was eventually traced to the 2SA539-Y transistor Q905 on the tube base panel. It's a pnp transistor that's connected in series with the emitters of the three RGB output transistors. **M.L.**

Sony KVX2182U (BE3B chassis)

Sets that are stuck in standby can be a problem. There are often so many possible causes, with all sorts of protection circuits which can operate, that it can be difficult to know where to start. If you should get one of these Sony sets with the problem however the first suspect is the memory chip IC002. It's a small, surface-mounted device which is on board A. There's an 80 per cent chance that a replacement will cure the problem, with no other faults evident. The part no. is 8-759-334-20. You will need to set up the width etc. afterwards. **M.L.**

Hitachi G8Q Chassis

We all know what happens when C933 (2,200µF, 25V) in this chassis dries up, don't we? Line tearing, leading to no picture with the sound OK. Then finally nothing, as if the set is dead. The 12V line is in trouble of course, because C933 is the reservoir capacitor for the supply to the 12V regulator. While you are replacing C933, do yourself a favour and change C932 (470µF,16V) as well. It's the reservoir capacitor for the 8V supply. You'll be glad you did, as the following story shows.

The set, a **CPT2578**, had for some years lived in a flat within walking distance. I had replaced C933 about twice. The owner then moved to a converted farmhouse miles away, and the set was installed two floors up. That meant two sets of narrow stairs. Guess what happened next?

The aerial rigger had retuned the set for the different transmitter. Then strange teletext faults appeared, the most obvious being the need to switch the set off at the mains, then on again, to return to TV from text. Two days later the set came on with a blank screen, the sound being OK. Could I call and investigate?

I made the call with a feeling of foreboding. A check on the memory program showed that it was wrong. After setting the bits correctly the text faults seemed to have been cured, but I still had a blank screen. When I turned up the A1 control flyback lines appeared. My first thought was sandcastle pulse problems, but I wasn't convinced about this. The owner lugged the set down the stairs, and back to the workshop it came.

Initial checks showed that the sandcastle pulses were indeed wrong, but I could smell something getting hot. That something was the L932/R931 combination in the 8V supply, which feeds the 5V regulator on the text panel. The regulator was getting hot. Things cooled down when I removed the text board and fitted a link to reconnect the video. A scope check then revealed that there was a large ripple on the 8V line. C932 was the culprit.

The sandcastle trouble was caused by the TDA2579A timebase generator chip IC701, which also produces the sandcastle pulses. It takes its supply from the 12V rail. Once a replacement had been fitted there was a good picture.

There was a clean 8V supply when C932, L932 and R931 had been replaced. But it was loaded down when I refitted the text panel, and there was a repeat of the overheating. It was difficult to assess how much silicon was faulty on the text board. Both RAM chips were damaged at least. Fortunately I had another text board, of unknown condition. It proved to be a working board.

The moral is to replace both C933 and C932. My notes suggest that when C932 starts to dry up diagonal bands of interference can be seen, particularly in the text mode. But the owner saw nothing amiss until it was too late. **R.B.**

Phoenix CTV2105R

This set is fitted with the **Fidelity ZX4000 series chassis**, or a version of it. But the component reference numbers are not the same. For example C80 (100µF, 25V), which causes low start-up voltage at pin 9 of the TDA4600 chopper control chip when it fails, is C94 in this version.

The fault this time came to light when the owner's son used the mains switch, for the first time in many months, to turn the set off – it normally stayed in standby. The set refused to come on straight away and when it did finally start up, after many frantic thumps on the mains switch, it couldn't be turned off.

The mains switch, which was the original one, had succumbed and was now welded on permanently. The cause of the very slow start up was the chopper transistor's base drive coupling capacitor C95 (100µF, 25V). Its value had fallen to 60µF. Incidentally this item is C78 in the ZX4000 series chassis. Fortunately the chopper had survived and, after resoldering some suspect joints, the set was declared to be healthy again. **R.B.**

Goodmans 2032

This Comet model is similar to the **Nikkai NT20**. Top foldover is a common fault with these sets. The item to check is C313 (2·2µF, 200V) which goes open-circuit. **R.B.**

£1 BARGAIN PACKS
Selected Items

PIEZO ELECTRIC SOUNDER, also operates efficiently as a microphone. Approximately 30mm diameter, easily mountable, 2 for £1. Order Ref: 1084.

LIQUID CRYSTAL DISPLAY on p.c.b. with i.c.s. etc. to drive it to give 2 rows of 8 figures or letters with data. Order Ref: 1985.

30A PANEL MOUNTING TOGGLE SWITCH. Double-pole. Order Ref: 166.

SUB MIN TOGGLE SWITCHES. Pack of 3. Order Ref: 214.

HIGH POWER 3in SPEAKER 11W 8ohm). Order Ref: 246.

MEDIUM WAVE PERMEABILITY TUNER. It's almost a complete radio with circuit. Order Ref: 247.

HEATING ELEMENT, mains voltage 100W, brass encased. Order Ref: 8.

MAINS MOTOR with gearbox giving 1 rev per 24 hours. Order Ref: 89.

ROUND POINTER KNOBS for flatted ¼in. spindles. Pack of 19. Order Ref: 295.

CERAMIC WAVE-CHANGE SWITCH. 12-pole, 3-way with ¼in. spindle. Order Ref: 303.

REVERSING SWITCH. 20A double-pole or 40A single pole. Order Ref: 343.

LUMINOUS PUSH-ON PUSH-OFF SWITCHES. Pack of 3. Order Ref: 373.

SLIDE SWITCHES. Single pole changeover. Pack of 10. Order Ref: 1053.

PAXOLIN PANEL. Approximately 12in. x 12in. Order Ref: 1033.

CLOCKWORK MOTOR. Suitable for up to 6 hours. Order Ref: 1038.

TRANSISTOR DRIVER TRANSFORMER. Maker's ref. no LT44, impedance ratio 20k ohm to 1k ohm; centre tapped, 50p. Order Ref: 1/23R4.

HIGH CURRENT RELAY, 12V d.c. or 24V a.c., operates changeover contacts. Order Ref: 1026.

3-CONTACT MICROSWITCHES, operated with slightest touch, pack of 2. Order Ref: 861.

HIVAC NUMICATOR TUBE, Hivac ref XV3. Order Ref: 865 or XN11 Order Ref: 866.

2IN. ROUND LOUDSPEAKERS. 50Ω coil. Pack of 2. Order Ref: 908.

5K POT, standard size with DP switch, good length ¼in. spindle, pack of 2. Order Ref: 11R24.

13A PLUG, fully legal with insulated legs, pack of 3. Order Ref: GR19.

OPTO-SWITCH on p.c.b., size 2in. x 1in., pack of 2. Order Ref: GR21.

COMPONENT MOUNTING PANEL, heavy paxolin 10in. x 2in., 32 pairs of brass pillars for soldering binding components. Order Ref: 7RC26.

HIGH AMP THYRISTOR, normal 2 contacts from top, heavy threaded fixing underneath, think amperage to be at least 25A, pack of 2. Order Ref: 7FC43.

BRIDGE RECTIFIER, ideal for 12V to 24V charger at 5A, pack of 2. Order Ref: 1070.

TEST PRODS FOR MULTIMETER with 4mm sockets. Good length flexible lead. Order Ref: D86.

LUMINOUS ROCKER SWITCH, approximately 30mm square, pack of 2. Order Ref: D64.

MES LAMPHOLDERS slide on to ¼in. tag, pack of 10. Order Ref: 1054.

HALL EFFECT DEVICES, mounted on small heatsink, pack of 2. Order Ref: 1022.

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PROJECT CASE, 95mm x 66mm x 23mm with removable lid held by 4 screws, pack of 2. Order Ref: 876.

LARGE MICROSWITCHES, 20mm x 6mm x 10mm, changeover contacts, pack of 2. Order Ref: 826.

MAINS RELAY with 15A changeover contacts. Order Ref: 965.

COPPER CLAD PANELS, size 7in. x 4in., pack of 2. Order Ref: 973.

100M COIL OF CONNECTING WIRE. Order Ref: 685.

WHITE PROJECT BOX, 78mm x 115mm x 35mm. Order Ref: 106.

LEVER-OPERATED MICROSWITCHES, ex-equipment, batch tested, any faulty would be replaced, pack of 10. Order Ref: 755.

MAINS TRANSFORMER, 12V-0V-12V, 6W. Order Ref: 811.

THIS MONTH'S SPECIAL

IT IS A DIGITAL MULTITESTER, complete with backrest to stand it and hands-free test pro holder. This tester measures d.c. volts up to 1,000 and a.c. volts up to 750; d.c. current up to 10A and resistance up to 2 megs. Also tests transistors and diodes and has an internal buzzer for continuity tests. Comes complete with test prods, battery and instructions. Price £6.99. Order Ref: 7P29.

1mA PANEL METER. Approximately 80mm x 55mm, front engraved 0-100. Price £1.50 each. Order Ref: 1/16R2.

VERY THIN DRILLS. 12 assorted sizes vary between 0.6mm and 1.6mm. Price £1. Order Ref: 128.

EVEN THINNER DRILLS. 12 that vary between 0.1mm and 0.5mm. Price £1. Order Ref: 129.

BT PLUG WITH TWIN SOCKET. Enables you to plug 2 telephones into the one socket for all normal BT plugs. Price £1.50. Order Ref: 1.5P50.

D.C. MOTOR WITH GEARBOX. Size 60mm long, 30mm diameter. Very powerful, operates off any voltage between 6V and 24V D.C. Speed at 6V is 200 rpm, speed controller available. Special price £3 each. Order Ref: 3P108.

FLASHING BEACON. Ideal for putting on a van, a tractor or any vehicle that should always be seen. Uses a Xenon tube and has an amber coloured dome. Separate fixing base is included so unit can be put away if desirable. Price £5. Order Ref: 5P267.

MOST USEFUL POWER SUPPLY. Rated at 9V 1A, this plus into a 13A socket, is really nicely boxed. £2. Order Ref: 2P733.

MOTOR SPEED CONTROLLER. These are suitable for D.C. motors for voltages up to 12V and any power up to 1/6h.p. They reduce the speed by intermittent full voltage pulses so there should be no loss of power. In kit form these are £12. Order Ref: 12P34. Or made up and tested, £20. Order Ref: 20P39.

BT TELEPHONE EXTENSION WIRE. This is proper heavy duty cable for running around the skirting board when you want to make a permanent extension. 4 cores properly colour coded, 25m length. Only £1. Order Ref: 1067.

LARGE TYPE MICROSWITCH with 2in. lever, changeover contracts rated at 15A at 250V, 2 for £1. Order Ref: 1/2R7.

BALANCE ASSEMBLY KITS. Japanese made, when assembled ideal for chemical experiments, complete with tweezers and 6 weights 0.5 to 5 grams. Price £2. Order Ref: 2P44.

CYCLE LAMP BARGAIN. You can have 100 6V 0-5A MES bulbs for just £2.50 or 1,000 for £20. They are beautifully made, slightly larger than the standard 6.3V pilot bulb so they would be ideal for making displays for night lights and similar applications.

DOORBELL PSU. This has AC voltage output so is ideal for operating most doorbells. The unit is totally enclosed so perfectly safe and it plugs into a 13A socket. Price only £1. Order Ref: 1/30R1.

INSULATION TESTER WITH MULTIMETER. Internally generates voltages which enable you to read insulation directly in megohms. The multi-meter has four ranges, AC/DC volts, 3 ranges DC milliamps, 3 ranges resistance and 5 amp range. These instruments are ex-British Telecom but in very good condition, tested and guaranteed OK, probably cost at least £50 each, yours for only £7.50 with leads, carrying case £2 extra. Order Ref: 7.5P4.

REPAIRABLE METERS. We have some of the above testers but slightly faulty, not working on all ranges, should be repairable, we supply diagram, £3. Order Ref: 3P176.

TWO MORE POST OFFICE INSTRUMENTS Both instruments contain lots of useful parts, including sub-min toggle switch sold by many at £1 each. They are both in extremely nice cases, with battery compartment and flexible carrying handles, so if you don't need the instruments themselves, the case may be just right for a project you have in mind.

The first is **Oscillator 87F.** This has an output, continuous or interrupted, of 1kHz. It is in a plastic box size 115mm wide, 145mm high and 50mm deep. Price only £1. Order Ref: 7R1.

The other is **Amplifier Ref. No. 109G.** This is in a case size 80mm wide, 130mm high and 35mm deep. Price £1. Order Ref: 7R2.

HEAVY DUTY POT. Rated at 25W, this is 20 ohm resistance so it could be just right for speed controlling a d.c. motor or device or to control the output of a high current amplifier. Price £1. Order Ref: 1/33L1.

STEPPER MOTOR. Made by Philips as specified for the wind-up torch in the Oct '00 Practical Electronics is still available, price £2. Order Ref: 2P457.

SOLDERING IRON, super mains powered with long-life ceramic element, heavy duty 40W for the extra special job, complete with plated wire stand and 245mm lead, £3. Order Ref: 3P221.

RELAYS

We have thousands of relays of various sorts in stock, so if you need anything special give us a ring. A few new ones that have just arrived are special in that they are plug-in and come complete with a special base which enables you to check voltages of connections of it without have to go underneath. We have 6 different types with varying coil voltages and contact arrangements. All contacts are rated at 10A 250V AC.

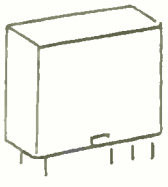
Coil Voltage	Contacts	Price	Order Ref:
12V DC	4-pole changeover	£2.00	FR10
24V DC	2-pole changeover	£1.50	FR12
24V DC	4-pole changeover	£2.00	FR13
240V AC	1-pole changeover	£1.50	FR14
240V AC	4-pole changeover	£2.00	FR15

Prices include base

MINI POWER RELAYS. For p.c.b. mounting, size 28mm x 25mm x 12mm, all have 16A changeover contacts for up to 250V. Four versions available, they all look the same but have different coils:

6V Order Ref: FR17
12V Order Ref: FR18
24V Order Ref: FR19
48V Order Ref: FR20

Price £1 each less 10% if ordered in quantities of 10, same or mixed values.



NOT MUCH BIGGER THAN AN OXO CUBE. Another relay just arrived is extra small with a 12V coil and 6A changeover contacts. It is sealed so it can be mounted in any position or on a p.c.b. Price 75p each, 10 for £6 or 100 for £50. Order Ref: FR16.

RECHARGEABLE NICAD BATTERIES. AA size, 25p each, which is a real bargain considering many firms charge as much as £2 each. These are in packs of 10, coupled together with an output lead so are a 12V unit but easily dividable into 2 x 6V or 10 x 1.2V. £2.50 per pack, 10 packs for £25 including carriage. Order Ref: 2.5P34.

FOR QUICK HOOK-UPS. You can't beat leads with a croc clip each end. You can have a set of 10 leads, 2 each of 5 assorted colours with insulated crocodile clips on each end. Lead length 36cm, £2 per set. Order Ref: 2P459.

BIG 12V TRANSFORMER. It is 55VA so that is over 4A which is normal working, intermittently it would be a much higher amperage. Beautiful transformer, well made and very well insulated, terminals are in a plastic frame so can't be accidentally touched. Price £3.50. Order Ref: 3.5P20.

BUY ONE GET ONE FREE

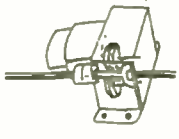
ULTRASONIC MOVEMENT DETECTOR. Nicely cased, free standing has internal alarm which can be silenced. Also has connections for external speaker or light. Price £10. Order Ref: 10P154.

CASED POWER SUPPLIES which, with a few small extra components and a bit of modifying, would give 12V at 10A. Originally £9.50 each, now 2 for £9.50. Order Ref: 9.5P4.

3-OCTAVE KEYBOARDS with piano size keys, brand new, previous price £9.50, now 2 for the price of one. Order Ref: 9.5P5.

1.5V-6.V MOTOR WITH GEARBOX. Motor is mounted on the gearbox which has inter-changeable gears giving a range of speeds and motor torques. Comes with full instructions for changing gears and calculating speeds, £7. Order Ref: 7P26.

MINI BLOWER HEATER. 1kW, ideal for under desk or airing cupboard, etc., needs only a simple mounting frame, price £5. Order Ref: 5P23.



TERMS

Send cash, PO, cheque or quote credit card number – orders under £25 add £4.50 service charge.

J & N FACTORS
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Sussex RH17 5PA.
Telephone: 01444 881965
Email: jnfactors@aol.com

MONITORS

Fault reports from
Ian Field
Geoff Butcher
and Gerry Mumford

We welcome fault reports from readers – payment for each fault is made after publication.

Reports can be sent by post to:

Television, Fault Reports,
Anne Boleyn House,
9-13 Ewell Road,
Cheam,
Surrey SM3 8BZ

or e-mailed to:
tessa2@btinternet.com

CTX 1565D

These monitors can be a bit puzzling when dead, since a short almost anywhere on the secondary side of the power supply can activate the safety shutdown transistor, which shorts out the supply to pin 7 of the UC3842 chopper-control chip. The second transistor in this part of the circuit assists the start-up resistor, by disconnecting it once the power supply has started up. So the cause of this fault is unlikely to be an open-circuit start-up resistor.

Possibly the most common causes of this type of shutdown are failure of the B+ chopper MOSFET Q401 or any of the rectifiers on the secondary side of the circuit. On this occasion however the 2SC4924 line output transistor was the cause. Line drive is coupled to this transistor's base by C701 (100µF, 50V), which was so bad that it failed to produce any deflection at all on my home-brew ESR bridge. I upgraded the replacement to an HF-SMPSU type and added an 0·33µF Mylar capacitor in parallel to further reduce self-heating.

One of the rectifiers on the secondary side of the circuit was a bit wobbly. Despite being soldered to a heat fin, it had cooked the bonding between its tracks and the PCB. Some stout link wire was used to eliminate the risk of cracks developing in the lifted track foil. I applied a layer of black ink from a jumbo marker pen to the heat fin to improve its ability to radiate heat. This reduced its operating temperature significantly. **I.F.**

ICL PD0110

These Acer produced chassis are well constructed. I had a batch of them that had come from a local school which had undertaken an upgrade. They are SVGA but only just, as they provide only 800 x 600 in addition to the basic VGA modes. Nevertheless they were worth checking out as they were quickly snapped up by customers as temporary/spare monitors.

They were all working, requiring only small adjustments such as grey-scale set up and, in a couple of cases, attention to the heater supply components.

The focus isn't too good. This is partly because of the poor HF performance of the video amplifiers and quite possibly coarse shadowmask pitch. The video outputs are DC coupled, so there are no coupling electrolytic capacitors to deteriorate and therefore no improvement to be had. The biggest single cause seems to be that the design uses the LM1203 chip's built-in cathode bias controls instead of separate presets to superimpose a clamp level on the video outputs. This way of using the LM1203 always seems to produce inferior video resolution. In one case I tried replacing every single electrolytic capacitor on the CRT's base PCB. This produced a just-noticeable improvement, but was certainly not worth the effort.

These monitors were all fitted with the Hitachi tube type M34JMA30X72(J). I've found that Hitachi tubes do sometimes give poorer focus performance than you might expect. But 'flashing' the focus electrode produced no improvement, suggesting that the CRT may not have been what was limiting the picture resolution. In the end I sold off the monitors cheap: no one who bought them has come back to complain!

One had something rattling about inside when it arrived. This turned out to be the screw from the top-steady bracket on the line output transformer. **I.F.**

Intertan VCM100S

The customer said that this monitor worked all right but the picture was too narrow. When I took the back off I saw that the monitor had been badly affected by cigarette smoke. Even TV sets were never tar-coated to this extent! In addition the soldering had deteriorated with age. Unfortunately the monitor has to be completely dismantled to get at the print side. I wondered whether the heavy deposits were loading anything down – this has been known with heavily-contaminated TV sets.

So, while it was apart, I cleaned everything with a mild solvent. This made no difference. The sub-width control VR440 was next tried. Even at maximum it failed to produce the required width. It's in series with the front panel width control and, as maximum resistance produces maximum width, when set at maximum it also reduces the range of the user width control.

There's no adjustable width inductor, so the only option left was to try to optimise the flyback tuning. As the existing tuning capacitor C952 (6·8nF, 1·6kV) was in good condition, I varied the value by adding 1nF in increments. The width peaked at a value of 10·5nF, so I fitted 9·5nF + 1nF. With the preset backed off to minimum, the user control had maximum adjustment range. The width was just right with the user control centred. **I.F.**

Multiscan L7031LD

This 17in. monitor was tripping. On investigation I found that Q710 (Mitsubishi FS10UM5) in the B+ PWM circuit was short-circuit. Despite its rather unusual-looking type number, this device is a fairly normal MOSFET. The PWM circuit is different from that found in

smaller monitors. It's a flyback converter instead of the usual buck regulator. A flyback regulator is safer, because a buck regulator carries out voltage step-down unless the series switch MOSFET goes short-circuit, when the full unregulated input voltage is applied to the line output stage. When the MOSFET in the flyback converter type of circuit fails, it shorts the B+ input, activating the power supply excess-current trip.

I removed the faulty MOSFET and lifted one end of the inductor to break the circuit, then inserted a 60W bulb to configure the circuit for step-down and limit the current. It didn't supply enough current for the line output stage to get going, so power resistors were added in parallel until some light appeared on the screen. This proved that the line output stage was operational. At this stage the combined resistance value was very low, and most of the 46V input was reaching the line output stage.

The next step was to find a suitable replacement for Q710. I settled for a 2SK1221, which has the ratings Id = 10A and Vds = 250V. It worked without any sign of distress, and the regulated B+ rail settled at 66·5V. **I.F.**

Bluepoint DC1464

The power supply was tripping silently. I found that someone else had replaced D111, which is on a heat fin, back-to-front! The original diode had been cut out, leaving enough lead attached to the heat fin to twist together with the replacement diode's lead. It was probably fortunate that the previous 'repairer' had dropped a large blob of solder on the track side of the PCB, as this shut the power supply down. Otherwise, the monitor would probably have been a loud and expensive write-off!

Not knowing the correct diode type (the replacement had been a BYW95B), I checked the voltage rating of its reservoir capacitor C120. It was 63V, so I decided that a UF5404 would be suitable. The repaired power supply then worked, but Q415 (2SC5326) was short-circuit. This had probably been the original and only fault. Once a replacement had been fitted the monitor was as good as new.

During the repair I found a number of marginal dry-joints in the line output stage. These could have been the cause of Q415's failure. **I.F.**

CTX 1565D

The first thing I noticed after removing the back was that all four screws which secure the CRT to the front moulding were about half unscrewed. The CRT was free to flop about! This usually means that the monitor has been dropped, stripping or cracking the screw bases. But these had been unscrewed!

After checking for any other forms of tampering, I powered the unit and found that there was a tilted display. It was possible to correct this by slackening the yoke-clamp Allen screw and easing the deflection assembly into the correct position. The convergence errors that this introduced were very slight, and were easily corrected with the wire-wound preset Yv and inductor Xv on the scan assembly. I didn't have to disturb the ring magnets.

While working on the deflection assembly it became apparent that the red output was intermittent. The CRT's red cathode pin had all but let go, and the soldering to all the three RGB output transistors was very poor. **I.F.**

AOC 7Glr

"There was a flash and it went off" the customer said. On investigation I found that the chopper FET had blown apart and the 47Ω resistor which is in series with its gate had burnt out. There were signs that the transistor had been running hot for some time before its final demise.

I replaced the transistor, the resistor and the UC3842 control/driver chip, and checked the associated components. The monitor then powered up and worked normally, but the new transistor heated to a higher temperature than seemed right – after about ten minutes the heatsink temperature was at over 50°C. I then noticed that there was space on the PCB for two diodes, D907 and D931, in the chopper drive circuit. They had never been fitted. As an experiment I fitted them, using a 1N4148 in position D907 and a BYX85C15 zener diode in position D931. The result was a good 5°C reduction in the temperature of the heatsink.

After a good burn-in period the chopper heatsink remained at a lower temperature than the heatsink in the line output stage. I considered this to be satisfactory. **G.B.**

CTX 1765D

There was almost total line collapse, with only about 3cm of scan remaining. I found that the 2SC4924 line output transistor Q314 was leaky, and in addition R380 (1Ω, 0·25W) was open-circuit. There were also masses of dry-joints in this area – at R390, Q318, Q336, D317, T303 and T401. These had probably been the cause of the trouble. **G.M.**

Dell D825TM (Sony chassis)

This monitor powered up but there was no screen display. A check on the heater voltage showed that it was low – 2·8V instead of 6·3V. The cause was the associated reservoir capacitor C632 (470µF, 16V). The heater supply is derived from the chopper circuit. **G.M.**

Philips 15B (CM2300 chassis)

There was excessive width with EW bowing, and the OSD adjustments had little effect. The cause of the trouble turned out to be a non-polar electrolytic capacitor, C2614 (3·3µF, 63V), in the EW driver stage. It was bulging. **G.M.**

Eizo F353, Model MA1767

The power supply was working but there was no display. On investigation I found that the 2SC5244 line output transistor Q501, the 2SD1889 EW driver transistor Q512 and the associated 30V, 500mW zener diode ZD502 were all short-circuit. As a result the 2SK1547 regulator FET Q930 on the secondary side of the power supply had been damaged and fuse F901 (800mA, wire-ended) had blown. Note that this item is on the track side of the PCB, between the positive connection to C908 and T901, with the track underneath it cut, i.e. it's a late addition/modification. **G.M.**

Tatung TM3401 (Y2 chassis)

The problem with this old-timer was partial frame collapse, with the top third of its shrunken raster compressed and over bright while the rest was expanded and dim. A check showed that the 21V supply to the TDA1675 frame timebase chip was low at only 14V. It follows a rather complicated path, via a sub-board that's bolted to the line output transistor's heatsink. A power FET on this sub-board switches the supply. Most of the voltage loss was across this FET, which was quite hot. It's drive is obtained from a 74LS123N logic-gate chip, IC701. The cause of the trouble was this chip, which wasn't turning the FET on hard enough.

Note that this chassis is also used in the **Apricot XJ52178B** and **Viglen MT1428E** monitors. **G.M.**

Acer JD156N

This monitor was dead and tripping. As usual with these monitors, there was a large dry-joint at pin 3 of the line output transformer – this is the B+ (HT) feed for the line output stage. The other pins were all, as usual, OK. But unfortunately pin 3 had this time arced over, destroying the FS10KM B+ regulator FET Q810 along with the associated voltage-doubler inductor L805 (part no. 2371131800). In addition EW modulator diode D421 (FSF05A60) was leaky. Replacement of these items restored the display. **G.M.** ■

VCR CLINIC

Reports from Eugene Trundle John Coombes Martyn Davis Roger F. White Ronnie Boag Geoff Butcher and Nick Beer

We welcome fault reports from readers – payment for each fault is made after publication. See page 746 for details of where and how to send reports.

Toshiba V312B

The front panel didn't light up and there was no action or response – except that the head drum was whizzing around faster than normal! Checks showed that there was low-frequency ripple on the outputs from the power supply. The culprit turned out to be DP15, a 3·9V zener diode that's wired across RP33 on the primary side of the power supply. It was short-circuit. This item is not shown in the circuit diagram, and was not fitted in all production batches. **E.T.**

LG KE14U43

This TV/VCR combi unit had a nasty buzz on sound, but only with tape playback. Consultation with LG revealed that replacement of three capacitors helps with early production units like this one. Change the value of C358 on the video panel from 0·022µF to 0·033µF. It's connected to pin 65 of IC300. On the TV board, change the value of C607 to 100µF and C603 to 56nF. With this particular machine there was also cyclic variation of the off-tape sound volume. It was cured by giving the ACE head assembly a little more 'lean-forward' into the tape. **E.T.**

Aiwa VX-T1450K

Access is good with this TV/VCR combi unit, and the deck can be got going for test while it's out of the cabinet. There was little sign of life with this one until fuse F90 had been replaced. The capstan motor rotation was then intermittent, the result being shut-down, chewed tapes etc. The motor itself was responsible. It's available from CPC under part number AWS6-003-030-600 at a little over £40 net. **E.T.**

Hitachi VTF450

Noisy playback, rewind and fast forward can be caused by the cassette housing's failure to drop the cassette low enough for correct drive. In this case however the cause proved to be a faulty tooth-type drive belt, which stretches and knocks on the chassis. To prevent stretching of the new belt, replace the take-up pulley as well. **J.C.**

Mitsubishi HS721 etc

The mode operation diodes can fail, causing a number of symptoms. In this case the machine cut out in playback after a few seconds because D5A9 and D5A1 were faulty. Other symptoms caused by faulty mode operation diodes include failure to accept a tape in the standby mode, no tape-remaining indication, and no tape autoplay only without its tab (in this case tape ejection may not work).

There is a modification kit which consists of all these diodes. It applies to the HS600 mono series and the HS700 mono and hi-fi series. **J.C.**

Toshiba V404B

No results because of a power supply problem can be caused by CP007 and/or CP008. Check them by replacement. **J.C.**

Mitsubishi HS621

The customer complained that this machine was either dead or ran erratically. There was no trouble once the following electrolytic capacitors had been replaced: C910 (4·7µF, 5V), C915 (2·2µF, 50V) and C9A3 (1,000µF, 10V). **M.D.**

Sharp VCM301

This machine was brought in because there was no deck operation. Curiously, the power supply was OK. After much hunting around I discovered a dry-joint at Q9903, on the secondary side of the power supply. **M.D.**

Mitsubishi HS750V

This machine came in with the complaint "dead – won't accept tapes". Checks showed that the power supply was working and that all the main voltages on the secondary side were apparently correct. But the 6·5V that should be present at D9AZ was low at only about 1V. Once C9A3 (1,000µF, 10V) had been replaced this voltage was correct and the machine ran normally. **M.D.**

GoldStar PW904I, T163I

If the fluorescent display is dim, replace C25 (100µF, 10V) in the power supply. **M.D.**

Sharp VCH81H

There was no capstan rotation. After checking the supplies to the motor I took a closer look at the motor itself and found that a 10µF, 25V capacitor had leaked on to the motor's PCB. As a result the print was open-circuit. A fairly neat repair was possible, and after fitting a replacement capacitor everything was OK. **R.F.W.**

Lloyds L444

The display had just two zeros, with occasional flicker, and there were no functions. It was the first time I'd ever seen a Lloyds VCR, but the Sharp deck was familiar. The fault was in the power supply however, where a 3,300µF, 25V radial electrolytic capacitor had a slight bulge in its top. When I unsoldered it one leg fell off. A replacement restored normal operation. **R.F.W.**

JVC HRJ665

This machine went dead intermittently. The cause was dry-joints at DS207. **R.B.**

Sanyo VHR789

This machine wouldn't accept tapes. A check showed that there was no voltage across the loading motor, which was short-circuit. **R.B.**

Akai VSJ717

There was no playback or E-E sound. Replacement of the TDA9605 chip IC801 cured the fault. **R.B.**

Matsui VP9505

This machine would sometimes eject a cassette immediately after insertion. At other times it would thread up and work normally. A new mode switch made no difference.

Some cassettes seemed to be more troublesome than others. Having found one that never seemed to work, I discovered that the left-hand end of the lift didn't go home fully. As a result, the cassette-down switch didn't operate and the machine ejected the tape.

I found that a new lift assembly, part no. HOUS471, is available from SEME at a surprisingly low cost, so it wasn't worth messing about with the original one. Once the new lift assembly had been installed the machine worked correctly at all times. **G.B.**

Panasonic NVA3B

A colleague was having problems with this VHS-C Slimcorder. When power was applied the chopper circuit started up but was pulsing. A raster appeared in the EVF then disappeared, and there was no video at the AV outputs. He had disconnected the camera head to eliminate the effect of a fault in this area – we occasionally get jammed iris motors for example – but this had made no difference to the symptoms. There didn't seem to be any shorts across the outputs from the power supply, and hot checks were inconclusive because of the speed of the pulsing.

I was able to establish that when the power supply started up its three main outputs appeared. Not all three feedbacks were present however. The camera 18V and –8V supplies provided via T1001 came up momentarily, like the others, but feedback at pin 22 of IC1001 was nil. I then found, by carrying out DC checks, that the 22kΩ surface-mounted resistor R1008 was open-circuit. When I inserted a temporary replacement, from a scrap PCB, the unit seemed to be working properly but the camera section was still disconnected. When it was plugged in the fault returned!

Disconnecting the camera section cleared the pulsing. So there had been two faults. It's relatively easy to establish the nature of a fault in the camera head as there are only two connectors, one for the lens motors and sensors and the other for the imager. In fact the imager was the cause of the problem. No shorts could be detected, and none of the few surface-mounted components on the flexiprint was the cause. A new imager restored order – and sanity.

Note that the imager's part number changed during production. The part number in the manual, VEK7146, applies to earlier models with a shorter FPC. The later part number, VEK7375, applies with the longer FPC. **N.B.**

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: Amstrad UF20 VCR for breaking. Require head and drum assembly plus guide unit. Condition of head unimportant.

Also, could anyone help identify the maker or importer of a colour portable badged "Univercell" (exact spelling on remote-control unit)? It has a separate power supply panel on the left-hand side looking in from the rear, and may be of Nokia origin, perhaps 1996 vintage. Better, could anyone supply a circuit diagram, in particular of the power supply?

Phone John Martin on 020 8337 3366 or e-mail john-martin@FreeNet.co

Wanted: JVC GR-45E camcorder, working or non-working but with working viewfinder. Accessories not important. Phone Andrew Duggan at ATD Electricals – tel/fax 01248 602 584 (Gwynedd).

Wanted: Single LCD display (one of three) for the Sony VPL-V500QM data projection unit. The LCD may have been produced only as part of a complete assembly, in which case a dud assembly with say one dud LCD would do. John Stockley, 27 Campden Road, Croydon CR2 7ER. Phone 020 8688 3089 any time.

For sale: *Practical Television* magazines from 1959-1979. Twelve full years, eight part sets. Also 19 *Radio and Television Servicing* books covering models before 1955 up to 1975-76, circuit diagrams for the Sanyo VCR Model VTC9300P and portable stereo music system Model G2711, service manuals for the Thorn 850, 950, 8000 and 9600 chassis, and a Breeze Electrical System. Offers please on 01233 663 835.

Wanted: Sentercel K8/50 EHT rectifier plus 0·05µF, 2kV EHT smoothing capacitor for the Telequipment oscilloscope Model D43. Geoff Davies, 13 Bowen Road, Rugby CV22 5LF. Phone 01788 574 774.

Wanted: BUZ77 transistor for the NEI 11AK08 chassis. Allan Watson, 2 Masefield Avenue, Padiham, Lancs BB12 8SY. Phone 01282 774 114.

Wanted: Remote control unit for the Orion satellite receiver Model JRD2001. F. Nedza, 40 Brynhyfryd, Glynneath, Neath, West Glamorgan SA11 5BA. Phone 01639 720 429.

Wanted: CRT (6in.) for the Decca marine radar Model 060, or information of a possible source of supply. The tube fitted is a Brimar F15-100LD 910/FV. Maybe there's an equivalent? No burns. Phone Dennis Shakeshaft on 01287 637 681 (Cleveland).

Wanted: Help with the Ferguson Model T59N (TX92 chassis?). The problem is locking up with no response to the remote-control unit. Jim Lesurf, 110 Hunters Square, Dagenham, Essex RM10 8BG. Phone 07974 611 402.

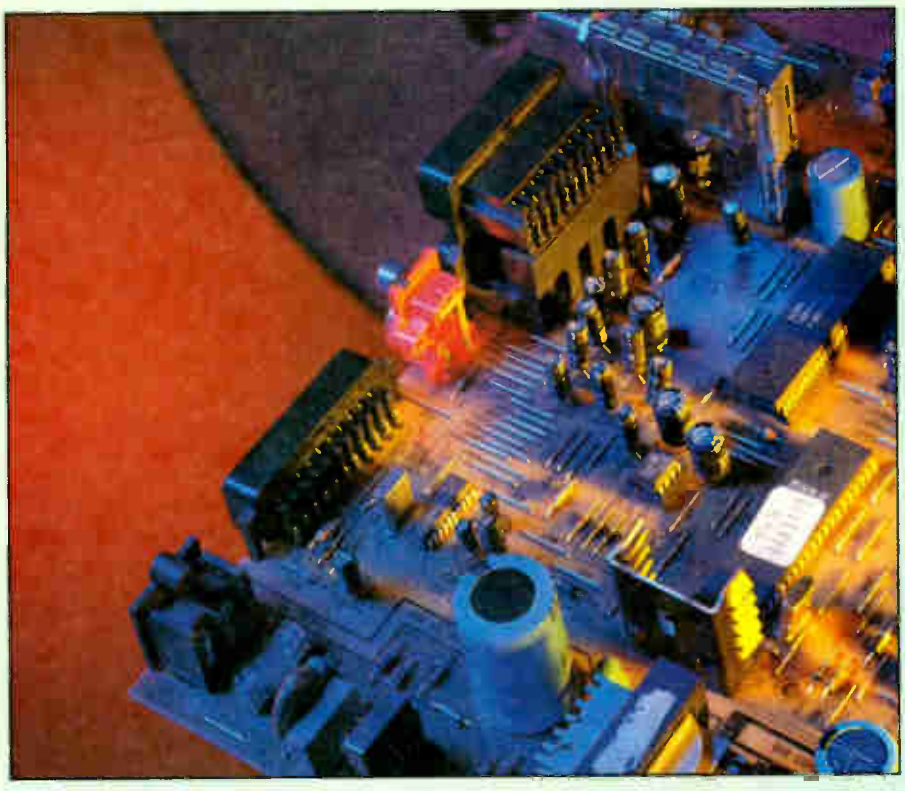
Wanted: Sony SLF1UB portable Betamax VCR. Must be in mint condition and in full working order. Will pay good money for the right unit. A.C. Griffin, 89 The Ridgeway, Sedgley, West Midlands DY3 3UN. Phone 01902 880 063.

Wanted/for sale: Cash paid for working Goodmans Model 149TT TV set, with or without cabinet. Have for sale a Gardner inverter, Model 107A: input 11-15V DC, output 220-240VAC nominal, square waveform. Price £50 ono. R.S. Rosier, 3 Downs View Road, Maidstone, Kent ME14 2JB. Phone 01622 761 391.

Wanted: SC84202 IC or tuning board 29504 003 02 for the Grundig A6410/2/3/4 (CUC220 chassis). This is required to repair a set that's otherwise in very good condition, for an elderly lady in poor health. All expenses paid. Reg Stroud, 2A Linden Road, Gloucester GL1 5HD. Phone 01452 503 581.

Wanted: A reel-to-reel audio tape recorder, also help in getting a Heathkit AFM2 tuner and AA22U amplifier going. Manuals or any information would be welcome. David Holdsworth, 11 Star Farm Close, Bradwell, Norfolk NR31 8UZ. Phone 01493 668 867.

Wanted: Information on replacing the 5532 dual analogue op-amp in the Nad 524 CD player with a Burr Brown OPA2604 FET op-amp. A circuit showing this modification and component values would be a great help. The op-amps are a direct swap pin-for-pin, but I understand that there are different



JACK'S WORKSHOP

Jack Armstrong

Like most people in the trade, I like to close my door in the evening and forget about work. Sometimes, unfortunately, this isn't possible. When the doorbell sounded at 9pm I knew it was another of these occasions.

"The pictures are all snowy, so will you mend our zapper again?" asked Mrs Wattle.

I was a little taken aback by this, but the two elderly ladies who live just across the road and like to call themselves "sisters" are quite inoffensive. So I agreed to do whatever was necessary to cure the "snowy pictures".

As I entered the house Miss Dorb handed me the remote-control unit. I reflected on how unlike they were for "sisters", one plump with a button nose, the other very thin with a roman nose. "Pictures snowy. Must be that battery wire again" she said.

I pointed the device at the TV set and pressed a button at random. It had to be that way – the numbers had long ago worn off. A very grainy BBC1 picture appeared, and the sound faded in and out of the background hiss.

"Well, the handset's OK but, oops." I had just dropped the thing on the floor and the 9V battery went spinning across the room, with its clips still attached.

"I'll just go and solder the wires back on" I said sheepishly.

"Told you it was the battery wires" a know-it-all voice behind me said.

While I was in the workshop I also made up a coaxial lead from CT100 cable, with a male TV plug at each end. I had just bought some new screw-connection plugs and was quite keen to try them out and compare them with the cheap ones whose plastic insert melts when you try to solder the end of the centre pin (the trick is to file off the nickel plating to expose the brass). The new plugs were fine, though a little fiddly for someone with eyesight like mine!

When I returned to the Wattle and Dorb house I tried the remote-control unit. It was just fine. Then I pulled out the old, brown cable that connected the TV set to the wall socket and replaced it with my pristine white one. The pictures were perfect.

"Lovely" said Miss Dorb, "better than we've seen for ten years. How much do we owe you for the battery thing?"

The pair seemed to think that £2 was a little expensive for "fixing the zapper", but I pointed to the nice white cable and mentioned that the picture was, as Miss Dorb had said, "better than we've seen for ten years." They acquiesced, but I didn't get a tip. Must remember to charge a *lot* more next time. Maybe they won't ask again. I could recommend Wossname up Church Street, then they'd know the meaning of "dear".

A Grundig digibox

Talk of the devil! Who should wander in this morning than Wossname.

"Hello there. Not seen you for months. Been on holiday? Looking rather thin."

"Yes, well, I've been away, you see."

"Good grief! Not in prison?" The light suddenly dawned on me. "What you been up to, you old rogue? Stealing chickens again?"

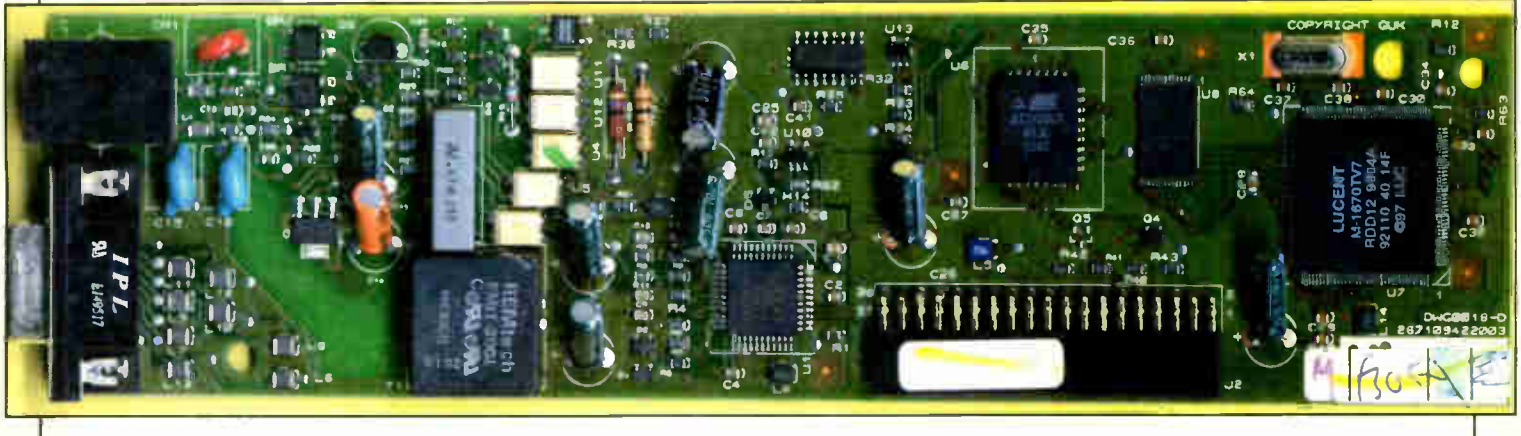
"Not exactly. You know those bl**dy two dee mac cards?"

"D2Mac, yes."

"That's the fella."

"The ones you tried to sell me?" He looked sheepish, so I knew I was right. "Got caught, did you?"

"Sort of. The guy in the pub – tall guy,



A Grundig GDS200 modem board – there are two versions, which are interchangeable.

you said 'hello' to him. Thought he must be OK if you knew him."

"Ah, you mean Bob the policeman. Went to school with him. Nice bloke, but funny ideas about right and wrong. You didn't sell him a card, did you? Wouldn't trust him with my grandmother."

"Sold him the lot. Next thing I know, I'm arrested. Shop's been closed for four months while I've been away. They took all the stock as evidence."

"You won't see that again!"

"Too true. Anyway, I didn't come in to talk about me 'olidays. Could you take a look at this? Been struck by lightning she says."

I removed the screws and levered the top cover off the GDS200, cutting my finger in the process. I seem to manage to do that each time! Everything inside looked perfect.

"No lightning in here" I smiled.

"'Course not. But it won't turn on. Try it."

I plugged it in and it didn't light up. Not even the little green LED inside. I replaced the power supply with a good one that I keep for testing, but it made no difference. On a hunch I removed the modem board, then reconnected the power lead. This time the digibox lit up its red and green LEDs and sequenced them off and on, which is normal when the modem is removed. When I fitted a spare modem board the digibox worked perfectly.

Since spares are available only to authorised agents, I contacted Gordon at Kesh Electrics to ask if he could fix the modem board. He thought he might be able to, as he'd already repaired several of them. So this wasn't a new fault.

As it turned out, every chip on the modem board had apparently been damaged. Gordon was fortunately able to send me one that had come from an unrepairable GDS200. The price was very reasonable, and Wossname subsequently accepted my inflated estimate. He always manages to extort cash from his customers somehow!

Kesh Electrics can be contacted on 01365 631 449 and can carry out various digibox repairs.

The accompanying photograph shows a GDS200 modem board: two versions, which are interchangeable, have been fitted.

Amstrad DRX100

Last month I mentioned, foolishly, that I had never had capacitor failure with the DRX100 digibox's power supply. It has now happened to me, and I find that I'm not alone – lots of engineers have had this sort of trouble. The parts which fail are listed in the accompanying table.

Table 1: Relkit 34 components list.

C3	82µF,400V
C7, C22, C24, C25	33µF, 50V
C8, C10, C12	1,000µF, 10V
C11, C13-C18	330µF, 25V
C19, C20	220µF, 50V
D12	1N4937

Thanks to some work done by Robert Philpot and other engineers from the TV e-mail group, SatCure is now able to supply a capacitor kit for this model, Relkit 34. The items included are shown in Table 1 – the capacitors are all low-ESR types rated at 105°C. The kit costs £6.95 plus £2.50 postage and VAT at 17·5%. You can order from the SatCure website at

http://www.satcure.co.uk

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

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

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

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

Test Case 466

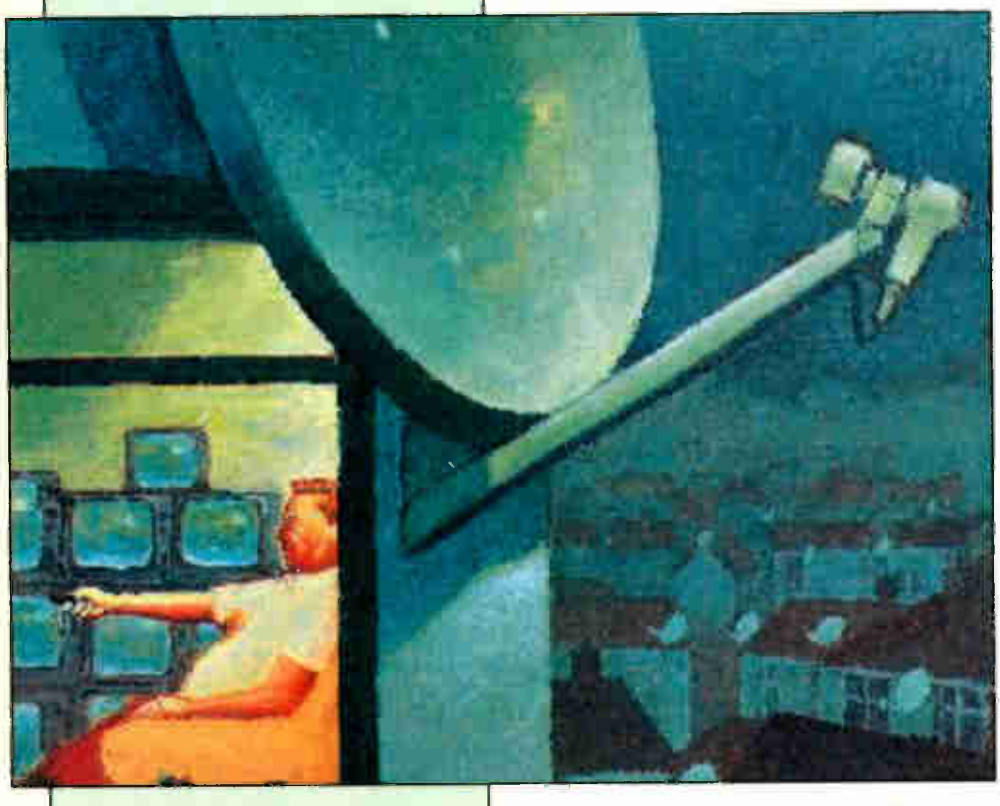
Nora Wilkins was in a fix. On impulse, she had bought a £40 small-screen black-and-white TV set for use in her kitchen. She spends a lot of time there, cooking and baking for her dos in aid of local charities. When she got the set back she plugged it in, extended the aerial and wound the tuning knob from one end to the other. But all she obtained was a flickering, snowy, barely-recognisable shadow, at just one point. She returned it and had been given another one, but the results were no better – until she took it to her friend Gwen's house on the other side of town. There, it produced much better, though rather ghosty, images on all the local channels.

Now Nora, a widow, is not rich, and thought that her local dealer might be unable to help anyway. But didn't she live opposite that nice young man Cathode Ray, and didn't Ray owe her a favour, having almost run over her cat the other day with that big white van of his? She went to see Ray and invited him in for a cup of tea, and to "just tune in" her little TV set . . .

The cat, knowing that Ray doesn't like him, abandoned the kitchen as soon as he arrived. The area is not a good one for TV reception, and Ray was not surprised that virtually no signals could be obtained from the built-in telescopic aerial. But what was this? A coaxial cable was coiled up in the corner of the window sill, and there was a coaxial to mini-jack adaptor in the TV box. They were very soon assembled, after which Ray confidently switched on the little TV and wound its tuning knob – only to find that things were little better than before. There was virtually no signal! He was told that reception was OK in Nora's living room, so they took the little set there and hooked it up. It now produced reasonable pictures and sound, though its RF gain seemed to be less than that of the main set and its tuning knob was very fiddly. A check in the bedroom, where another aerial cable came through a hole in the ceiling, showed that here too the signals were failing to get through.

The aerial cable in the lounge was looped through a mains power unit that looked very ancient. It must have been providing the 18-24V its yellowing case boasted, or there would have been no signals at all, Ray reasoned. So suspicion fell on the three-way UHF distribution amplifier that was taped half-way up the aerial mast. It would have to be replaced and, after acquainting Nora with the £27-odd cost, Ray ordered a three-way outdoor type from the Whizzo Electronics catalogue in the workshop. It arrived very quickly, and Ray didn't have too much trouble fitting it. The short chimney stack and mast were accessible from the garage roof: step-ladder stuff!

Back indoors, Ray switched the power to the mains unit on then turned on the living-room set to admire the result of his handiwork. All he got was a screenful of snow on all channels. The kitchen and bedroom outlets were likewise dead! What was the cause? There was nothing wrong with Ray's wiring, and the Whizzo unit was perfectly OK. For the solution, turn to page 760.



SATELLITE NOTEBOOK

Reports from Christopher Holland and Tony Cattell

BBC satellite radio

In his column in the August issue Donald Bullock mentioned that his digibox often goes into standby after a power cut. When this happens during the night he doesn't get the BBC radio service of his choice, to which the receiver was left tuned the night before, when he wakes up. He didn't have this problem with his previous analogue receiver.

One way around this problem is to use the single-receiver version of the Kesh Electrics Digimemo unit I reviewed in the December 2000 issue of *Television*. You enter the station you require as the 'favourite channel' and the unit returns the digibox to this after a power supply interruption. Details of the unit can be obtained from the Kesh Electrics web site (www.pacelink.co.uk).

As the BBC Radio stations, except for Radio 5 which is encrypted, are all transmitted in clear digital form, a good solution to the problem is to buy a simple digital receiver that isn't capable of receiving encrypted channels. A good thing about such receivers is that they usually return to the station being received prior to a power cut, though it's as well to confirm that this is so before you make the purchase. The new receiver can be connected to the same dish, pointing at 28·2°E, via a twin LNB. An advantage of this arrangement is that the radio stations continue to be available when someone is watching the telly.

A fairly well-kept secret is that the BBC is still transmitting its radio services, with the exception once again of Radio 5, in analogue form from 19·2°E. Tune to the CNBC transponder at about 10·728GHz (vertical polarisation) and you will find Radio 3 at 7·56MHz, Radio 4 at 7·74MHz and the World Service at 7·38MHz. Tune up the band to 11·243GHz (horizontal polarisation), the German RTL Shop transponder, and you will find Radio 1 at 7·74MHz and Radio 2 at 7·92MHz. These transmissions are all in mono. For how long they will continue to be available remains to be seen.

Photo 1: Test card J, seen recently at 12·129GHz V.

Don't despair too much about TV in the morning, Donald. Look what I found recently on the BBC Parliament channel (at 12·129GHz V, transponder 22), see Photo 1. A real live test card! Unfortunately it was accompanied by a test tone, not the test card music of the Fifties and Sixties. Surely, with all the digital space the BBC has available at its three 28·2°E digital transponders, there should be room for a permanent test card! **C.H.**

Digital TV update

There have been quite a few changes since our last complete listing (February, pages 236/7) of the transponder allocations at 28·2°E. Table 1 shows the situation at mid-August, when this issue of *Television* was being prepared for publication. Note however that channels can alter quickly. The transponder number is in brackets after the frequency and the EPG number in brackets after the channel name. It seems quite likely that Astra 2D's three ITV transponder allocations will become active during the next few months.

Transponder 4 is the digibox default frequency. Add 700 to the Box Office numbers. Some channels are listed at more than one frequency: only one will be the 'active' channel in the EPG at any one time, though Sky can change this round rapidly.

Cards with a Welsh address place S4C at EPG 104, Channel 4 at 184. The correct BBC1 and 2 regions for the viewing card's address are at EPG 101 and 102. Out-of-area BBC2 regions are available at 964/5/6. Out-of-area BBC1 regions are not available at present though there seem to be plans to make them available at 967/8/9 – these numbers are mentioned in the spoken audio "channel line up" on 996.

The correct Channel 4 region is brought in at 104 by the viewing card (184 in Wales), but out-of-area regions can be stored as 'extra channels'.

Viewing cards in the Republic of Ireland bring in Sky 1 Eire at 106 and BBC 1 and 2 Northern Ireland at 214 and 215. Other BBC channels are not available there, nor are the UK Channels 4 and 5. Sky News Eire is allocated to ch. 501. With the exception of World Service, BBC radio stations are not listed in the Irish EPG, but can be stored as 'extra channels'. Radio 5 is not available.

The Irish channel Tara TV (EPG 178), which is aimed at UK-based viewers, has recently been blocked to Irish viewing cards. **C.H.**

Amstrad DRX100

This digibox was dead. Yes, an Amstrad that didn't need the tuner replaced for a change! The cause of the fault turned out to be Q1, which is type 1L0380R. It's not the easiest device to obtain from the usual spares suppliers but can be obtained from SatCure, whose e-mail address can be found at the company's web site www. satcure.co.uk **T.C.**

Table 1: Digital transponder listing.

Frequency (GHz)	*Sat/ beam*	*Pol*	*Channels and EPG numbers*
10·862 (51)	2D/UK	H	Disney (613), Disney Plus (614), Toon Disney (615), Playhouse Disney (616), *Playjam Interactive*
10·876 (52)	2D/UK	V	Box Office (5, 10, 15, 19, 20, 25, 30, 40, 46, 54)
10·921 (55)	2D/UK	H	Sky Travel (145), Tara (178), Hallmark (190), Kerrang (457), Starplus (672), Box Office (36-39)
10·936 (56)	2D/UK	V	Sky Sports Extra (404)
11·508 (D3S)	EB	H	Discovery Home & Leisure +1 (134), Smash Hits (451), Animal Planet +1 (571)
11·585 (D7S)	EB	H	Fashion (220)*, Best Direct (644)*, MBI (698), Al Jazeera *†
11·680 (D12S)	EB	V	Extreme Sports (422)*, Go Barking Mad (425)*, Digital Classics (464), Euronews (528)*, God (650)*, TBN (652)*
11·720 (1)	2A/S	H	BBC1 England/N. Ireland (101), BBC2 England (102), BBC Choice (160), BBC News 24 (507), BBC Knowledge (573).
11·739 (2)	2A/S	V	Living (112), Challenge (121), Bravo (124), Trouble (607), Travel Shop (632)*
11·758 (3)	2A/N	H	Channel 5 (105), Sky Sports 1, 2, 3 (401/2/3), Premiership Plus (433), God Revival (651)
11·778 (4)	2A/N	V	EPG background audio, Box Office 18†, 47, 48, 59, Box Office Widescreen 1, 2, No 5, *Sky Enquiries Interactive*
11·798 (5)	2A/S	H	BBC1 Wales/Scotland (101), BBC2 Wales/Scotland/N. Ireland (102), all BBC Radio stations
11·817 (6)	2A/S	V	UK Gold 1 (109), UK Gold 2 (110), UK Style (148), UK Drama (151), Play UK (217), UK Horizons (564), UK Horizons +1 (565)
11·836 (7)	2A/N	H	Sky 1 (106), Premier 1 (301), Premier Widescreen (305), MovieMax (308), Box Office 1-4
11·856 (8)	2A/N	V	Premier 2 (302), MovieMax 2 (309), Sky Sports News (413), Nat Geographical (558), Box Office 6, 7
11·876 (9)	2A/S	H	Discovery (551), Discovery +1 (552), Adventure (553), Civilisation (554), Sci Trek (555), Wings (556), Discovery Kids (618)
11·895 (10)	2A/S	V	Paramount (127), all MTV/ VH1 channels (440, 441, 443, 444, 446, 447, 448), Nick Junior (605)
11·914 (11)	2A/N	H	Premier 3 (303), MovieMax 3 (310), Sports 3 (403), Box Office 11-14
11·934 (12)	2A/N	V	Premier 4 (304), MovieMax 4 (311), Sky Sports 1, 2, 3 in pubs‡, Box Office 16-18, Playboy/Adult (974), Retail Info (997)‡
11·954 (13)	2A/S	H	Travel Shop 2 (633)*, Screenshop (640)*, Dating (656)*, TVX (977), Red Hot (989-991)
11·973 (14)	2B/S	V	Sony TV Asia (670), Zee Cinema (678), Bangla (679), Pakistani (680), Asia 1 (682)*
11·992 (15)	2B/N	H	*Open Shopping*
12·012 (16)	2A/N	V	*Open Shopping*
12·032 (17)	2B/S	H	ITN News (525)*, QVC (630)*, Ideal World (638)*, Bid up (647)*, Jobshop (654)*, B4U Music (668)*, Lashkara (691), ITN Radio News (878)*, *QVC Interactive*
12·051 (18)	2A/S	V	Travel (181)*, TCM (327)*, CNN (513)*, Cartoon channel (601), Boomerang (603)*, Shop (634)*, CNN Radio*.
12·070 (19)	2B/N	H	Sky 1 Ireland (106), Sky Cinema (315), Sky Sports Extra (404), Cartoon Network +1 (602), Box Office 21-4
12·090 (20)	2B/N	V	Sky Cinema (315), Sky Cinema 2 (316), Rapture (458), Disney Channel (613), Box Office 26-29
12·110 (21)	2B/S	H	Channel Health (193)*, Shop America (641)*, UCB Europe (875)*, UCB Cross Rhythms (876)*, UCB Inspirational (886)*, Bible (890), UCB Talk (891)*
12·129 (22)	2A/S	V	S4C (104, 184), BBC Parliament (508)*, S4C 2 (519)*, Einstein (576)*, Simply Shopping (643)*, B4U Movies (667), Zee (676), *Simply Shopping Interactive*
12·148 (23)	2A/N	H	Granada (118), Sky Sports News (413), Bloomberg (504), Nick (604), Box Office 31-5
12·168 (24)	2A/N	V	Channel 4, 6 UK regions, (104), E4 (205), Film 4 (323-6), *E4 Ineractive*
12·188 (25)	2B/S	H	Music Choice (480/1), History (561), Biography (563), Sky Latest Ireland (999)
12·207 (26)	2B/S	V	Sky News (501)*, History +1 (562), Channel line up (996)*, Sky Welcome (998)
12·226 (27)	2A/N	H	Breeze (136), Men & Motors (139), Racing channel (416), History channel (561), Box Office 41-5
12·246 (28)	2B/N	V	*Open Shopping*
12·266 (29)	2B/S	H	MovieMax 5 (311), Kiss (450), Fox Kids plus 1 (611), Box Office 49-53, Private Blue (980), Retail info Ireland (997)‡
12·285 (30)	2B/S	V	Game Network (223)*, Energis promo
12·303 (31)	2B/N	H	*Open Shopping*
12·324 (32)	2B/N	V	Wellbeing (211), CNBC (510), Money (516)*, Adventure One (560), Virgin (857)*, Talk Sport (858), Capital Gold (863)*, XFM (864)*, Youth FM (871)*, Premier (873), Heart FM (874)*, One Word (877), Storm Live (881)*, Primetime (882), Sunrise (833)*, Talk Gospel (884), The Storm (887), TWR (888)*, Real Radio (896)*, Costcutter*, Sky News Radio‡
12·344 (33)	2B/S	H	Liberty (202)*, Magazine Showcase (208), Pin (636)*, Gurjari (692), CEE I (693), Anjuman (694), Classic FM (856)*, Classic Gold (859)*, Planet Rock (861)*, Core (862)*, WRN (872)*, Solar Radio (879)*, Punjab (880)*, Total Rock (885)*, LBH (889)*, RTE Radio (892)*, Asian Air (893)*, Club Asia Radio*†, EWTN*†, SSR Radio*†
12·363 (34)	2B/S	V	Nat Geographic +1 (559), Nick replay (605), Star News (671), Box Office 18†, 1-4, Sky Business/Pub Channel‡
12·382 (35)	2B/N	H	Eurosport (419), The Box (449), Q Music (455), Community ch (655)*, *Sky Movies Active*
12·402 (36)	2B/N	V	Where it's at (461), SBN Radio*†
12·422 (37)	2B/S	H	Prime TV (685), *Teletext Holidays*
12·441 (38)	2B/S	V	*BBC Sport Interactive*
12·460 (39)	2B/N	H	Sky Sports Extra (404)
12·480 (40)	2B/N	V	Artsworld (199), MUTV (410), Chelsea TV (427), Playboy (981), Spice (982)

2A = Astra 2A, 2B = Astra 2B, 2D = Astra 2D, EB = Eurobird, UK = UK footprint, N = North footprint, S = South footprint.
Interactive services shown in italics.
* Unencrypted. † No EPG no. allocated. ‡ Channel not available with a normal domestic viewing card.

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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/enginfo

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

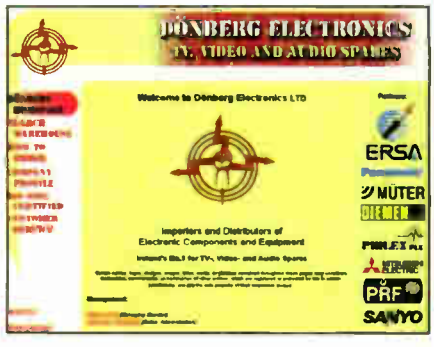
Doknet Service manuals

http://www.doknet.com

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

Dönberg Electronics

http://www.donberg.ie



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

EURAS International Ltd

http://www.euras.com/english

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

Goot Products

http://www.kieagoot.co.uk

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

Matrix Multimedia Ltd

http://www.matrixmultimedia.co.uk

Matrix Multimedia publishes a number of highly interactive CD ROMs for learning electronics including: Complete electronics course, Analogue filter design, and PICmicro(R) microcontroller programming (C and assembly).

M.C.E.S.

http://www.mces.co,uk

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

NTL

http://www.ntl.co.uk

Go to this site for information on NTL's Broadcast, Interactive and Telecom services, including packages for home area by area. There's also a useful transmitter site map and database, giving locations and information. The site also contains useful documents,

which describe digital TV, interactive TV and digital Radio. There's also a useful contacts list.

Mauritron Technical Services

http://www.mauritron.co.uk

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

PC Universe

http://www.pc-universe.net

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Sky digital repairs

http://www.horizonsatellites.co.uk

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

Servicing Advice

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

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

Switch-it-on

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

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

Service Engineers Forum

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

The forum is now visited by Thousands of engineers every week, over 3000 pages of content including new repair tips, servicing articles, circuits, help, for sale, wanted & industry news sections, open access to the site is free to all engineers.
Our product mailing list is also available free of charge for engineers without net access, ring Mike on 0151 522 0053 with your address details.

Televes

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

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

The Service Engineers Forum

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

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

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

UK Electrical Direct

http://www.uked.com

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

UK Mailing List Group

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

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

PSA

http://www.psaparts.com

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

Repairworld

http://www.repairworld.com

Repairworld is a US based fault report database which is updated bi-weekly. It operates on a subscription basis and describes itself as an "affordable solution for all technicians". There is apparently no minimum number of months for which you have to subscribe.

You can see some samples of the material for free, monitors, VCR, DVD and Camcorders being of particular relevance to UK users. The site provides a "chat room" where you can talk via your keyboard to others "in the room".

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Health hazards

Following the letter headed ozone in the August issue, I'd like to clear up a couple of misconceptions. First, ozone isn't electrified air. The air we breathe contains about twenty per cent oxygen which, like most common gases, normally exists in the form of molecules that each contain two atoms. Oxygen can however take another form, with three atoms in the molecule. This is ozone. Pure ozone is a pale blue gas with a pungent smell. It's a powerful oxidising agent which is highly destructive to all forms of organic material and causes severe irritation to the respiratory system. It is very unstable, and rapidly breaks down to form normal diatomic oxygen. Ozone occurs when oxygen is subjected to electrical stress or exposed to short-wave ultraviolet radiation (UV-C) – the latter is the mechanism that maintains the stratospheric ozone layer.

A corona discharge forms small quantities of ozone and nitrogen oxides, all of which contribute to the characteristic smell. The quantities produced depend on the voltage and the current density. It's very unlikely that corona discharge in a domestic TV set could produce enough ozone to present any significant health hazard – the ozone will be rapidly breaking down, and natural room ventilation will dilute what's left. The air in even an apparently unventilated room is replaced completely every few hours via airbricks and diffusion through the walls.

Asthmatics are particularly sensitive to the respiratory irritation caused by ozone yet, speaking as an asthma sufferer myself, I cannot recall the smell from any TV corona ever causing me any distress – even as a teenager in the Sixties, when I was forever tinkering with old valve TV sets which were notorious for corona around their wired-in EHT rectifiers. The danger occurs when the 'cold' corona progresses to form an arc. Incidentally, air ionisers run at about –7·5kV, as corona discharge at this voltage forms copious quantities of ions with minimal ozone and nitrogen oxide production.

The plastic materials used in modern TV sets can produce very poisonous fumes when they burn. Take for example an arcing line output transformer. The potting compound will more than likely be polyurethane resin. This is not particularly flammable but will break down to produce, among other things, deadly hydrogen cyanide gas when it is subjected to the high temperature of an arc. Burning PVC insulation releases hydrogen chloride: when this is inhaled it is dissolved by the moisture in the lungs, producing hydrochloric acid. The toxic fumes from an established TV fire certainly do represent a serious health risk – in the workshop as well as in the home.

I'm not sure how ionised air could be made to explode. The only difference between ionised and neutral air is that some of the atoms in the former may have one more or one less electron in their outer (valence) shell – depending on whether the ionisation is negative or positive respectively. All natural air is slightly ionised, and heavily ionised air rapidly loses its 'charge'. There is no explosive mechanism involved – otherwise thunderclouds would explode and no one would dare have an ioniser in their home. The polarity of any ionisation is important from a health point of view. Negative ions cause brain chemistry changes that lead to a feeling of well-being. Positive ionisation produced by corona discharge in a TV set has the opposite effect.

A line output transformer fault may produce internal heating without rupture of the casing. In this situation the heated plastics cannot burn, as there is no oxygen present. They break down instead, forming volatile hydrocarbons of which some are gaseous. The internal pressure builds up, and eventually the outer casing of the transformer bursts. If an arc is present, the vapours released may ignite. This, together with the noise of the transformer's case bursting, may give a passable impression of an explosion!

Pete Roberts,
Runcorn, Cheshire.

Goodmans TVs

Have you tried to repair a Goodmans TV set or VCR bought from Comet recently? We have just been told by Comet's head office that the company will no longer supply circuit information or spare parts to independent service engineers. Thus when any product sold by Comet develops a fault after the guarantee period the customer has to either return it to Comet for repair or buy something new. Is Comet advising customers at the point of sale that they will be tied to the company for service?

Is this going to be another nail in the coffin for independent service engineers? As a small company we can have little influence with the big boys in the trade. If we could get together with other independents and large spares suppliers however, maybe our voice would be heard.

Is there any help or hope out there?

N.D. Bottrill and D.K. Veitch,
NDC Electronics,
290 Prince of Wales Road,
Sheffield S2 1FF.
e-mail ndcelectronics@aol.com

CRT testing

Here's a quick way of assessing the condition of a colour CRT if you don't have a tester to hand. Check the voltages across the flashover protection resistors that are connected in series with the three cathodes. The voltage across a resistor is

proportional to the current through it, in this case the beam current, which in turn depends on the cathode emission.

If, when checking these voltages, you notice that one differs markedly from the others, you can be pretty sure that the relevant cathode's emission is low. This would mean that the CRT is the cause when the symptom is a poor or missing primary colour.

The cathode voltage with respect to chassis is the check for the operation of an output stage of course.

Miodrag Krajcinovic,
Belgrade, Yugoslavia.

The 11AK08 and 11AK10 chassis

In the February 2000 issue of *Television* Alan Dent wrote about servicing the Vestel-manufactured 11AK08 and 11AK10 chassis. The model numbers he listed are no longer useful however as they relate to NEI and Nikkai sets. They will get you nowhere nowadays when ordering spares. The 11AK08 chassis was used in the Alba Model CTV3459 and the 11AK10 in the Alba Model CTV4889.

The chopper transformer is notorious for going short-circuit on the primary side. It can be obtained from CPC, the part no. being AB42003900 for the 11AK08 chassis and AB4040504910 for the 11AK10 chassis. The special version of the TDA8362A jungle chip (IC401) used in these sets has been mentioned on a couple of occasions. It's available, but is expensive. Some sets were fitted with the TDA8361A. I have found that the TDA8361AN3, which is available for about £6.50 from A.R.D. Electronics (01282 683 000), will work all right as a replacement for either of these chips.

John Hepworth,
Peterlee, Co. Durham.

Dodgy mouse operation

Because I smoke, I tend to suffer from computer mouse reliability problems. The tobacco tar deposits that accumulate on the mouse mat get picked up by the ball and are transferred to the rollers. This occurs with other airborne pollutants of course, but it's worse when you smoke. Cleaning the rollers will usually revive a mouse, but take care to avoid scratching or roughening their surfaces as this will help the next accumulation of gunge to stick to them.

Here's a tip if you find that you need to clean the rollers frequently. Apply a very light, even smear of white heatsink compound to the ball. If the coating is thick enough to be sticky it will increase the amount of debris collected. But if it's a very thin coating the silicon grease will prevent dirt sticking to both the ball and the rollers. In addition, the magnesium-oxide filler acts as an incredibly fine polishing abrasive. In normal use it polishes out the minute scratches on the rollers to which the dirt adheres. I also use it to polish the plastic lens on the EverReady swivel torch that gets rattled about in my toolbox.

Because I use a Microsoft Inport mouse card to free a serial port (unless the computer has a built-in PS/2 port), my choice of mouse is limited. I normally avoid the electrical-contact type of position-sensor design, as this is affected by smoke and pollution. It wasn't until the Microsoft own-brand mouse I had been using became very troublesome and I had to look for a replacement that I realised the enclosed sensors at the ends of the rollers were contact types instead of slotted-disc opto-interrupter encoders. Although the contacts had survived, the greater operating torque required was making it difficult to maintain reliable operation. The replacement I eventually found is a Mouse Systems type with slotted-disc opto-position encoding and nylon instead of steel rollers. This type has virtually zero operating torque on the rollers and the nylon, although still vulnerable to abrasion and dirt accumulation, responds better to the 'polish'.

Ian Field,
Letchworth, Herts.

ITV Digital's woes

As the UK's digital terrestrial TV service descends into ever deeper crisis, I feel we should ask who's in the driving seat? For the last few years Mr Brown and his chums at the Treasury seem to have been anxious to get their hands on the TV UHF spectrum space and sell it off. To this end pressure has been put on the public to accept that, like it or not, they are soon going to have to go digital. This is in stark contrast to the original plan for a gradual, 405-style run down. But if ITV believes it's the driving force, it needs to ask what it has that Sky hasn't got? If the only answer is itself, its position needs serious consideration. For one thing, unless it is being supported by someone else, no company can continue haemorrhaging as ITV Digital is for long.

The public hasn't taken to the idea of digital TV in the way the government wanted or hoped. Most people simply don't understand what's meant by "digital", associating the term with computers. The majority of people I speak to certainly don't understand that all their children's analogue portables will simply cease to work, but that's another matter.

In comparison Sky has been extremely astute in its approach to digital TV. It obviously has some very clever marketing people who are well in touch with the public. When Sky first appeared in 1988 I was sceptical as to whether people could be persuaded to take up the new technology and also pay for the programmes provided – with, in addition, the programmes put together in packages so that people have to pay for some they don't want! Sky became a success in a relatively short space of time however, by concentrating in particular on sports coverage. But the really clever bit is how Sky has managed the introduction of its digital services. Initial advertising got people interested then, when they went to dealers to see for themselves, a fully-operational system was up and running with a huge selection of programming and stunningly good pictures on the major channels. The EPG was a surprise that captured the imagination.

Having got people interested, and with a huge word-of-mouth publicity machine in operation, Sky then announced that in a very short time it would simply switch off its analogue services, so you'd better move to the digital ones instead. The response that might have been expected from the great British public would be outrage, after spending all that money on analogue equipment. But free digiboxes were made available, and people said fair enough. They took out bigger and better packages – even stumped up another £40 or more to get the equipment installed! Now that's marketing at its cleverest and best. Unless ITV Digital feels that it can compete on a similar footing, it might as well give up now.

What would ITV via satellite involve? For a start, everyone would be able to receive it. Channel 5 too. No more messing about with multiplex allocations and transmitter power levels to try to ensure that you get digital as well as analogue TV via an existing aerial. The only downside I can see is that a certain amount of regionalisation would be lost. But this has already happened – there are no longer many ITV companies that join together and operate as a network only for major drama and entertainment programmes.

The obvious loss would be local news. But the geographical areas now covered by 'local' news are quite large, and a bit larger would hardly be noticed.

The ITV Digital situation is complex, with probably many subtleties and political angles. But from the outset it appeared to me to be doomed. Sky Television had already achieved huge success, there were potential interference problems and those associated with inadequate signal levels. The future of digital TV does seem to lie with satellite and cable.

Geoff R. Darby,
Northampton.

CORRECTION

Because of a server computer font fault at the editorial office there were errors in the first letter on page 502 of the June issue. All signal levels should have been specified as dBμV. Unfortunately the computer deleted the μs. This happened at the last moment, after page checking. Our apologies. That's technology for you.

Answer to Test Case 466

– page 751 –

Nora's cat was in attendance as this little disaster unfolded, and gave Ray a look of contempt as it stalked off to the kitchen. Cats can judge people, Nora says . . .

Ray was correct in his suspicion that the old mast-head distribution amplifier was faulty. It had certainly been there for many, many years, and was maybe older than Ray himself! That it required an 18-24V supply stood witness to its longevity, and this turned out to be the key to the problem. Ray hadn't replaced the power supply, even though the Whizzo amplifier came complete with a new one that provided an output rated at 12V. The output from the old power unit, with the light current load presented by the modern amplifier, had risen to a very generous level – higher in fact than its rated maximum of 24V. This had been too much for the UHF booster amplifier up aloft. It had succumbed, and subsequent inspection showed that some of its internal bits had got very hot.

Nora's little kitchen set now produces almost snow-free pictures while she makes her quiches and sausage rolls, and the big set in the living room gives better pictures than before. All thanks to the lower noise figure of the (second!) new amplifier now clamped to her aerial pole and the new power unit. It's not to be revealed here how the matter of the electrocuted amplifier was resolved, nor where its body lies. Nora doesn't know, Ray does. And maybe, just maybe, the cat does. Look out for the big white van, tabby!

NEXT MONTH IN TELEVISION

Servicing the Philips VR258

John Coombes provides a detailed guide to fault-finding with this Turbo deck VCR.

The Berlin Radio Show

The International Funkausstellung (Berlin Radio Show) is the world's largest consumer electronics exhibition. It's where every new development gets an initial public showing. George Cole reports on this year's main developments, which included the first TV sets to feature DVB Multimedia Home Platform interactive technology, DVD recorders, Bluetooth camcorders and hard-disk recorders.

Motor home installation work

There's lots that can be added to a motor home and money to be made from the installation work. Tom Baker resumes his series: this time, how to fit an electric step.

NiCad pulse-charger circuit

Ian Field presents a simple NiCad battery pulse charger circuit based on the use of a conventional iron-cored transformer. It can be built from scratch at little cost.

Published on the third Wednesday of each month by **Cumulus Business Media**. Anne Boleyn House, 9-13 Ewell Road, Cheam, Surrey SM3 8BZ. **Cumulus Business Media** is a division of **Highbury Communications PLC Filmsetting** by JJ Typographics Limited, Unit 4, Baron Court, Chandlers Way, Temple Farm Industrial Estate, Southend-on-Sea, Essex SS2 5SE. **Printed** in England by Polestar (Colchester) Ltd., Newcomen Way, Severalls Industrial Park, Colchester, Essex CO4 4TG. **Distributed** by Comag, Tavistock Road, West Drayton, Middlesex UB7 7GE (tel. 01895 444 055). **Sole Agents** for Australia and New Zealand, Gordon and Gotch (Asia) Ltd.; South Africa, Central News Agency Ltd. ***Television*** is sold subject to the following conditions, namely that it shall not, without the written consent of the Publishers first having been given, be lent, resold, hired out or otherwise disposed by way of Trade at more than the recommended selling price shown on the cover, excluding Eire where the selling price is subject to currency exchange fluctuations and VAT, and that it shall not be lent, resold, hired or otherwise disposed of in a mutilated condition or in any unauthorised cover by way of Trade or affixed to or as part of any publication or advertising, literary or pictorial matter whatsoever.

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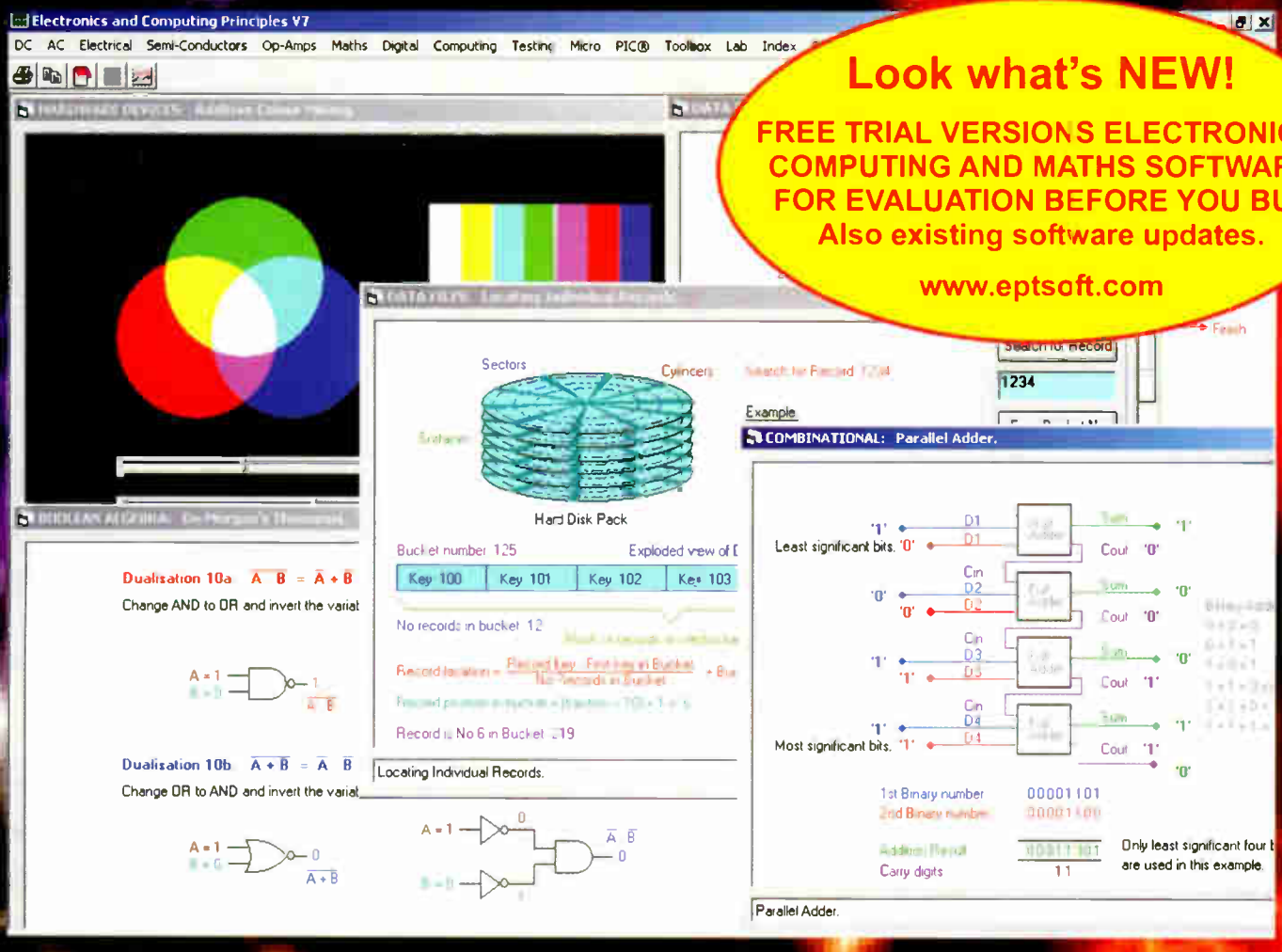

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