

THE LEADING UK CONSUMER ELECTRONICS TECHNOLOGY MAGAZINE

# TELEVISION

SERVICING · VIDEO · SATELLITE · DEVELOPMENTS

NOVEMBER 1996 £2.35

A REED BUSINESS PUBLICATION

## Servicing the Panasonic K deck

Pace MSP200 dish positioner

DVD launch latest

Channel 5 reception techniques

Surface-mount failure mechanisms



Fault Reports *TVs, VCRs, Camcorders and Satellite*



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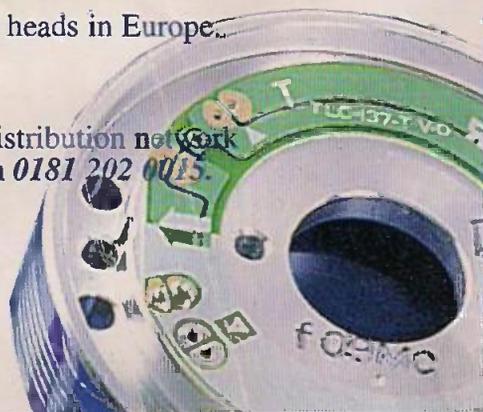
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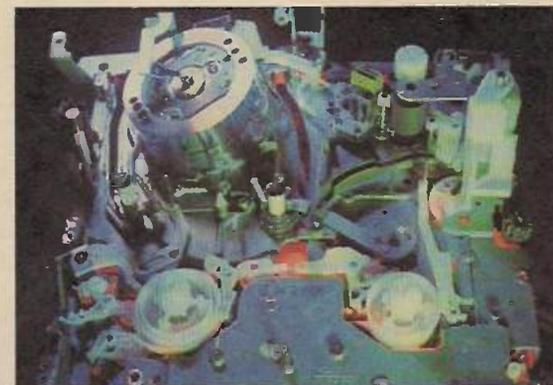
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John Coombes provides a guide to fault conditions that can arise with this deck, which is used in Panasonic NVHD and NVSD series VCRs.

## **CORRECTIONS**

The correct telephone number for HS Publications is 01332 381 699, not as given on page 904 last month beneath the loop aerial photograph.

The fault report on the Sony EVA300UB in Camcorner last month should have appeared in VCR Clinic.



Cover photograph  
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2SC1833	27p	2SC2330	300p	2SC22812	40p	2SC2310	125p	2SC2883	210p	2SD415	55p	2SD973	70p	2SD1402	120p	2SD1849	280p	2SK415	500p
2SC1834	80p	2SC2331	50p	2SC22814	40p	2SC2316	280p	2SC2884A	200p	2SD424	350p	2SD973A	70p	2SD1403	225p	2SD1853	325p	2SK423	75p
2SC1841	12p	2SC2333	200p	2SC22824	75p	2SC2317	350p	2SC2885	250p	2SD426	150p	2SD982	90p	2SD1405	80p	2SD1855	40p	2SK427	50p
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2SC1858	70p	2SC2360	120p	2SC22839	40p	2SC2334	100p	2SC2896	400p	2SD476	100p	2SD1012	40p	2SD1413	60p	2SD1878	160p	2SK534	700p
2SC1870	70p	2SC2381	150p	2SC22843	70p	2SC2346	130p	2SC2897	400p	2SD525	70p	2SD1022	250p	2SD1415	190p	2SD1879	275p	2SK537	900p
2SC1871	425p	2SC2382	50p	2SC22873	70p	2SC2352	200p	2SC2907	250p	2SD545	18p	2SD1024	850p	2SD1417	125p	2SD1880	360p	2SK538	350p
2SC1881	70p	2SC2365	280p	2SC22877	120p	2SC2353	280p	2SC2927	250p	2SD549	12p	2SD1027	850p	2SD1425	260p	2SD1881	350p	2SK539	1100p
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2SC1890	15p	2SC2371	25p	2SC22879	3200p	2SC2358	120p	2SC2943	75p	2SD554	225p	2SD1031	70p	2SD1427	160p	2SD1886	450p	2SK552	250p
2SC1895	600p	2SC2373	210p	2SC22882	60p	2SC2358	50p	2SC2944	80p	2SD555	50p	2SD1036	600p	2SD1428	180p	2SD1887	300p	2SK553	225p
2SC1904	125p	2SC2383	60p	2SC22883	60p	2SC2378	300p	2SC2950	120p	2SD556	225p	2SD1046	200p	2SD1430	280p	2SD1894	300p	2SK555	320p
2SC1906	15p	2SC2389	45p	2SC22898	200p	2SC2377	50p	2SC2953	60p	2SD568	200p	2SD1047	180p	2SD1431	200p	2SD1895	225p	2SK556	500p
2SC1907	20p	2SC2407	110p	2SC22899	50p	2SC2378	120p	2SC2955	70p	2SD569	50p	2SD1051	130p	2SD1432	400p	2SD1897	280p	2SK557	400p
2SC1909	250p	2SC2408	120p	2SC22909	60p	2SC2379	1200p	2SC2964	100p	2SD571	20p	2SD1055	60p	2SD1433	400p	2SD1911	300p	2SK558	600p
2SC1913	90p	2SC2412K	50p	2SC22910	25p	2SC2381	130p	2SC2972	250p	2SD575	530p	2SD1060	130p	2SD1438	100p	2SD1913	60p	2SK560	580p
2SC1914	30p	2SC2440	200p	2SC22911	80p	2SC2383	80p	2SC2973	210p	2SD582	25p	2SD1062	160p	2SD1439	165p	2SD1920	50p	2SK566	475p
2SC1921	15p	2SC2458	10p	2SC22912	120p	2SC2393	80p	2SC2975	210p	2SD596	25p	2SD1063	200p	2SD1441	220p	2SD1930	50p	2SK606	70p
2SC1922	175p	2SC2459	50p	2SC22921	650p	2SC2397	20p	2SC2987	220p	2SD600	30p	2SD1064	250p	2SD1442	80p	2SD1933	75p	2SK612	80p
2SC1923	10p	2SC2466	55p	2SC22922	480p	2SC2399	50p	2SC2996	800p	2SD601	40p	2SD1065	160p	2SD1445	200p	2SD1939	75p	2SK684	950p
2SC1929	180p	2SC2486	275p	2SC22923	75p	2SC2400	35p	2SC2997	1400p	2SD602	50p	2SD1069	150p	2SD1446	300p	2SD1941	600p	2SK685	1150p
2SC1940	110p	2SC2492	50p	2SC22928	550p	2SC2401	60p	2SC2998	1000p	2SD612	60p	2SD1073	350p	2SD1450	60p	2SD1944	50p	2SK699	100p
2SC1941	27p	2SC2470	65p	2SC22929	280p	2SC2402	100p	2SC2999	1000p	2SD613	70p	2SD1088	150p	2SD1451	200p	2SD1958	80p	2SK719	300p
2SC1942	350p	2SC2481	120p	2SC22934	75p	2SC2405	130p	2SC3000	280p	2SD617	300p	2SD1094	375p	2SD1452	275p	2SD1959	210p	2SK724	500p
2SC1944	350p	2SC2482	20p	2SC22937	250p	2SC2409	400p	2SC3023	325p	2SD633	10p	2SD1110	225p	2SD1453	140p	2SD1978	60p	2SK725	550p
2SC1945	380p	2SC2483	120p	2SC22938	400p	2SC2416	30p	2SC3029	350p	2SD636	70p	2SD1111	20p	2SD1455	250p	2SD1984	450p	2SK726	425p
2SC1946	1500p	2SC2484	185p	2SC22944	300p	2SC2417	90p	2SC3043	45p	2SD637	15p	2SD1113	225p	2SD1457	165p	2SD1991	50p	2SK727	475p
2SC1947	450p	2SC2485	400p	2SC22958	50p	2SC2419	120p	2SC3048	45p	2SD638	15p	2SD1128	200p	2SD1458	50p	2SD1994	300p	2SK739	400p
2SC1953	45p	2SC2491	200p	2SC22962	800p	2SC2420	80p	2SC3056	350p	2SD639	20p	2SD1133	85p	2SD1459	80p	2SD1996	45p	2SK758	300p
2SC1957	70p	2SC2498	50p	2SC22979	160p	2SC2421	45p	2SC3059	550p	2SD640	350p	2SD1135	75p	2SD1468	40p	2SD2006	75p	2SK769	600p
2SC1959	10p	2SC2500	26p	2SC22987	250p	2SC2422	75p	2SC3064	140p	2SD645	60p	2SD1138	40p	2SD1487	225p	2SD2010	280p	2SK786	200p
2SC1962	175p	2SC2502	140p	2SC22988	150p	2SC2423	65p	2SC3070	200p	2SD661	160p	2SD1140	40p	2SD1494	200p	2SD2011	60p	2SK787	800p
2SC1967	1300p																		



# The Thomson Saga

As we all know, foreigners begin at the English Channel. And there are no stranger foreigners than the first ones you come across, the French. This is borne out by the current Thomson situation. Thomson, a vast company by any reckoning, is a strange beast. It's state controlled, which means that the government owns most but not quite all of it, and consists of two distinct arms, the defence group Thomson-CFS which is quite profitable, and the consumer electronics group Thomson Multimedia which loses a packet. The government wants to be rid of it, but won't sell the bits separately. It doesn't want to be left with the problem of what to do with Thomson Multimedia.

You might think that no one would be interested in helping the French government. But in fact there are two contenders to take over Thomson, the telecommunications and power group Alcatel Alsthom and the defence and media group Lagardère. They have been engaging in quite a battle over the ownership, and as we go to press the French government is due to decide whose bid to accept. Whoever wins will end up with the profitable defence company – and the problem of Thomson Multimedia (TMM). Lagardère has stated that it would sell TMM to Daewoo of Korea. Alcatel Alsthom has not been quite so specific, but has announced that it would take immediate action to reduce TMM's losses and seek an "Asian partner" that "specialises in consumer electronics". The partner would be expected to take over management of TMM, but Alcatel would like to remain a "minority partner" – it sees prospects in the move to digital TV

technology that will occur during the next decade.

All this gives one a strange feeling of déjà vu. At the time when Thomson took over Ferguson, in June 1987, we mentioned in this column that Thomson is "now on the government's privatisation list". It's taken almost a decade to happen. We also said that "Thomson may be big, but has not been all that successful in the past in the consumer electronics field". Right on! What has happened to Ferguson in the UK illustrates the dismal Thomson effect. From being the local brand leader, with over ten per cent of the market, Ferguson has ended up being an also ran. It's only fair however to mention that Ferguson was making substantial losses when Thom EMI was glad to get £90m for it from Thomson.

Thomson has been able to survive in the consumer electronics field because it is part of a larger organisation, with those defence profits. It has nevertheless over the years attempted to play a major role in the international consumer electronics field, keeping up with Philips and the Japanese corporations. From its French origins, it first expanded by picking up various German companies such as NordMende. It added Telefunken, a venerable name if ever there was one in this industry, in the early eighties, then took what was to be a big move into the UK market when it bought Ferguson. It currently uses six brand names in Europe. The largest step however occurred when TMM became a major force in the North American market by taking over General Electric's consumer electronics interests. This also gave it the RCA operation. The idea behind all this seems to have been to

achieve success simply by getting bigger. There was always government finance to back the policy, which in the event has not been a success.

The TMM débâcle is a sad one, since Thomson's research and engineering has had many successes. It has not stinted on R and D work, with laboratories in Los Angeles, Indianapolis, Strasbourg, Hanover, Villingen, Tokyo and Singapore. Much work has been done on HD-TV, digital signal processing and other developments that have kept it in the forefront of the technology. Now, it seems, TMM is likely to be swallowed up by one of the Oriental corporate giants. If there are any lessons to be drawn, they would seem to be that expansion by itself is no guarantee of success, that to spread ones activities and their control across the globe makes management extremely difficult, and that costs are very hard to control in such a context.

Alcatel Alsthom's plans to reduce TMM's losses bear this out. It would close down TMM's US factories, transferring production to the company's modern facilities in Mexico, where wages are much lower. It would rationalise the large collection of brands, possibly adopting RCA as the main one worldwide. And there is a suggestion that the company should be run from the USA, since this is its largest market. But all this would be just initial steps towards ceding majority control. Venerable brand names such as Telefunken, GE and RCA would pass to oriental ownership. This will happen whoever wins, Alcatel Alsthom or Lagardère, which would leave just Philips to carry on Europe's traditions in the consumer electronics field.

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# TELETOPICS

## Internet via Cable TV

The first Internet service to be provided via fibreoptic TV cable has been launched by @Home in Fremont, California. At 10Mbits/sec the bandwidth of the cable connection is more than three hundred times that of a conventional state-of-the-art telephone connection (28.8kbits/sec), giving far faster access to Internet material – a file that would normally take more

than an hour to download is available in seconds. @Home makes a set-up charge of \$150 with a monthly rental charge of \$35 – the service is at present limited to commercial customers.

There were delays in introducing the service as considerable technical problems had to be solved – the most difficult was design of the Internet/cable TV interface. Capital cost per installation is around

\$2,000 at present. Because of this the service, which is to be made available via US cable TV operators, is expected to develop only slowly. In addition to the much faster access time, the increased bandwidth will enable new Internet technologies to be introduced more quickly, vastly increasing the system's potential. It could also make many current technologies, such as ISDN, obsolete.

## Channel 5 Latest

The minister for technology has announced that Ch. 5 is to be allowed the use of ch. 35, which will increase its terrestrial coverage to 80 per cent of the population of the UK. But the use is to be restricted to a five-year period, and it could take up to a year to obtain the necessary international permission.

Meanwhile retuning difficulties continue. Telewest, the UK's largest cable TV company, was to

undertake this task in its franchise areas but has called off talks with C5B. According to a Telewest source, the price and schedule proposed by C5B were "ridiculous". Following the ch. 35 concession, C5B has decided to recruit a further 1,500 retuners, bringing the total to 8,500. The new service is now likely to start in mid-February or early March rather than the planned January 1st.

In a further move, C5B is holding

discussions with BSkyB. C5B aims to secure satellite transmission for Ch. 5 and undertake joint programme commissioning and cross-promotion with BSkyB.

NTL has announced that it will use both Orion and Intelsat 705 as part of its innovative digital distribution system for Ch. 5. The satellite-based system will provide NTL's terrestrial transmitter network with compressed video in MPEG-2 form. Cable companies will also be able to use the satellite transmissions, further extending Ch. 5's coverage.



## Catalogues

CPC's 1997 catalogue is now available. Existing CPC customers will receive the catalogue automatically. Copies can alternatively be obtained by calling 01772 654 455. The 2,000 full-colour pages, divided into sixty clearly indexed product sections, list over 52,000 items that are available from stock. 17,000 products have been added since the last catalogue.

SEME's 1996/7 catalogue is now available. It includes new ranges from Daewoo and Crown along with many new component lines. For further information phone SEME on 0166 465 392 or fax 0166 463 976.

## Digital Camcorder Formats

Dissension in the digital video field: Hitachi has condemned the DVC standard as "ridiculous", and has developed a camcorder that instead stores the video signal in MPEG form on a mini hard disc. The company maintains that future video products should be based on MPEG as this is "the common standard for the multimedia world". Hitachi plans to launch its MPEG camcorder next year, at around £1,300, and is seeking partners in the project.

The prototype camera looks like a rotary-head shaver, with a high-resolution optical system at the 'head' end and a colour LCD screen the size of a postage stamp at the back for playback (or connect to a TV set or PC) and to act as a viewfinder. There's a slot in the camera's body for a miniature PCMCIA disc drive of the type used in notebook computers. It can store up to half an hour of moving video with

better than VHS quality, 3,000 indexed still pictures, or four hours of hi-fi sound. The 300,000 or so components required for MPEG coding have been integrated by Hitachi into a single chip that consumes only 600mW and is thus suitable for use in a battery-operated camera. The hard disc gives almost instant access to any part of the recorded material.

Meanwhile JVC is launching a new DVC camcorder in Japan. Model GR-DVM1 incorporates the first high-resolution polycrystalline-silicon TFT LCD colour monitor/viewfinder, which is claimed to give clear viewing outdoors. It has 180,000 pixels and is 2.5in. across. Other features include a 570,000 pixel CCD image sensor, a x10 optical zoom, a x100 digital zoom and weight of just 730g with battery and tape. Price in Japan is the equivalent of some £1,740.

# Flat-screen TV

Philips demonstrated a flat-screen, TV set at the CeBIT electronics show held in Hanover during August. The set uses a Fujitsu 42in. gas-plasma display panel which has over 400,000 pixels arranged in an 852 x 480 matrix – the aspect ratio is 16:9. VGA resolution is offered for computer display, and there are 256 grey-scale levels. The viewing angle is 160°.

The Philips set, known as Flat TV, consists of two sections, the display which can be wall hung and the receiver itself. The two are linked via a pair of cables. Features include a multi-system tuner, Dolby Pro-Logic Surround sound and five AV connections. The display section is less than

10cm (4in.) deep. Philips plans to launch the set in Germany next year at the equivalent of about £9,000. Initial sales are expected to be mainly to businesses for multimedia presentations. Further models with screen sizes from 25 to 55in. are planned. Philips estimates that by the year 2000 annual worldwide sales of sets of this type will reach a million.

According to Fujitsu, plasma displays of the type used have a minimum service life of 10,000 hours – about five years' viewing at six hours a day. Failure occurs mainly because of the corrosive behaviour of the ionised gas.

Sony and Sharp have agreed to undertake joint development of flat-screen TV technology that



uses plasma discharges to control a liquid-crystal display. Sony is already producing sets fitted with the Plasmatron display. The basic technology is licensed from Tektronix (see *Television*, September 1995, page 780).

## DVD News

JVC has announced plans to start bulk manufacture of DVD discs in the USA next spring. The company's US subsidiary JVC Disc America will produce the discs at its Sacramento and Tuscaloosa plants. Sample production is to start in November. Initial production will be at the rate of 600,000 discs a month.

SGS Thomson has developed an anticopying chip for use in DVD players. It prevents prerecorded material being copied. While broadcasts could be recorded on a blank disc, copies would not be possible.

Thomson Multimedia has decided to join Sony and Philips in licensing its DVD patents.

Sonic Solutions has established the DVD Production Alliance, which IBM and Apple Computers have joined, to get the DVD-ROM market off the ground. The

Alliance will use premastering systems developed by Sonic and Daikin Industries. These enable MPEG-2 video and sound encoding and authoring software to be handled, so that DVD-ROM based multimedia titles can be created.

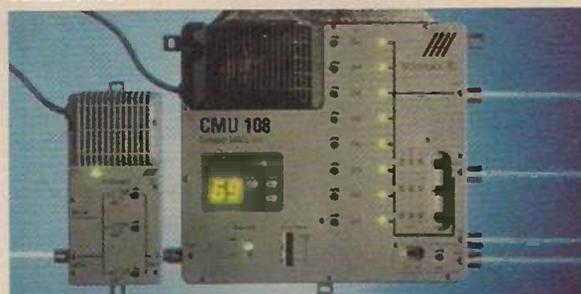
## MATV Filter-amplifier

Satellite Solutions (1 Hartburn Close, Crow Lane Industrial Park, Northampton NN3 9UE – phone 01604 787 888/fax 01604 787 999) has added to its range the Hirschmann CMU108 eight-channel MATV filter-amplifier. It could be a boon for MATV installations with the advent of Ch. 5. Each of the eight inputs can be separately tuned from ch. 21 to ch. 69, and the gain can be adjusted by 20dB per channel. A built-in meter makes level setting very quick. Almost any

## Servicing Aid

US manufacturer Chemtronics has introduced a range of products designed for use where static build-up can cause component damage. The range includes Freeze-It Antistat, which rapidly lowers the temperature to -51°C. Tests have shown that it generates 90 per cent less static than many comparable products. For further information phone 01132 720 111.

input/output combination can be arranged and correctly filtered and balanced on site.



## Internet on TV

Several Japanese setmakers have introduced TV receivers that also provide access to the Internet. They include Mitsubishi, Sanyo and Sony. Sanyo's 28in. widescreen model can produce split-screen displays, showing a TV programme and an Internet page simultaneously side by side. In addition to its WebTV set, Sony plans to launch a set-top box called the WebTV Internet Terminal for

use "with any TV". It will incorporate a 33.6kbits/sec modem and Web-filtering software to prevent unsuitable material being seen by child viewers.

The BBC is entering the Internet server field with BBC Online, which will provide BBC programme material and a general point of access. The aim is to create a service that's "easy to use and easy to enjoy". ICL and BBC

Worldwide are jointly developing the service.

Netscape, the company that markets Navigator – the world's most popular Internet browser – has formed a new company to develop consumer and non-PC devices for access to the Internet. Netscape is working on the project with a number of other companies, including Sony, Nintendo, NEC and IBM.





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HRD110/111/120/121/225			
<i>Contents</i>			
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3V29/3V30			
HRD7200/7300/7350			
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HRP50/HRD140/150/158/160			
HRD250/257/565/566/755			
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Order Code: SK57	<i>Economy Kit Contents</i>	£13.00	ORDER CODE: SK58
	BELT SET, PINCH ROLLER, IDLER TYRE		
FVHP615/618/620/622/710/711/715/716/720/721/722/725/730/830/840			
<i>Contents</i>			
BELT SET, PINCH ROLLER, IDLER, GEAR IDLER UNIT, TENSION BAND			
Order Code: SK58	<i>Economy Kit Contents</i>	£11.00	ORDER CODE: SK69
	BELT SET, PINCH ROLLER, IDLER TYRE		
<b>HITACHI</b>			
VT11/VT33			
<i>Contents</i>			
BELT SET, PINCH ROLLER, TENSION BAND, IDLER TYRES			
Order Code: SK08		£5.00	

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## VIDEO SERVICE KITS (Cont.)

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<i>Contents</i>			
BELT SET, T/U/P REEL TABLE TYRE, SUPPLY REEL TABLE TYRE, PINCH ROLLER, FF/REW IDLER, CLUTCH PLATE, TENSION BAND			
Order Code: SK45	<i>Economy Kit Contents</i>	£13.00	ORDER CODE: SK46
	BELT SET, PINCH ROLLER, FF/REW IDLER TYRE, T/U/P REEL TABLE TYRE, SUPPLY REEL TABLE TYRE		
VT52/61/62/63/64/65/85/86/640			
<i>Contents</i>			
BELT SET, PINCH ROLLER, FF/REW ARM, CLUTCH PLATE, TENSION BAND			
Order Code: SK49	<i>Economy Kit Contents</i>	£14.00	ORDER CODE: SK50
	BELT SET, PINCH ROLLER, FF/REW IDLER		
VT400/405/410/13/14/15/18/420/25/26/28/430/31/35/48/450/486/510/520/25/26/530/35/36/540/545/46/48/570/75/576/580/85/88			
<i>Contents</i>			
TIMING BELT, PINCH ROLLER, FF/REW ARM, CLUTCH BASE, TENSION BAND			
Order Code: SK52		£9.75	
VT100/110/111/113/115/118/120/125/128/130/135/138/145/150/175/220/225/250/255/258/260/VTL30			
<i>Contents</i>			
BELT SET, PINCH ROLLER, FF/REW ARM, CLUTCH PLATE, TENSION BAND			
Order Code: SK51		£14.00	
<b>PANASONIC</b>			
NV2000/NV2010			
<i>Contents</i>			
BELT SET, PINCH ROLLER, TENSION BAND, IDLER TYRES			
Order Code: SK03	<i>Economy Kit Contents</i>	£5.00	ORDER CODE: SK02
	BELT SET, PINCH ROLLER, TENSION BAND, IDLER TYRES		
NV300/NV330/NV333/NV340/NV366			
<i>Contents</i>			
BELT SET, PINCH ROLLER, TENSION BAND, IDLER TYRE			
Order Code: SK01		£5.00	
NV2000/NV2010			
<i>Contents</i>			
BELT SET, PINCH ROLLER, FF IDLER, PLAY IDLER, TENSION BAND, VIDEO LAMP			
Order Code: SK13	<i>Economy Kit Contents</i>	£6.00	ORDER CODE: SK14
	BELT SET, PINCH ROLLER, IDLER TYRE, PULLEY TYRE		
NV7000/NV7200/NV7800			
<i>Contents</i>			
BELT SET, PINCH ROLLER, IDLER UNIT, PLAY IDLER, TENSION BAND			
Order Code: SK11	<i>Economy Kit Contents</i>	£8.50	ORDER CODE: SK12
	BELT SET, PINCH ROLLER, IDLER TYRE, CLUTCH TYRE		
NV300/NV330/NV333/NV340/NV366			
<i>Contents</i>			
BELT SET, PINCH ROLLER, IDLER UNIT, PLAY IDLER, TENSION BAND			
Order Code: SK15	<i>Economy Kit Contents</i>	£7.00	ORDER CODE: SK16
	BELT SET, PINCH ROLLER, IDLER TYRE, PLAY IDLER		
NVG7/NVG9/NVG10/NVG11/NVG12/NVG14/NVG15/NVG16/NVG18/NVG30/NVG120/NVG130/NVG400/NVH65 (P/XA/CV/AG1810 (P/K))			
<i>Contents</i>			
LOADING BELT, CAPSTAN BELT, PINCH ROLLER, IDLER TENSION BAND			
Order Code: SK27	<i>Economy Kit Contents</i>	£5.00	ORDER CODE: SK28
	BELT, PINCH ROLLER, IDLER TYRE		
NV332			
<i>Contents</i>			
BELT SET, PINCH ROLLER, PLAY IDLER, FF/REW IDLER, TENSION BAND, FF/REW TYRE			
Order Code: SK29	<i>Economy Kit Contents</i>	£12.00	ORDER CODE: SK30
	BELT SET, PINCH ROLLER, PLAY IDLER TYRE, FF/REW IDLER TYRE		
NV230/250/260/280/430/450/460/470/650/810/890/AG1200PK/AG1500PK			
<i>Contents</i>			
BELT SET, PINCH ROLLER, IDLER, TENSION BAND			
Order Code: SK23	<i>Economy Kit Contents</i>	£5.00	ORDER CODE: SK24
	BELT SET, PINCH ROLLER, IDLER TYRE		
NV500/NV688			
<i>Contents</i>			
BELT SET, PINCH ROLLER, PLAY IDLER, FF/REW IDLER, TENSION BAND			
Order Code: SK25	<i>Economy Kit Contents</i>	£12.00	ORDER CODE: SK26
	BELT SET, PINCH ROLLER, PLAY IDLER TYRE, FF/REW IDLER TYRE		
NV730/NV770			
<i>Contents</i>			
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Order Code: SK19	<i>Economy Kit Contents</i>	£5.00	ORDER CODE: SK20
	SLOT IN BELT, LOADING BELT, PINCH ROLLER, IDLER TYRE		
NV370/NV380/480/630/780/830/850/AG2100PK/AG2200PK			
<i>Contents</i>			
BELT SET, PINCH ROLLER, IDLER, TENSION BAND			
Order Code: SK21	<i>Economy Kit Contents</i>	£5.00	ORDER CODE: SK22
	BELT SET, PINCH ROLLER, IDLER TYRE		
NV777/NV788			
<i>Contents</i>			
BELT SET, PINCH ROLLER, IDLER UNIT, TENSION BAND			
Order Code: SK17	<i>Economy Kit Contents</i>	£6.00	ORDER CODE: SK18
	BELT SET, PINCH ROLLER, IDLER TYRE		

## VIDEO SERVICE KITS (Cont.)

<b>SHARP</b>			
VC381			
<i>Contents</i>			
BELT SET, PINCH ROLLER, REEL IDLER, TENSION BAND, VIDEO LAMP			
Order Code: SK47	<i>Economy Kit Contents</i>	£8.00	ORDER CODE: SK48
	BELT SET, PINCH ROLLER, REEL IDLER TYRE		
VC500/VC571/VC581/VC582/VC583/VC584/VC5F3			
<i>Contents</i>			
BELT SET, PINCH ROLLER, REEL IDLER, TENSION BAND			
Order Code: SK60	<i>Economy Kit Contents</i>	£3.50	ORDER CODE: SK61
	BELT SET, PINCH ROLLER, REEL IDLER		
VC781/VC781Q/VC782Z/VC785/VC786/VC793/VC800/VCA100/VCA102/VCA104/VCA202			
<i>Contents</i>			
BELT SET, PINCH ROLLER, REEL DRIVE UNIT, TENSION BAND			
Order Code: SK64	<i>Economy Kit Contents</i>	£13.50	ORDER CODE: SK65
	BELT SET, PINCH ROLLER, REEL DRIVE UNIT TYRE		
VC681/VC682/VC684/VC685/VC689/VC699/VC6F3/VC700			
<i>Contents</i>			
BELT SET, PINCH ROLLER, REEL DRIVE UNIT, TENSION BAND			
Order Code: SK62	<i>Economy Kit Contents</i>	£13.50	ORDER CODE: SK63
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TX2112, TX2162, TXC22		
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<b>AR7000</b>				
VS125, 128, 155	IDLER	BV321079	800p	
VS185, 240, 244, 245, 247, 248, 250, 512, 515, 516	IDLER ASSY	MZ308690J2	900p	
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VS9500, VS9800				
VS9700, VS9800	UNLOADING IDLER	PU48381	£4.00	
VS9800, VS9800				
VS9700, VS9300	REW IDLER	PU48380	500p	
VS9500, VS9800				
VS98	IDLER	BV336087	£6.00	
VS1, 3, 4, 9, 12	REEL TABLE	BH347731	450p	
VS15, 55				
VS2, 35, 37, 53, 56	CLUTCH	ML373043	1100p	
VS88, 75, VS477				
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VS9700	REW IDLER	W321762	£4.23	
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VCR4500, VCR5000, VCR9000				
VTR1, VCR4500	GEARHOLDER	161284	£3.50	
VCR4600, VCR6200, VCR9000				
VTR1, VCR4600	REF CLUTCH			
VCR6200				
VCR6000, VCR6100	CLUTCH	153202	£3.80	
VCR4500, VCR9000	CLUTCH			
VCR4500, VCR4600	MOD KIT	(TAPE CREASING)	300p	
VCR4700				
MOD KIT TAPE CREASING FOR AMSTRAD				
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3V16, 3V22	T-UP IDLER	PU49280	£5.50	
8903, 8909, 8912, 8922				
3V23, 3V29, 3V30	REEL IDLER	PU48967	175p	
3V01, 3V32, 3V36, 8923, 8924, 8929, 8930, 8931	SUPPORT CLUTCH	8940, 8941, 8942	350p	
3V22, 3V31	ROLLER ASSY	PU48042A	100p	
3V29, 3V30, 3V31	T-UP IDLER	51402	100p	
3V22, 3V25, 3V36, 3V38, 3V39, 3V49, 8930, 8931, 8940, 8941, 8942	T-UP IDLER		200p	
3V29, 3V30, 3V31	T-UP CLUTCH	PU51980	200p	
3V29, 3V36, 3V38	REEL IDLER	PU55374	200p	
3V29, 3V45, 8943, 8944				
3V29, 3V36, 3V38	T-UP CLUTCH	PU55373	150p	
3V38, 3V49, 8943, 8944				
3V58, 3V69, 3V84	IDLER ARM	PU58845	£2.25	
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FV42, FV43, FV45	CLUTCH ASSY	PU56043-1-4	240p	
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FV42, FV43, FV44	SUPPORT CLUTCH			
FV45, FV48, FV53, FV54, FV55, FV56, FV57, 8947, 8948	T-UP CLUTCH			
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8912, 8922				
3V00, 3V01, 3V16	REW IDLER	PU46380	500p	
3282, 8900, 8901, 8904, 8906				
3V16, 3V22, 8902	IDLER	PU49281	£1.70	
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FVHP840, 905, FVHP906, 910, 911, FVHP915, 916, 918				
FVHP615, 618, 620	GEAR IDLER ASSY	R1430490400900	380p	
FVHP622, 710, 711, FVHP720, 721, 722				
FVHP725, 730, 830, FVHP840				
FVHP615, 618, 620	REEL T-UP ASSY	R1430410040900	£5.50	
FVHP662, 710, 711, FVHP720, 721, 722				
FVHP725, 730, 830, FVHP840				
FVHP906, 909, 908	GEAR IDLER ASSY	R1430490402400	275p	
FVHP910, 911, 915, FVHP916, 918				
FVHP975, 980, 990	IDLER	R1430420400700	300p	
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FVHP5050, 5075, 5100				
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FVHP75, 800, 990	CLUTCH	14230510404200	£9.50	
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VCS3500	IDLER		250p	
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GHV8200, 8210, 8215, GHVPS1, VCP4100, 4130				
GHV1221, 1232, 1240	IDLER		110p	
GHV1241, 1242, 1243, GHV1244, 1245, 1246, GHV1247, 1248, 8000				
GHV8200, 8210, 8215, GHVPS1, VCP4100, 4130				
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VOX2	IDLER		110p	
VOX4, VXL35	IDLER		£2.75	
VOX4, VXL35	CLUTCH		£6.50	
VOX4, VXL12, VXL26	LIMITER POST		£1.80	
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VT300-5700				
VT300-3000, 7000	FF-REW PULLEY	6383531	80p	
VT300-5700				
VT300-5700, 8500	FF-REW IDLER	6881471	250p	
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VT300-5600, 8500	PLAY IDLER	6861482	230p	
VT300-9000, 9700				
VT300				
VT300-9500, 9700	IDLER	681805	230p	
VT300-500, 680, 6800	IDLER	687043	£3.80	
VT300-33, VT63-64	FF-REW IDLER	6886971	125p	
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65, 96, 88, 330, 640				
VT300, 113, 115, 113	FF-REW ARM	6886792	240p	
VT15, 17, 19, 34, VT35, 38, 39, 52, 61, 62				
65, 96, 88, 330, 640				
VT300, 113, 115, 113	FF-REW	68970504	£1.30	
VT15, 17, 19, 34, VT35, 38, 39, 52, 61, 62				
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VT300, 113, 115, 113	FF-REW	68970504	£1.30	
VT15, 17, 19, 34, VT35, 38, 39, 52, 61, 62				
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VT300, 113, 115, 113	FF-REW	68970504	£1.30	
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VT438, 450, 458, 510, 518, 520, 526, 528, 530, 535			
VT538, 540, 545, 548, 548, 548, 570, 575, 576, 580, 585			
VT688, VTM625, 626, 630, 635, 638, 640, 645, 646, VTS80, 85			
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VT3000	REW IDLER	£6.00	
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HR7655, 7300, 7380, 7610	T-UP IDLER	PU51402A	100p
HR7200, 7300, 7350	REEL IDLER	PU48967	175p
HR7800, 7610, 7650, 7655, 7700	ROLLER ASSY	PU49042A	350p
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HR7655, 7700			
HR3300, 3680, 4100	T-UP IDLER LRG	PU47752	£4.60
HR7200, 7600, 7650			
HR7655, HRD110, HRD111, HR7300, 7350, 7610, HRD120-121, 225			
HRD110, HRD120-121, T-UP CLUTCH		PU55373	150p
HRD225, HRD111			
HRD110, HRD120-121, IDLER ARM		PU55374-3-8	200p
HRD225, HRD111			
HRD170, 180, 210, 230	IDLER ARM	PU58485	£2.25
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HR55000, HR55500			
HRD455, HRD725	CLUTCH MECH	PU558822	1200p
HRD140, 150, 167, 158	CLUTCH MECH	PU57658	1050p
HRD180, 250, 257, 565, 566, 755, HRP60	REW IDLER	PU46380	500p
HR1300, HR3300			
HR860, HR420			
HRD140, 150, 157, 158	TAKE UP CLUTCH	PU56043-1-4	240p
HRD160, 250, 257, 455, 565, 566, 725, 755, HRP50			
HRD140, 150, 157, 158	TAKE UP CLUTCH	PU56044-1-5	160p
HRD160, 250, 257, 455, 565, 566, 725, 755, HRP50			
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VX730, 735, 750, 755	LIMITED POST LEVER ASSY		£1.30
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VX800A, VX820	REEL UNIT CLUTCH		280p
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HS347, 349, 412	IDLER	522902002	£3.00
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HS200	UNLOADING IDLER		£4.00
HS200	REWIND IDLER		£8.00
HS306, 307, 318, 319	SUPPLY REEL	522A00101	£3.20
HS400, 410, 710	DISK		£3.00
HS320	REEL DISK	522C06301	£6.00
HS337, 338, 411, 421	REEL DISK	522P006	

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## Satellite PSU Repair Kits

Experience shows that 50% of all receiver power supplies 'bounce' unless the correct precautionary measures are taken when being serviced. A kit of all the recommended parts is supplied for the 4 most popular models, which when fitted should overcome this.

MAKE & MODEL	ORDER CODE	PRICE
PACE PRD800, PRD900	SATPSU1	850p
PACE SS9000, 9200, 9010, 9020, 9220	SATPSU2	850p
AMSTRAD SRD610, SRD620	SATPSU3	850p
AMSTRAD SRD500	SATPSU4	850p



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### POWER SUPPLY REGULATOR

### ALBA CTV10 TRAVELLER

### NIKKAI BABY 10

ORDER CODE: BABY 10

PRICE: 1200p + VAT

## Audio Control Head

AMSTRAD ORIGINAL NO: 150751

Used on: AMSTRAD TVR1, 2, 3, VCR4600, 4600MKII, 4700, FUNAJ V52, VCR4600, 4800, 5200, 5600, 6600, VIP3000, 5000  
Also fits: FIDELITY, FUNAJ, HINARI, PROLINE, SCHNEIDER, TOWADA, UNIVERSUM ORDER CODE: AH01 PRICE: 1350p

AMSTRAD ORIGINAL NO: 153134

Used on: AMSTRAD DD8900, 8904, VCR2000, 6000, 6100, 8600, 8602, 8603, VCR8604, 8700, 8704, 8714, 8800, 9005, 8244  
Also fits: ANTECH, BONDSTEC, CASIO, CROWN, FIDELITY, GOLDHAND, GRANADA, HINARI, MARQUANT, OMEGA, PROFEX, SCHNEIDER, SEG, SENTRA, SHINTOM, TASHIKO, TATUNG, TOWADA, UNIVERSUM ORDER CODE: AH02 PRICE: 1450p

## Replacement Audio Control Video Sound Head for National Panasonic

PART NUMBER	MODELS	PRICE
VBR0091	NV67 etc	875p
VBR0050	NV300, NV340 etc	875p
VBR0061	NV777 etc	875p
VBR0103A	NV250, NV450 etc	825p
VBR0125		625p

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- Original remote not required

Order Code: 8 WAY PRICE: 1450p + VAT

## Replacement Video Cassette Housings

NAME	MODELS	CODE	PRICE
AKAI	V535, V553, V555, V556, V575	CH18	3200p
GRANADA	VHS0P1	CH05	1700p
	VHSYJ2	CH01	2800p
GOLDSTAR	GHV1290P, 1291P, 1295P, 9400, 73401, GSE1295P, GSE1851P, 20001Q, 20051Q VCP4200, 4300, 4301, 4305, VCP4306, 4311, 4315, 4316, 4320, 4321, 4325	CH25	2000p
	GHV51, 1221, 1232, 1240, 1241, 1242, 1244, 1246, 1248, GHV8000, 8200	CH26	2900p
FERGUSON & J.V.C.	3V38, 3V39, 8943, 8944, 8951, 3V35, 3V36, 3V49, HRD 110, 111, 120, 121, 225 3V42, 3V43, 3V44, 3V45, 3V48, 3V53, 3V54, 3V55, 3V57, 8945, 8947, 8948, HRD 140, 141, 150, 157, 158, 180, 250, HRD257, 455, 565, 566, 725, 755	CH01	2800p
	8948, 8950, FV10B, 12L, 13H, 14T, 20B, 21R, 22L, 26, 395, HRD230, 430, 530	CH02	2800p
	3V58, 3V59, 3V64, 3V65, FV11R, 8950, 8951, HRD170, HRD180, HRD370	CH03	2800p
	FV31R	CH19	4300p
	HRD515, 520, 527, 540, 550, 580, 600, 610, 620, 660, 670, HRD830, 840, 850, 860, 4050, 6600, FV37H	CH20	2200p
	HRD540, 580, 830, 860, 910, 960, HRD970, HRDX20, FERGUSON FV57H	CH27	2400p
I.T.T.	VR3605, VR3905	CH01	2800p
	VR3916, 3926, 3946, 3948, 3976, 3986, 3995, 3997, 6948	CH02	2800p
	VR2916, 2926, 2946, 2948, 2976, 2986, 2995, 3997, 6948	CH02	2800p
NATIONAL PANASONIC	NV730	CH01	4300p
N.E.C.	N830EG, N831EG, N831EG, N832, N833EG N895	CH01	2800p
		CH02	2800p
PHILIPS	CASSETTE LIFT ASSEMBLY (69120088) DV186, 190, 286, 471, 562, 761, VR6180, 6182, 6185, 6285, VR6290, 6291, 6293, 6362, 6367, 6393, 6467, 6468, 6470, VR6561, 6670, 6760, 6761, 6870, 6970	CH05	1100p
	VR6443	CH22	2900p
	VR6448	CH23	2500p
	495B6	CH24	2500p
SHARP	VCA100, VCH851, VCH852	CH22	2900p
	VCA103, 103GV, 106, 106GYM, 254GYM	CH23	2500p
	VCS211, 244, 5055, 605, VCB230, VCD806G, 810G, VCT212, 310, 410G, 610	CH24	2500p
TELEFUNKEN	VR2970	CH02	2800p
THOMSON	V320, 321, 323, 326, 4200, 4300	CH01	2800p
	V342, 343, 352, 353, 360, 364, 368, 4210, 4230, 4260, 4400, V5500, 6000, 8540	CH02	2800p
TOSHIBA	V55, V57	CH01	2800p

## Service Aids

DESCRIPTION	VOLUME	CODE	PRICE
VIDEO HEAD CLEANER	75ML	SP01	160p
SWITCH CLEANER	178ML	SP02	170p
SILICONE GREASE	200ML	SP03	210p
FREEZE IT	176ML	SP04	310p
FREEZE IT	400ML	SP16	600p
FOAM CLEANER	400ML	SP05	180p
ANTI-STATIC	150ML	SP06	190p
AEROKLEANE	135ML	SP07	220p
AERO DUSTER	150ML	SP08	310p
AERO OUSTER	400ML	SP17	550p
PLASTIC SEAL	200ML	SP09	250p
GLASS CLEANER	250ML	SP10	160p
COLDKLENE	250ML	SP13	230p
EXCEL POLISH 80	250ML	SP18	150p
ADHESIVE 120	400ML	SP19	190p
LABEL REMOVER 130	200ML	SP20	240p
REFURB 140	400ML	SP21	240p
TUBE SILICON GREASE	50 GRAMMES	SP11	210p
TUBE SILICON SEALANT WHITE	75ML	SP22	280p
TUBE SILICON SEALANT CLEAR	75ML	SP23	280p
TUBE HEAT SINK COMPOUND	25 GRAMMES	SP12	150p
DRIVE CLEANER	200ML	SP24	150p
SCREEN CLEANER	200ML	SP25	150p
COMPUTER CARE KIT	-	SP26	2100p

All the above items are manufactured by Servisol

If you purchase more than one Servisol Product, postage & package will be charged as follows:

300p for 5 cans 450p for more than 5 cans

## CD Pick Ups

SONY OPTICAL PICK UP

PART NO: KSS210A SONY CDPC 301M, CDPC 305M 2200p  
Fits most Sony, Akai & J.V.C. Portable Hi-Fi and Midi Systems

PART NO: KSS210B

USED ON MODELS:  
CFD100, 105L, 120, 300, 440, 454, 455, 50, 500, 55, 58, 60  
CFD68, 750, 755, 760, 765, 770, 775, 440S, W100, 100S 2200p

## Cassette DC Motors

MOTOR TYPE	PRICE
6V MOTOR	170p
9V MOTOR	170p
12V CW MOTOR	170p
12V CCW MOTOR	170p
13.2 CCW MOTOR	280p

## Cassette Tape Heads

HEAD TYPE	PRICE
MONO HEAD	90p
STEREO HEAD	110p
MINI HEAD	150p
AUTO REVERSE HEAD	200p

## Soldering Accessories

DESCRIPTION	CODE	PRICE
ANTEX SOLDERING IRONS		
25 WATT 240 VAC (XS25W 240V)	S101	900p
15 WATT 240 VAC (XS15W 240V)	S102	900p
25 WATT SPARE ELEMENT	S103	450p
15 WATT SPARE ELEMENT	S104	450p
SOLDERING STAND & SPONGES		
SOLDERING STAND (MADE BY ANTEX)	S108	350p
SPARE SPONGE	S109	55p
SOLDER		
18 SWG 500 GRAMMES	S110	500p
20 SWG 500 GRAMMES	S111	650p
22 SWG 500 GRAMMES	S112	700p
DESOLDERING AIDS		
SOLDER MOP STANDARD GAUGE 1.2MM X 1.5M	S107	80p
SOLDER MOP 1.2MM X 10M	S113	400p
DESOLDERING PUMP	S105	320p
SPARE NOZZLE	S106	60p

## GRANDATA LTD

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Fax: 0181-903 6126

# REMOTE CONTROLS

Description	Order Code	Price	Description	Order Code	Price
GRUNDIG			PHILIPS (continued)		
TP160E	RC 107	900p	RC38	RC 301	750p
TP200, TP300	RC 380	750p	KT3 TEXT	RC 5301	750p
TP400	RC 401	675p	RC5352	RC 5352	750p
TP590-600	RC 600	750p	RC5375	RC 5375	750p
TP390, TP610	RC 610	750p	RC5 STANDARD	RC 5534	850p
TP621	RC 621	800p	RC5901	RC 5901	850p
TP630, TP650	RC 650	750p	RC5903	RC 5903	700p
TP660	RC 660	750p			
TP661	RC 661	750p	SABA		
HITACHI			T6772	RC149	900p
CLE800-CLE830	RC 140M	700p	TC319-320	RC 328	800p
A617402/655602	RC 192	800p	TC356	RC 356	800p
A512120/230	RC 900	750p	TC358	RC358	800p
A514790	RC 901	750p	TC360	RC 360	750p
A5088470	RC 902	800p	TC365	RC 365	750p
A518612	RC 903	750p	SALORA		
SCL002	RC 904	750p	SERIES L	RC 190	750p
C2096	RC 905	800p	86173	RC 882	750p
A511940	RC 906	750p	SANYO		
655602H	RC 907	800p	RC218, RC222, RC228, RC238	RC 140M	700p
ITT			JXGE	RC 878	800p
IFB13, 14, 15	RC 143	800p	JXDE	RC 884	750p
FS4	RC 148	750p	VHR2300	RC 890	750p
RG305	RC 305	675p	RC628	RC 865	900p
RG306	RC 306	750p	SHARP		
FS9/1-10/1	RC 307	750p	G0121CESA, 123CESA, 204, 251	RC 140M	850p
VS5 RUK	RC 308	750p	SIEMENS		
VS4-1	RC 310	750p	FC616	RC 130	850p
MULTICONTROL (17C20)	RC 311	750p	FC631	RC 132	750p
KORTING			FC742	RC 164	750p
18279, 18396, 18460, 18521 SE	RC 108	750p	SONY		
40540 VTS	RC 108	750p	RM604, RM605, RM606	RC 140	700p
LOEWE			32 CHANNEL	RC 140M	700p
DC11	RC 146	800p	RM613	RC 141	750p
MATSUI			RM632, RM636	RC 160	675p
010270601	RC 889	750p	TATUNG		
VX770	RC 892	750p	FXA	RC 877	750p
METZ			RC70	RC 883	750p
JAVA COLOR (6890)	RC 166	800p	FX70 FASTTEXT	RC 894	750p
COLOR (7156)	RC 183	800p	TELEFUNKEN		
JAVA (7180)	RC 184	800p	FB632	RC 632 ST	750p
MITSUBISHI			FB 639	RC 639 ST	750p
939P/03607, 939P/03609	RC 140M	850p	THORN/FERGUSON		
NOKIA			3V35-42	RC 342	650p
SATELLITE	RC 550	750p	3V31-32	RC 344	750p
NORDMENDE			3V57-58	RC 628	750p
TC2336	RC 351N	750p	TX10 TEXT	RC 732	575p
CMC1, TC3519	RC 356	800p	TX10 STEREO TEXT	RC 738	575p
OCEANIC			TX9-90-100	RC 740	675p
390C9500	RC 339	750p	3V55, FV11	RC 783	750p
ORION			TX100 FASTTEXT	RC 785	650p
RC53	RC 892	750p	TX100 STEREO FASTTEXT	RC 789	650p
PANASONIC			PROFESSIONAL	RC 790	650p
EUR51200	RC 200	800p	TOSHIBA		
TC2200	RC 201	850p	CT937	RC 950	750p
VSQ0357/NV730	RC 202	750p	CT9117	RC 951	750p
TN01621	RC 203	750p	201R4B	RC 952	750p
PHILCO					
CARVEL, CONCORDE,	RC 108	750p			
TELESTAR					
TC10	RC 152	900p			
PHILIPS					
RC5002,5154	RC 134	750p			
KT3 NON TEXT	RC 135	750p			
69117032	RC 178	800p			
69117194	RC 180	750p			
RC5991-UNIV	RC 300	580p			

## VCR ALIGNMENT KIT

CONTAINS:

- SET OF 7 HEAD & TAPE PATH ALIGNERS
- RCA TYPE AUDIO & CONTROL HEAD POSITIONING TOOL
- RCA ADJUSTMENT TOOL FOR TAPE GUIDE POSTS
- RCA TYPE BACK TENSION TOOL
- TENSION ADJUSTMENT TOOL FOR VARIOUS USES
- VCR ADJUSTMENT TOOL

3 Reversible Screwdrivers  
Spring Hook

Allen Keys  
0.77mm  
0.95mm  
1.27mm  
1.50mm  
1.80mm  
2.00mm  
2.40mm  
3.00mm

Circlip Pliers  
Micro Screwdriver

VCR Head Extractor

Order Code: TOOL10 Price: 2900p

## FUSES

Value	TIME LAG (20mm)		QUICK BLOW (20mm)	
	Order Code	Price	Order Code	Price
160mA	FUSE 01	75p	FUSE 17	60p
250mA	FUSE 02	75p	FUSE 18	60p
315mA	FUSE 03	75p	FUSE 19	60p
400mA	FUSE 04	75p	FUSE 20	60p
500mA	FUSE 05	75p	FUSE 21	60p
630mA	FUSE 06	75p	FUSE 22	60p
800mA	FUSE 07	60p	FUSE 23	60p
1A	FUSE 08	60p	FUSE 24	60p
1.25A	FUSE 09	60p	FUSE 25	60p
1.6A	FUSE 10	60p	FUSE 26	60p
2A	FUSE 11	50p	FUSE 27	60p
2.5A	FUSE 12	50p	FUSE 28	60p
3.15A	FUSE 13	55p	FUSE 29	50p
4A	FUSE 14	55p	FUSE 30	50p
5A	FUSE 15	60p	FUSE 31	50p
6.3A	FUSE 16	60p	FUSE 32	50p

## FUSES

CURRENT RATING	ORDER CODE	PRICE
CERAMIC PLUG TOP		
3A	FUSE 33	100p
5A	FUSE 34	100p
13A	FUSE 35	100p
20mm CERAMIC TIME LAG		
3.15A	FUSE 41	100p
4A	FUSE 42	100p
5A	FUSE 43	100p
6.3A	FUSE 38	100p
8A	FUSE 39	100p
10A	FUSE 40	100p
32mm CERAMIC SLOW BLOW		
8A	FUSE 44	210p
10A	FUSE 45	210p
15A	FUSE 46	210p
20A	FUSE 47	210p
38mm CERAMIC SLOW BLOW		
10A	FUSE 48	875p

ALL THE ABOVE PRICES ARE FOR PACKS OF 10 FUSES

## I.C. PROTECTOR

ICPF10 ICPF38 ICPN10 ICPN38

ICPF15 ICPF50 ICPN15 ICPN50

ICPF20 ICPF75 ICPN20 ICPN75

ICPF25 ICPN5 ICPN25

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# Satellite workshop

As I was driving away from the supermarket I was aroused by a call on my mobile telephone. A local electronics design company had a gentleman in reception: he wanted his Pace MSS1000 satellite receiver mending. Could I come immediately? As luck would have it, I was less than three minutes away – and the customer was quite impressed when I told him that his receiver would be ready for collection that afternoon.

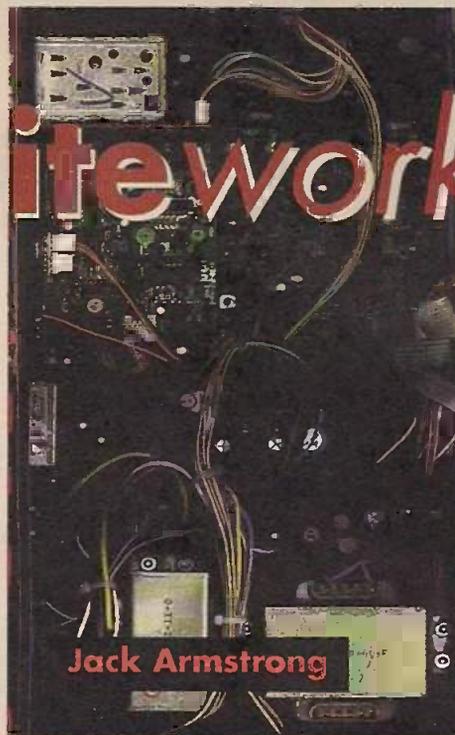
He thought that the intermittent audio was being caused by his scart lead, which was “only a metre long”. It had been stretched tight, and the scart socket was badly marked and distorted.

Back at the workshop I discovered that the real culprit was the MSP3400 audio processor ship U18. This has about a zillion legs, spaced close together, and is time consuming to remove. If you use solder braid, be careful to avoid touching the adjacent surface-mounted components – I’ve seen one attempted repair where the dealer had unwittingly drained the solder away from these.

Once I’d replaced the audio processor chip I fitted a double scart socket from a scrap MSS1000 and tested the unit. As there were no problems I reassembled the unit and gave the owner a call.

## The Grundig GRD150

A nice lady brought me her Grundig GRD150 receiver for repair. The



audio had never been very good, but when her son connected it to the stereo hi-fi stack there was a very noticeable sibilance. A number of upgrades have been issued by Grundig, one of which covers this very problem. The items to check/replace are as follows:

- (1) Replace C28 with a 470µF, 16V type if this value is not already fitted.
- (2) Change C24 and C32 to 0.1µF.
- (3) Add 12pF capacitors in parallel with R41 and R42.
- (4) If L4 and L7 are not 4.7µH, change R40 and R43 to 47kΩ, change R44 and R117 to 680kΩ and change C23 and C25 to 22pF.

It took some time to locate the surface-mounted components around the ASIC chip IC1, so I decided to make a layout picture (see Fig. 1) which will be useful for future reference. There’s not a great deal of work involved, but it does make life easier if you have to hand the surface-mounted components required and diagram before you start.

The customer was delighted with the result and phoned me the following day to say so. It made a pleasant change from the usual grumbles.

## Norwegians Would

So you don’t have to shout at foreigners to make yourself understood! A Scandinavian neighbour came to my workshop to seek advice

about his Pace MSS1000. This was no ordinary receiver: it was the D2MAC version, and I knew that the customer had his dish aimed firmly at 1°W.

“What seems to be the problem?” I shouted, twice.

He explained, in perfect English, that the unit was self-censoring. Whenever a naughty programme began the picture would, apart from a one inch border, be blotted out by a checkerboard pattern. To watch the programme he had to select the menu. That way he missed only the action in the centre of the screen.

I told him to leave the unit with me so that I could test it that night. I had to force myself to stay awake, and it took me some time before I traced the cause of his problem to the fact that when you select Norwegian subtitles the naughty programmes are automatically blanked out. With any other language selected for the subtitles the picture remains clear. I’ve seen this with other D2MAC decoders, so it was no surprise. It probably explains why the Norwegians speak such good English – they learn it from the subtitles.

Since the customer left his official smart card with me, I decided that I had better keep the receiver for at least a week’s soak test – just to be sure that the fault had been cleared, you understand.

## A Grundig GRD200

The postman delivered a Grundig GRD200 for repair. It failed to show any decoder messages. Naturally I dived into the decoder board, and it was only after I’d replaced every

Fig. 1: Positions of the surface-mounted components, on the underside of the board, involved in the audio improvement modification to the Grundig GRD150. See also Fig. 2.

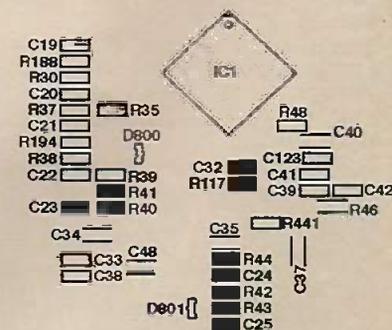
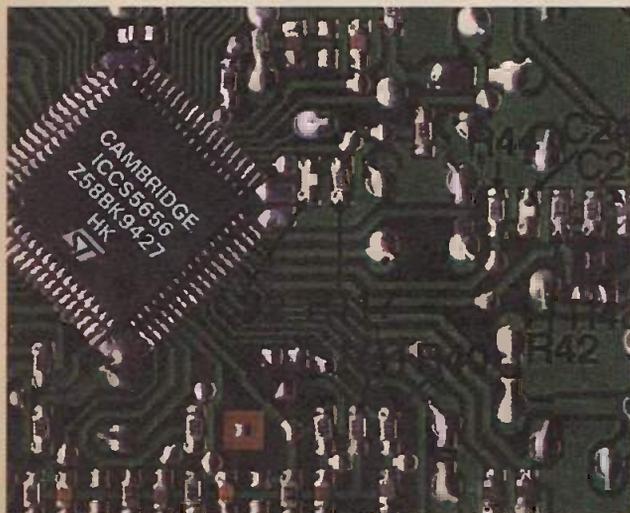


Fig. 2: Drawing to help with component location, Grundig GRD150.

PTV chip that I realised I hadn't checked the input and output signals.

My scope soon showed that the signal wasn't being routed through the decoder at all. The cause of the fault was the horrible 'gull-wing' ASIC chip beneath the board. This surface-mounted device is a pain to remove without the correct (expensive) equipment.

A replacement chip was ordered from the only Grundig stockist. As they held no stock, it had to be obtained from Germany (I had to find this out for myself).

Meanwhile the customer was going doolally and telephoning me every other day.

When it did eventually arrive it was packed in an ordinary polythene bag with no antistatic protection whatever. My views about this are unprintable! Fortunately the receiver worked perfectly once I'd soldered the new chip in place – but whose fault will it be if the chip fails in a few weeks' time?

Although I've had several receivers in this series for repair, they are highly reliable – the failure rate is less than half a per

cent. I've confirmed this figure with other dealers. It compares favourably with the ten per cent rate of other makes.

#### FilmNet Decoder

The postman looked quite pleased as he dropped an enormous box on my counter. "Been doin' some weightlifting" he grinned. In fact the parcel was as light as a feather. It contained only a Philips FilmNet decoder, in a sea of polystyrene foam chips. I remembered telling the customer to pack it well – he'd done an excellent job. Some distributors originally shipped these units in a cardboard box with no packing whatsoever. I've seen several whose main board had snapped in two.

The complaint was of "speckly pictures". When I hooked up my trusty Pace SS9200 test receiver the pictures were very blotchy indeed. After replacing the usual socketed ICs without success, I traced the cause of the problem to the VCU2133 chip.

The picture was also reluctant to lock in place. It would scroll leftwards for half a minute before stabilising. This was easily cured

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

[jackarm@netcentral.co.uk](mailto:jackarm@netcentral.co.uk)

One model per message – state make/model and fault symptoms. If you have no e-mail facilities you can write to him c/o Television, Room L302, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS. Please enclose two stamped envelopes.

by entering the service mode, punching in "1 5 0" and using the handset to alter the VCO setting until picture movement stopped. The Philips handsets are not cheap, but mine has paid for itself several times over. The English language User Manual from SatCure (01270 753 311) is also quite useful: it includes all the service mode codes. ■

## Test Case 407

Cathode Ray had been having a good time in the workshop – until the Hitachi C2118 (G7PS Mk 2 chassis) came back! He'd repaired it three weeks previously, charging Mr Robinson a handsome sum for replacing the overvoltage protection diode ZD903, a 130V zener type. This item had gone short-circuit, stopping the set's operation in no uncertain manner. Now here it was back again, with a rude note from the shop saying, in effect, "bounced repair, no go".

Ray took off the back cover, slid out the chassis and went straight to ZD903. Sure enough his replacement had gone short-circuit, and once again a new one restored the sound and picture. So why had two diodes failed? In the normal course of events, Ray would have turned to his good friends Sage and Television Ted for advice. But Ted was off sick and Sage, tiring of rainy Wales, had jetted off to Corfu. At that moment he was downing red wine in a Sidari bar. It beats mending TVs and VCRs!

Instead, Ray rang up Warner Rogers, the lecturer at our local tech, who after all had got him through City and Guilds 272. "What would make a 130V zener diode fail?" he asked.

"There's no such thing as a 130V zener diode" boomed Warner, "check your voltages." Not very helpful!

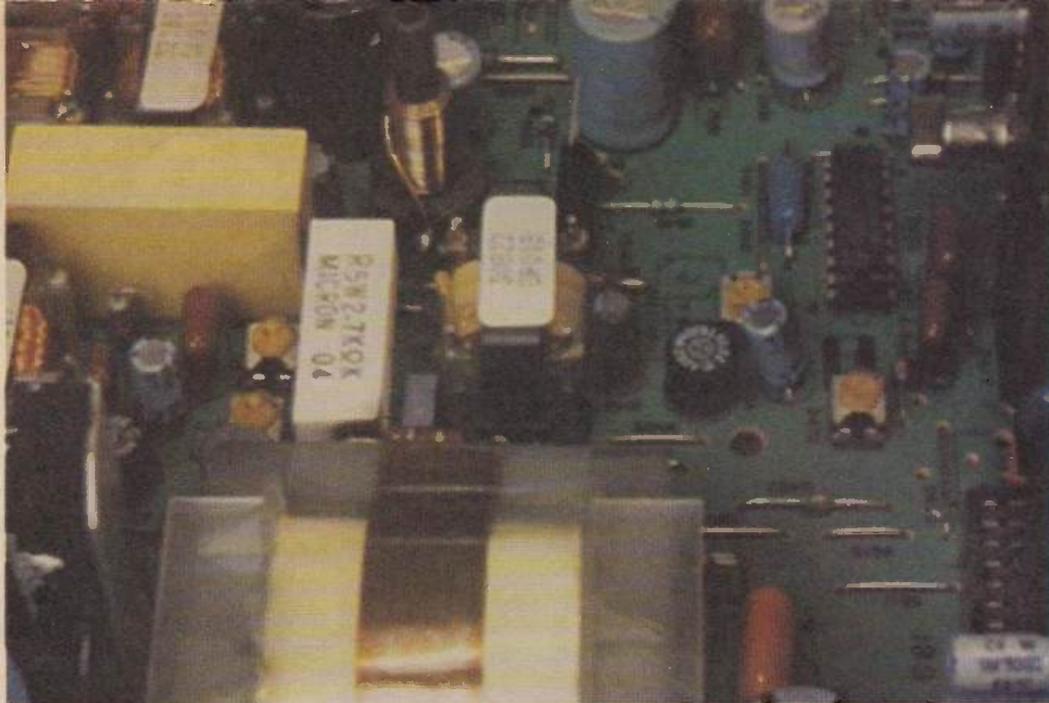
Well, the set was still working, with the BBC-1 afternoon programme on view. Why not give it a soak test and see what happened? But it was a pity that Ray didn't tune in some sort of test card or pattern display – this may have given him a clue. Towards the end of the day a clue presented itself anyway: the set tripped and cut out. When it was switched off and on again however the set perked up and continued to work. As it seemed likely that the troublesome zener diode was about to be splatted

once more, Ray decided to carry out some tests in the power supply.

He hooked a voltmeter to the HT rail and obtained a reading of 121V across the 100µF smoothing capacitor C720, which is in parallel with ZD903. Had he checked the picture size, he may have realised at an earlier stage that the HT voltage was too high. He should perhaps have done so three weeks before, when the original 'repair' had been carried out. Anyway, he found the HT preset VR901, and wound it down until the HT voltage reading was 114V, at which point VR901 ran out of travel – it was at minimum.

Now this was one circuit that Ray well understood. The error amplifier transistor's collector current depends on the feedback at its base, tapped from the slider of VR901, and the voltage at its emitter, which is set by the 6.8V zener diode ZD902. He replaced ZD902, and the transistor (Q905) for good measure. Now, with VR901 at minimum, he could get the correct HT voltage reading of 112V. He reassembled the set, but was dismayed to see that the picture size still fluctuated somewhat. For the next couple of days however the set neither tripped nor blew up its overvoltage protection diode.

Later in the week Television Ted returned. He wanted to know all that had happened in his absence. Told about the Hitachi set, he demanded to see the picture, then tuned in a test pattern. The picture size variations told their own story. Once more the back came off – the set hadn't been properly repaired, and the root cause of the problem was still there. What was it? And what did college mentor Warner Rogers mean about there being no such thing as a 130V zener diode? Ray had one in his hand, didn't he? For the solution, turn to page 52.



# The Philips G110

## Revisited

**Richard Newman** provides a service update on the chassis he wrote about in the December 1995 issue

I have come across several faults of interest to service engineers since covering this chassis in December 1995. Naturally most of the problems have related to the power supply, so we'll take this first.

### The Power Supply

Normally these sets come to life and operate correctly when the recommended Philips service kit has been fitted (part no. 4822 310 20489). But there are always exceptions.

A recent power supply rebuild failed to resolve the problem. I must admit that I had my suspicions from the start with this particular set. The BUT18AF chopper transistor had a hole blown through it, which is something I'd never seen before. After fitting the kit and doing the usual tests, I found that the set flatly refused to start. As the cause of the fault was definitely on the primary side of the power supply, I made some careful checks in this area. This revealed that R3615 (220Ω) and R3616 (100Ω) were both open-circuit. So it was not surprising that the set wouldn't start, since they are both associated with the chopper switch-off transistors T7615/T7616. Once they had been replaced the power supply started up and all was well.

When carrying out a basic rebuild, be careful of diode D6653. I've found that this is sometimes incorrectly marked on the PCB. Its cathode should point towards transistor T7652.

Sometimes, even after a rebuild, the power supply will fail instantly when the set is put into the standby mode. This is normally because coil L5619 (3.9μH), which is connected series with the base of the chopper

transistor, has gone open-circuit. I found out about this the hard way, and now always replace L5619 as part of a normal rebuild, together with the 10Ω resistor in parallel with it (R3619).

### Extra Kit

Philips now produces an extra kit, ES7059 (part no. 4822 310 10708), which includes this choke and fourteen other parts. It's supposed to be used with 'rogue' sets, in conjunction with the main kit (SBC7020, part no. 4822 310 20489). I keep a couple in stock, but have not had to use them so far.

With this extra kit, it seems that ninety per cent of all known faults in the G110 chassis can be cured. But there is one thing you have to be careful about with this kit. Don't take too much notice of the component part numbers printed on the fitting instructions that come with it. They seem to have been changed at some point. Fortunately the zener diodes have their type and rating printed on the relevant packaging and the transistors are marked with the correct code.

### Other Faults

I had a real nasty one some time back. With a high-brightness scene the width would come in by as much as one and a half inches. Since the HT was correct and rock stable, the cause of the fault was obviously in the EW correction circuit. Checks showed that the voltage at the emitter of the 2SA1359 diode modulator driver transistor T7533 was bobbing up and down in sympathy with the width variations. More by accident than logical testing I found, after much checking around, that C2526

(8.2nF) was leaky – the test reading was several k $\Omega$ . A new chip capacitor restored normal width. I've had this fault again since that first episode. It's also worth checking the width control, which can go open-circuit. The result is a wide, uncontrollable picture.

The report with one set that came to me said the picture had suddenly shifted to one side, after which there had been a loud pop and a puff of smoke. At that point the owner had wisely switched off. On investigation I found the remains of C2594, while C2593 was badly swollen. These two 10 $\mu$ F, 25V electrolytics are in the line shift balance circuit. The two transistors in this circuit, T7593 (BC858) and T7594 (BC848), were both leaky. Presumably the capacitors didn't like the excess voltage and line pulses to which they had been subjected. Normal operation was restored on replacing these items.

### Control Faults

A TMP47C634N microcontroller chip (IC7720) is used in these sets. Its mask number varies with the software incorporated. If a fault arises in the control system, an F code will be displayed and the LED at the front of the set will blink.

I recently had a set that displayed F2 intermittently. The cause was dry-joints at the Nicam board's edge connector. There's a complete list of the F codes at the back of the service manual. Since F2 relates to the input/output expander chip on the Nicam board, this led me to the dry-joints.

With some faults there will be no display because the set will shut down (go to standby). The LED will blink



however, and its off time can be measured with a scope to help pinpoint the fault area.

### In Conclusion

I hope that these further notes will be of help. Strangely, I am quite an enthusiast of these sets – probably because they presented something of a challenge in the early days. ■

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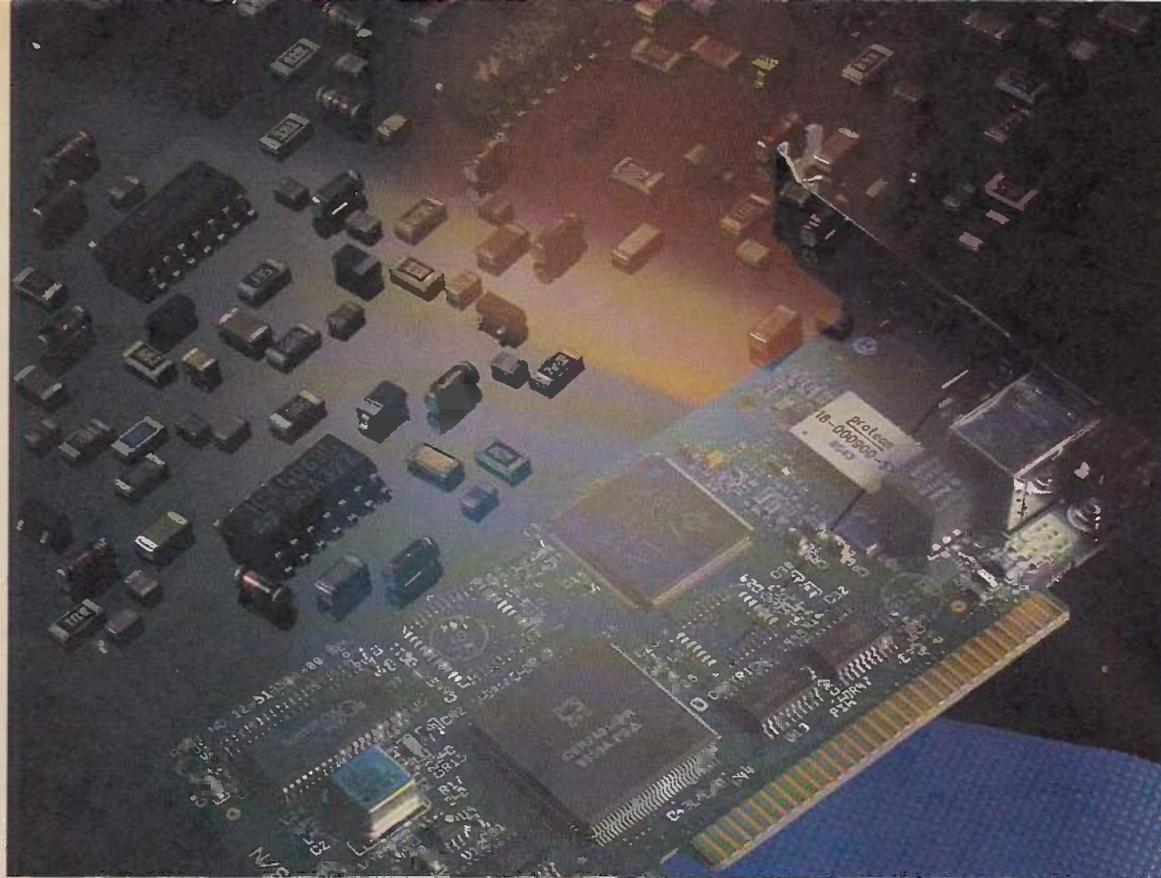
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# Surface-mount *failure* mechanisms

**Martin T. Pickering, B.Eng., on ways of reducing the stresses that can fracture surface-mounted components**

In a previous article (May 1996) I promised to elaborate on stress fracturing of surface-mounted components. The following notes are based on personal experience and on discussions with various manufacturers, including Syfer Technology, AVX and Vitramon. The discussions and tests were carried out some years ago, but the relevant component technology has not altered significantly and the conclusions should remain valid.

As with my previous article, the notes are intended to provoke thought rather than lay down didactic rules. I don't want to impose 'rules' on anybody, but I do want those concerned to have a basic understanding of the problems that can occur and possible solutions.

## Multilayer Ceramic Capacitors

The multilayer ceramic capacitor (MCC) is the component in which stress fracturing principally occurs, though it can also affect resistors. There's a multitude of possible causes. I will deal briefly with a few of them. It's useful to know how MCCs are manufactured, so that their internal structure can be understood.

To my knowledge there are two production methods. With one, successive layers of ceramic paste, alternated with a special film, are laid down to build up a sandwich of these materials. The special film is then vapourised at

high temperature, leaving a ceramic biscuit with empty gaps between the layers. Finally, lead alloy is forced into the gaps at high temperature to form the electrodes.

The second method is to lay down successive layers of ceramic paste, alternated with silver or a silver alloy, then fire the whole thing to bake the ceramic.

In both cases the 'biscuits' must, at some stage, be chopped up to form individual components and metal end terminations added. One end will be connected to the even electrode layers, the other to the odd layers (don't ask me how!). The end terminations are usually deposits of palladium silver. Some manufacturers add a coating of nickel to reduce the possibility of silver being leached away during the soldering process. Fig. 1 illustrates the basic structure of an MCC.

## Mechanical Stress

Surface-mounted resistors and capacitors are very brittle, their structure making them prone to fracture under certain circumstances. One such circumstance is when the component is soldered rigidly to a PCB that can be flexed. When such flexing occurs, any ceramic components that are subjected to a high-tension force will crack, usually pulling off an end termination (see Fig. 2).

Such a failure need not be immediately catastrophic.

The component is held together, and may continue to fulfil its circuit function for many years. In fact problems often arise only when a PCB assembly has been disturbed – perhaps to rectify a different fault – or after a period of high humidity and/or temperature change.

We carried out tests to show the effects of mechanical stress. Two test boards were made up (see Fig. 3) with pairs of tinned copper pads in a row across the centre. Type 1206 ceramic capacitors, with a thickness of less than 0.6mm, were soldered to the pads of one board. Thicker capacitors were soldered to the other one. The resultant assemblies were checked carefully to ensure the integrity of the capacitors.

Each board was then placed in a jig that applied pressure along the board's centre line – directly above the capacitors, which were on the underside. The boards were flexed until cracking noises were heard (at 2.5mm flexure in the centre of a board of 100mm length). The boards were then removed from the jigs and the capacitors were checked. Only small variations in capacitance from the original values were detected – less than ten per cent. Some capacitors showed no electrical change at all.

The boards were then subjected to several temperature varying cycles in a humidity chamber. After being allowed to rest at room temperature for an hour, the capacitors were again checked. More than half of the thinner capacitors showed a massive decrease in capacitance value, and several of the thicker ones did as well. In addition, leakage current was high.

This was a fairly drastic test to prove what was already obvious: bend something that's brittle and it snaps! It's also obvious that a slate snaps more readily than a brick. Less obvious was the fact that there would be no measurable sign of damage until the capacitors had been subjected to temperature/humidity conditioning. The point here is that initial function testing would have shown no board faults, but they could have failed in service.

The tests were taken further. More boards were made, but with narrower solder pads. It was found that if the pad width was reduced to 60 per cent of the width of the capacitor, not fracturing at all occurred! At 75 per cent the cracking was minimal. Thus to eliminate mechanical stress fracturing, all you have to do is to reduce pad widths to two-thirds of the component widths. In fact we found that a pad is not really needed at all: the track width alone is sufficient to ensure a reliable joint. The solder connection then becomes a sort of flexible buttress at each end. In addition to ensuring that mechanical stress is not transferred to the component, this approach minimises solder use and, as an extra bonus, leaves more room for tracks.

Some further experiments were carried out. The components were mounted at angles, so that they did not lie on the axis of the tracks. The solder joints were still good. Even when the solderable ends of the tracks were moved away from each other, so that the components only just touched them, the soldering was still perfect.

So the solder pad does not need to lie beneath the component. It can simply butt up against the end termination. In practice however it's necessary for the pad to extend a little way under the component to allow for placement tolerances.

To summarise, we have the following advantages: solder pads can be smaller, with less solder (which is expensive) required; more room is left for additional tracks around and beneath components; and there is less risk of solder forming unwanted bridges between pads.

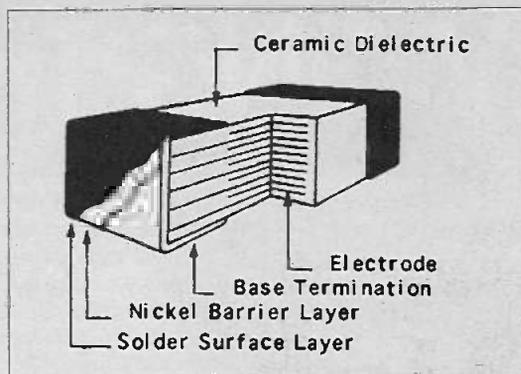


Fig. 1: Basic multilayer ceramic capacitor structure (Syfer Technology Ltd.).

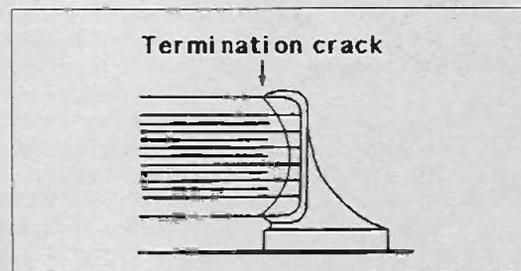


Fig. 2: Damage caused to an MCC end termination by mechanical stress (Syfer Technology Ltd.).

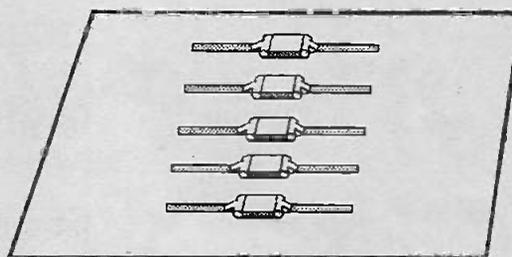


Fig. 3: Sketch of a board set up to test MCC stress conditions.

### Causes of Mechanical Stress

There may be good reasons why you cannot or won't reduce the solder pad width. There is often great resistance to change, especially in large organisations. In many companies the "we've always done it this way" attitude persists. It can take many years to implement the simplest of changes. With this in mind, the thing to do is to avoid subjecting components to stress.

Mechanical stress occurs when a board is flexed. The effect of the stress on components can be reduced by aligning them along the line of greatest flexure instead of across it. It helps if the board size is small. Board flexing can occur in the following circumstances:

- (1) As the board cools after soldering it can change shape. There is little you can do to prevent this, but you can slow it down.
- (2) A board is often flexed when it's fixed in a test jig. Look at the design of the jig.
- (3) Boards are often flexed when they are pressed on to plastic clip pillars or bolted into a housing.
- (4) Flexing occurs when a daughter board is pressed or cropped from a mother board.

### Thermal Stress

The test boards mentioned above were also used to subject the capacitors to thermal shock. Each capacitor was heated with a soldering iron tip, then the board was plunged into cold water. Cracking noises were heard.

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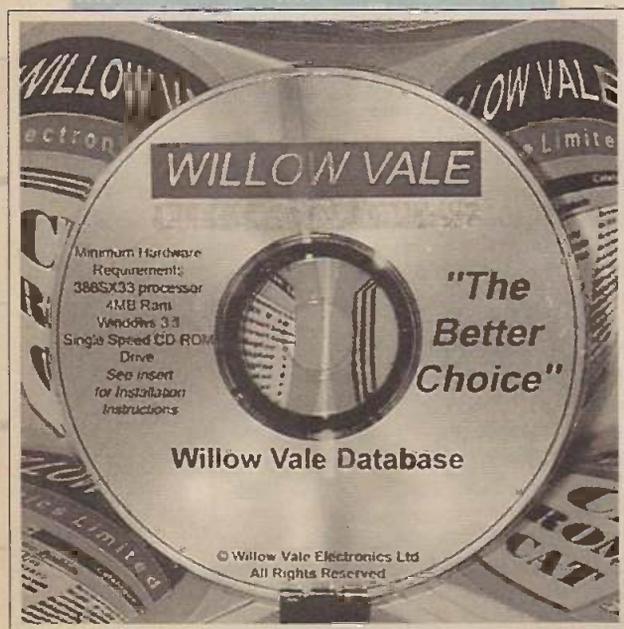
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plunged into cold water. Cracking noises were heard. Once again we were proving the obvious, but it was instructive to discover the failure modes.

This time the thick capacitors cracked while the thin ones didn't. In addition, only the capacitors soldered to wide pads failed. This may have been because of the larger thermal mass of solder, or to the more rigid joint. The cracks could be seen under a microscope. Most of the capacitors that cracked did so at one end termination, the crack propagating diagonally through the body of the capacitor. A few showed a characteristic semicircular wedge crack near the centre. Again the effect of the cracks could be measured only after humidity conditioning.

This test was unrealistically harsh. In practice you don't get this degree of thermal shock. A lesser shock can occur during soldering however, and capacitor failures have been experienced after wave soldering. To prevent this, it's important to heat the board assembly before it reaches the solder wave. The temperature difference between the components and the solder should be minimised (it should preferably be less than 100°C). Many wave-soldering machines cannot achieve this. The damage will be greatest at the outer edges of a PCB, since these are often much cooler than the centre after 'pre-heat'.

Thermocouple measurements on a PCB can and should be carried out to check all soldering machines. The results may well horrify you.

### Crushing Forces

The equipment used to place surface-mounted components on a board can also cause damage.

The suction-tube type presses directly down on the centre of the component. While the placement force can be set for a particular component thickness, if there is debris on the board, or the component is replaced with a thicker type and the equipment is not reprogrammed, the force exerted may be too great.

Other placement machines use jaws, which can crush the component if set incorrectly.

In either case, examination of the component under a microscope will reveal damage that differs from thermal or mechanical stress cracking.

### Inherent Faults

This article has been concerned with faults caused by assembly methods. A tiny percentage of capacitors are faulty when made however. The production problems, using a combination of metal alloys and ceramics, with high-temperature processing, virtually guarantee that there will be a number of faults.

Modern manufacturing methods and screening tests have reduced the number of such faults to minuscule proportions. You can safely leave the manufacturers to worry about them.

### In Conclusion

It would be impossible to cover all aspects of surface-mounted technology design in a short article such as this. I have therefore concentrated on points that are most often overlooked or are perhaps unknown to younger designers.

In my previous article on design reliability I mentioned that a lot of design knowledge and experience fails to be passed on to younger designers. As a result, mistakes continue to be made. Hopefully, through articles such as this one, we can redress the balance - by making designers aware of potential problems before they become production disasters

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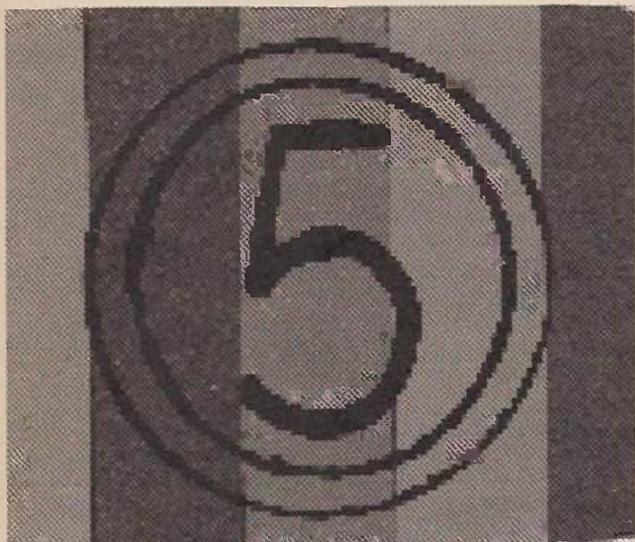
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# Channel 5



## Reception

Reception of Channel 5 will present different problems in different parts of the country. **Bill Wright** surveys the likely situation

**F**or over a quarter of a century a rational, efficient UHF TV channel allocation plan has been in operation in the UK. Four channels, broadcast from co-sited transmitters of identical power, have been available to almost everyone, only a single, small receiving aerial being required. A few channels in the middle of the band were reserved for other purposes: they have come to be convenient for signals generated at the receiving site – by VCRs, satellite receivers and TV games. Three channel groups have between them catered for almost every transmitter, making the business of stocking and selling aerials very simple. Now, with the advent of Channel 5, all this is about to change.

A great deal has been said and published about the technical rights and wrongs of Channel 5, but come January 1st 1997 it could be a reality with which we shall have to deal. There will be an initial period of hoo-ha, when half the country will find that it is suffering from interference of one sort or another. Then we will settle down to a five-channel (or four plus one channel) situation. In this article we will be looking at the techniques that will be required for Channel 5 reception once the VCR etc. interference problems have been dealt with.

### Will Channel 5 make us rich?

Well no, I don't think so. In a large part of the country existing aerials will provide acceptable Channel 5 reception. This will be the situation where the new transmission falls within or adjacent to the channel group already in use, where the polarisation is the same,

where the transmitter power is similar and where the transmitters are co-sited (or at least in the same general direction).

Most aerial manufacturers have modified their Group A and Group B products to include ch. 37, by far the most common one to be used for the new service. A few quick tests have shown that even pre-Channel 5 Group B arrays perform reasonably well on ch. 37. But Group A aerials don't, their response falling off significantly above ch. 34. Incidentally the Nottingham relay will have the new service on ch. 34, which is within the channel group already in use and a continuation of the existing channel sequence (21, 24, 31 and 37). Same transmitter site, ERP, polarisation and channel group – not much extra work there for the aerial riggers of Nottingham!

### Will it make some of us rich?

In many areas the Channel 5 signals are to be transmitted at much lower power than the existing services and on a frequency outside their channel group. So it looks as though a lot of viewers will have to spend money if they want to receive the new service satisfactorily. Or, to put it another way, for zero expenditure many people within the planned service areas will get no more than a very snowy Channel 5 picture.

How much will people be prepared to spend to receive Channel 5? When you consider many customers' astonishing tolerance of poor TV reception, it's likely that many will accept below standard Channel 5 pictures

rather than pay for another aerial. In many cases a Channel 5 installation will require a diplexer and possibly a masthead amplifier, pushing the cost up still further.

Certainly many viewers will wait to see whether the channel is worth having before they pay up. Enthusiasm will no doubt be generated should the new channel turn out to be a commercial success, with attractive programming.

None of this will apply with commercial installations, where the assumption is that good quality reception of all local TV services should be available.

An examination of the transmitter list (see September issue supplement and page 863 last month) will show that different parts of the country are going to have very different reception conditions. For aerial nerds like me, who travel the country peering excitedly at the rooftops, this will be an interesting test of local riggers' ingenuity. I look forward to seeing many a strange configuration atop the nation's chimneys. Later in this article I'll look at the situation that is likely to arise in some parts of the country, taking Sheffield and East Anglia as representative examples. First, let's consider some general problems.

### Multiple use of Ch. 37

The use of ch. 37 by transmitters that are by all previous standards too close together will inevitably result in some co-channel interference. There will be large areas where otherwise good reception will be affected. A particular example will be that part of the country lying between Sheffield and Nottingham, where there will be a strong possibility of mutual interference between the Emley Moor and Lichfield transmitters. It appears that the two signals will be of equal strength at some locations, making usable reception impossible.

One drawback of analogue TV transmission is its great susceptibility to co-channel interference. Even where there is a 40dB differential between two signals, visible interference will be present. Theoretically the front-to-back ratio of the aerial could provide 25dB of rejection, but since the transmitter bearings at Alfreton, Derbyshire for example are 130° rather than 180° apart the practical rejection figure is likely to be much less. A signal that is too weak to produce a picture itself can still cause patterning.

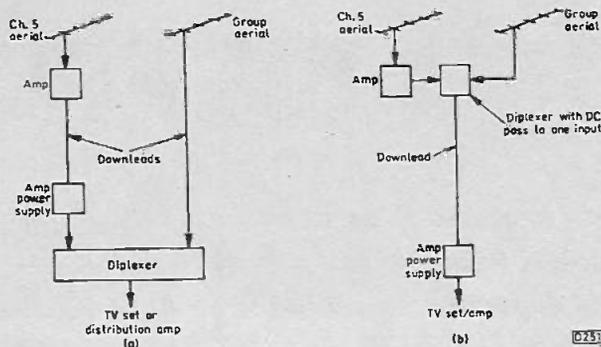
Another area of ch. 37 overlap will be the Isle of Man. As there will be no Channel 5 transmitter on the island, reception will be possible only in northern coastal areas, from the mainland. Unfortunately, any signal from Divis will probably suffer permanent or intermittent interference from Cambret Hill.

We will no doubt have to redeploy anti-ghosting techniques – stacked and phased arrays, and the use of buildings as a screen. But no matter what we do, the effective service area of some transmitters will inevitably be reduced by co-channel interference, which produces close-spaced horizontal lines on the screen. Even when it is slight, this venetian blind effect can be very annoying, especially with a large-sized screen.

The broadcaster will presumably attempt to minimise the problem by the use of frequency offsetting. With offset operation the carrier frequencies are moved from the nominal by either zero, +5/3 or -5/3 of the line frequency. It has been found that these values minimise the visible effect of co-channel interference.

### Transmitters not Co-sited

In a radical departure from previous UHF planning, some of the Channel 5 transmitters will not be co-sited



**Fig. 1: Channel 5 received using a separate aerial with a masthead amplifier. When Channel 5 is well outside the existing channel group, it should be possible to use a diplexer to combine the signals. In the arrangement shown at (a) the diplexer is mounted below the amplifier's power supply. If a diplexer with a DC throughpass to one input is used, as shown at (b), it can be fitted at the masthead, removing the need for a second downlead.**

with the existing TV transmitters for the service area concerned. The service areas affected are:

- Crystal Palace:** Channel 5 from Croydon.
- Divis:** Channel 5 from Black Mountain.
- Pontop Pike:** Channel 5 from Burnhope.
- Ridge Hill:** Channel 5 from Churchdown Hill.
- Rosemarkie:** Channel 5 from Mounteagle.
- Rowridge:** Channel 5 from Fawley.
- Sudbury:** Channel 5 from Chelmsford.
- Sutton Coldfield:** Channel 5 from Lichfield.

Where the two transmitters lie in the same direction, or within 10° or so of each other, the same aerial will probably receive them both without problems. No doubt where the two are say 45° apart the cowboys will happily align aerials somewhere in the middle. A few bemused viewers, such as the inhabitants of Shenstone in the English Midlands and Annfield Plane in the North East, will find that their Channel 5 signal comes from a direction more or less opposite to that of the other channels. I expect the cowboys will throw the reflectors away.

Even where the two signals come from almost the same direction, problems might arise should there be large differences in field strength because of screening along one signal path.

### Combining Signals

There will be many areas where a separate aerial is required for Channel 5, either because the reception angle between the two transmitters is too great, because one or both signals is/are very weak, or because of severe ghosting problems. This raises the question of how to combine the signals.

Never use a splitter to combine the signals from two aerials. This has a disastrous effect on the installation's directional characteristics, especially when both aerials are of the same channel group. Ghosting will be likely. In the case of the Chelmsford and Sudbury transmitters a simple diplexer can be used, as shown in Fig. 1, because the channels are 41, 44, 47 and 51 and, for

**Table 1: New Antiference diplexers.**

Model	Low input	High input
UF3134	21-31	34-69
UF3437	21-34	37-69
UF3739	21-37	39-69
UF4648	21-46	48-69
UF4850	21-48	50-69
UF5052	21-50	52-69
UF5355	21-53	55-69
UF6567	21-65	67-69

Channel 5, 63. A normal A/B to C/D diplexer will suffice.

With Channel 5 in mind, Antiference is to introduce a new range of diplexers that cover most permutations, see Table 1. They are outdoor units, with a switchable DC pass to one or both inputs.

In some cases it may be better to use a channel-pass filter (see Fig. 2) rather than a diplexer. If Channel 5 is on a frequency close to the existing transmissions, or if there is need for particularly good out-of-band rejection, channel-pass filters are to be preferred.

### LO and Image Interference

The standard four-channel groupings used in the UK rigorously avoid five-channel and nine-channel spacing. This is because of image-rejection and local oscillator interference problems, which are inherent in the design of a superhet receiver. For the same reason, it's good practice to avoid these channel spacings when installing a satellite receiver or VCR.

Imagine my surprise therefore when I found a number of n+5 and n+9 clashes as I compared the Channel 5 allocations with the existing four channels in each area. These clashes are as follows:

**Black Hill:** BBC-2 ch. 46, Channel 5 ch. 37, n+9 clash.  
**Huntshaw Cross:** BBC-2 ch. 62, Channel 5 ch. 67, n+5 clash.

**Lichfield/Sutton Coldfield:** BBC-1 ch. 46, Channel 5 ch. 37, n+9 clash.

**Presely:** BBC-1 ch. 46, Channel 5 ch. 37, n+9 clash.

Some TV sets and VCRs will react badly to this. I have two Panasonic VCRs at home, an NVG40 and an NVL20. Neither will receive ch. 59 properly, because we also use ch. 54 (one day I'll do something about it!).

I've recently been called out to a large communal aerial system that uses Crosspool (chs. 21, 24, 29 and 31) and Bilsdale ITV (ch. 29). It's a fairly deprived area, and the TV sets are a rag-bag assortment. Quite a few of them display distinct patterning on ch. 24 because of the presence of the ch. 29 signal.

It seems inevitable therefore that the frequency clashes listed above will cause problems. There is no quick or cheap fix for this, other than attenuating one signal in the hope that the patterning on the other will disappear before the first one becomes grainy – and of course doing the converse, increasing the level of the channel with the interference. Such tricks are not really a good idea however: they are rarely very successful, and we should always aim to present every TV set with all the channels at a correct and equal level.

Channel changers are the answer, but since good-quality units would raise the bill for receiving Channel 5 to more than the cost of a satellite system I can't see many domestic customers being interested. A device

announced by Pace – it apparently moves ch. 37 signals to ch. 68 – might find an application here. We'll return to channel changers in Part 2, when we deal with distribution systems.

### Wide Channel Range

Sheffield would be well within the Emley Moor service area were it not for the fact that the city is low lying and surrounded by hills. A high-powered relay transmitter, Crosspool, serves the city and many outlying areas. It transmits on chs. 21, 24, 27 and 31, at 5kW (vertical). Channel 5 will be right up near the top of the band, in ch. 67, at 2.5kW (vertical).

I am taking Sheffield as an example, but there will be a number of other areas where the existing four channels are within group A and the new service is up at the top end of group B or within group C/D. This section thus applies to the following: Belmont, Blaes Plwyf, Caldbeck, Craiggelly, Durris and Fenham.

Channel 5 reception is going to be very poor at most existing installations, because the group A aerials in use perform very badly at the higher channel frequencies. As most forms of signal screening, in particular trees, attenuate the higher frequencies more severely than lower ones, we can expect some screened locations to have ch. 67 (in the case of Sheffield) coming in at 15 or 20dB below the existing services. This is reminiscent of the start of UHF transmissions, when we discovered that Band IV and V coverage is much more patchy than Band III. Those with even greyer beards than mine will chime in "yes, and it was just the same when ITV started, using ridiculously high frequencies such as 200Mc/s". What a pity that the new service could not be on ch. 34, which would mean that Sheffield would use the same channel line-up as Nottingham. And why shouldn't the service be on ch. 34? A casual look through the transmitter lists for any existing ch. 34 signals that might suffer from interference reveals – nothing!

### Wideband Aerials

Where the field strengths are high, it will often be possible to carry out a straightforward aerial replacement, using a wideband array instead of the existing grouped array. But remember that wideband arrays don't work as well as their grouped equivalents. Channels near the ends of the bandwidth are particularly likely to suffer from reduced gain and directivity. For example the gain of the Antiference XG8 aerial in the group A version is 15.5dB on ch. 21. The wideband version of the aerial manages just 8.5dB on this channel. Amplification might compensate for the signal level shortfall, but it will not help with ghosting, a likely consequence of the wideband aerial's inferior directivity.

The cheap 'contract quality' wideband Yagi arrays, which consist of a folded dipole and reflector cut for group A and a chain of eight directors cut for groups B and C/D, are in my opinion next to useless. Log-periodic and stacked dipole ('fireguard') arrays are far better but don't have very good gain. Simply replacing a grouped array with a wideband one is going to be a dodgy business. The customers won't thank you if your attempts at improving their Channel 5 reception result in poor reception of the other four channels!

When we take into account the lower transmitter ERP and the increased cable loss at the higher frequency, in an unscreened location the ch. 67 signal from the Sheffield transmitter will probably arrive at the TV set at 8-10dB less than the other channels. This will not be acceptable in areas of moderate or low field strength, so other measures must be considered. In many cases a

broadband masthead amplifier will be fitted, raising all signal levels more or less equally. At difficult sites, or where quality matters more than cost, installations will probably involve a separate aerial, a masthead amplifier and a diplexer (Fig. 1) or a set of channel-pass filters (Fig. 2).

### Narrowband Aerials

If a separate aerial is installed it will need to receive only one channel. I wonder if some enterprising manufacturer will introduce a range of narrowband arrays, for chs. 34, 37, 56 and 67, the ones to be most commonly used for the new service? These would out-perform a normal grouped aerial hands down, since the design could be optimised for one channel.

To take the idea a stage further, a kit comprising a 'one-channel' aerial, a short connecting cable and a combiner would surely be a winner. The combiner would diplex the extra channel (only) with the rest of the signals, and would need switchable DC throughpasses available at both inputs to allow for masthead amplifiers.

A narrowband aerial would be a particular boon for ch. 37. This is going to be used at high power by a number of main stations, many of which will have coverage overlap with other transmitters that are going to broadcast Channel 5 either at very low power or not at all.

An example is the large service area overlap between Lichfield (Sutton Coldfield), Waltham and Sandy Heath. Lichfield will transmit on ch. 37 at 1,000kW, Sandy Heath on ch. 39 at only 10kW while Waltham won't carry the new service at all. Viewers in the Sandy Heath and Waltham areas will want to keep their own regional programming, so it looks as if there will be a large market for add-on aerials here.

Furthermore, within the coverage areas of the Channel 5 main stations there are literally hundreds of local relay stations that are not going to transmit the new service. Viewers using a relay will have to get their Channel 5 from the main transmitter. Reception is likely to be a problem, otherwise there wouldn't be a relay, and in most cases the new array will be fixed to the same mast as the existing installation. What's needed is a compact, light, end-mounted aerial with very good gain and directivity – these are much easier to achieve when the aerial is optimised for one channel.

The alternative is to use a group A or group B array for ch. 37. This is not an attractive idea, since either type of array would be working at the very edge of its designed bandwidth.

Because the Channel 5 transmitter network is only loosely modelled on that of the existing four-channel services, it's likely that reception from a different transmitter will be quite common in many parts of the country.

### Channel 5 at Low Power

The most significant factor in the Channel 5 transmission plan is the use of a very low ERP (effective radiated power) in many areas. Taking East Anglia as an example, Tacolneston transmits on chs. 55, 59, 62 and 65, to which Channel 5 is to be added on ch. 52. This is fine, since most group C/D aerials work quite well down to ch. 49. But the ERP for the new transmitter is a bit of an eye-opener – a measly 4kW compared with 250kW for the existing four channels.

Now it's a fact that in the opinion of many East Anglian aerial men Tacolneston is under powered as it is – which is true, since there is a ring of thirteen relay transmitters around the edge of this relatively small, flat region. The height of the Tacolneston transmitting aerials, at only

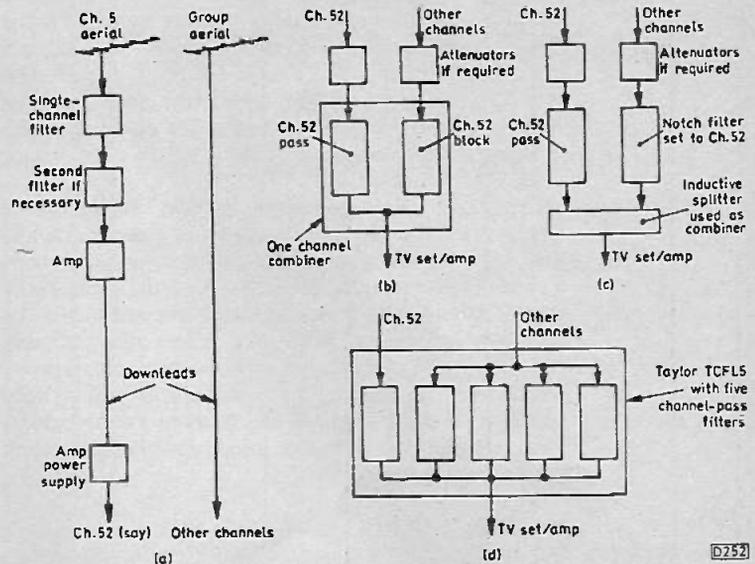


Fig. 2: Reception of Channel 5 where the transmission is low-powered but within or close to the channel group used by the other transmitters being received. One solution where there is a serious signal level imbalance between the new service and the existing four would be to use a separate aerial and masthead amplifier. For Tacolneston the Channel 5 aerial should be a group B type if a narrowband aerial is not available. A group B aerial will minimise pick-up of the four 250kW group C/D channels, and is likely to have better ch. 52 gain than a group C/D array. An 8MHz (one channel) pass filter tuned to ch. 52 provides further attenuation of the other channels to avoid possible cross-modulation in the masthead amplifier. The Taylor TCFL-1 is suitable. A second identical filter might be necessary. These filters have an insertion loss of 2dB and are not waterproof, so protection will be required if they are fitted outdoors.

The response of a diplexer is not sharp enough to combine signals that are only two or three channels apart, so channel-pass filters must be used. Three possible arrangements are shown in (b) – (d).

(b) Use of the Taylor TCFL1-1CH, which is intended for combining one UHF channel with the rest of the band. It has a single-channel notch filter at one input and a single-channel pass filter at the other. The notch filter will ensure that the ch. 52 signal does not get through and combine, in random phase relationship, with the other wanted signals. The channel-pass filter prevents masthead amplifier noise degrading the signals at the other port. It may be necessary to add attenuators at the inputs to obtain the correct signal levels.

(c) Use of separate channel-pass and notch filters. The trouble with the TCFL1-1CH is that it is factory tuned. It's not feasible to stock filters for every channel. If you operate in several transmitter areas you need to be able to build filters on the spot. The TCFL-1 and TBF4 are one-channel pass and notch filters respectively. For Band V use the TBF5. The TCFL-1 is sold as factory-tuned, but can be tuned about ten channels away from the nominal carrier. Thus only four filters need be stocked to cover the whole band. Accurate tuning requires the use of a spectrum analyser.

Use a good-quality inductive splitter to combine the outputs.

(d) Use of the Taylor TCFL5. If the signals are fed to a distribution system of any size, it's important that each channel is at the correct level. This justifies use of the TCFL5, which incorporates five one-channel pass filters. Each has three tuned stages and a variable attenuator, enabling the level of each channel to be set independently.

Various input configurations are available. For this application we need option A, which has four inputs fed from one aerial and a fifth input fed from a separate aerial.

Putting all the off-air signals through filters like this has another advantage: all unwanted signals are kept out. This eliminates many types of interference and ensures that unwanted inputs do not lower the amplifier's cross-modulation threshold.

221m above sea level, makes matters worse. This is much lower than virtually every other main transmitter in the country. Though the area is not hilly, Tacolneston doesn't even put a decent signal into some parts of Norwich, which is only twelve miles away. And the problem is field strength, not ghosting. So what chance has Channel 5, at 4kW?

The early coverage maps showed Tacolneston's Channel 5 coverage to be quite wide – not much less than that of the existing channels. A later version showed a considerably reduced coverage. With the signal more than 17dB down, even the later version could be optimistic. Sending 4kW out across the sparsely populated but broad acres of rural Norfolk sounds pretty ineffective. So Channel 5 is clearly going to be very restricted in East Anglia – and in many other regions. The transmitters with the most remarkable power disparities are as follows:

**Caldbeck:** Channel 5 10kW, existing channels 500kW, received signal level difference about 17dB.

**Fawley/Rowridge:** Channel 5 1kW, existing channels 500kW, received signal level difference about 27dB.

**Huntshaw Cross:** Channel 5 2kW, existing channels 100kW, received signal level difference about 17dB.

**Sandy Heath:** Channel 5 10kW, existing channels 1,000kW, received signal level difference about 20dB.

**Tacolneston:** Channel 5 4kW, existing channels 250kW, received signal level difference about 17dB.

**Winter Hill:** Channel 5 12.5kW, existing channels 500kW, received signal level difference about 16dB.

Readers who operate in these service areas can amuse themselves by conducting the following imaginary experiment. You are at a customer's house where the reception might be good, bad or indifferent. Fit an 18dB attenuator and observe the results. That's Channel 5!

### Masthead Amplifiers

OK, if this low-power transmission is really going to happen, what's to be done? Some viewers – those whose rooftops have a clear line-of-sight to the transmitter – will be able to receive the new service perfectly at little or no expense. In some cases the existing aerial installation will be highly inefficient, producing acceptable reception only because of very high field strengths. If a decent aerial is installed, good reception of the five channels may well be possible.

Where the existing channels are at reasonable but not excessive signal levels, a masthead amplifier will probably bring in a decent Channel 5 picture. But at locations where the existing four channels are even slightly snowy a masthead amplifier, whilst improving them, is unlikely to provide good Channel 5 reception.

At North Walsham, which is well within the Tacolneston service area at 22 miles and not particularly screened, the line-of-sight signal is around +16dB/mV. But few rooftops in the town have more than +4dB/mV available, and in many places the signal falls to -17dB/mV. For Channel 5 this becomes -13dB/mV at best, i.e. adequate with a masthead amplifier, and -34dB/mV at worst, i.e. no chance at all. These figures assume the use of a good-quality 18-element aerial: add 5-6dB if a really splendid high-gain array is used.

A common complaint about reception from Tacolneston is that the higher channels appear to be the weakest – Channel 4 on ch. 65 is a particular problem in many locations. It will be interesting to see how the new Channel 5 signal compares. Will it be 17dB below the

best of the existing four, or 17dB below the worst? Since it will be the lowest frequency, things might not be as bad as one might expect.

Many locations in rural East Anglia are screened from Tacolneston by trees. So high-gain aerials and masthead amplifiers are used. Although Channel 5 reception might at first sight seem impossible here, as it will be the lowest frequency in use this might not be the case.

At many locations, both screened and unscreened, the difference in field strength will be such that where an amplifier is required for Channel 5 reception a low-gain unit will have to be used. This is most likely to be the case where a masthead amplifier is at present employed, with moderately good signal levels, to compensate for losses in a long download. A two-stage amplifier could well be driven into cross-modulation by the other channels. Where signal level imbalance is a real problem, the answer will be to use a separate aerial for Channel 5 and feed the signal through a one-channel pass filter before amplification (Fig. 2). The disadvantage of this is that the filter introduces a slight signal loss just where you don't want it – in front of the amplifier.

When a separate aerial and masthead amplifier are used for Channel 5, the signals will have to be combined. If they are too close for diplexing, channel-pass filters will be needed (Fig. 2). This applies to Tacolneston, Burnhope/Pontop Pike, Huntshaw Cross, Perth, Oxford, Selkirk, Winter Hill and most areas where the existing four transmitters are in group A or B and the new service is on ch. 37.

Next month we'll look at the problems with communal aerial systems. ■

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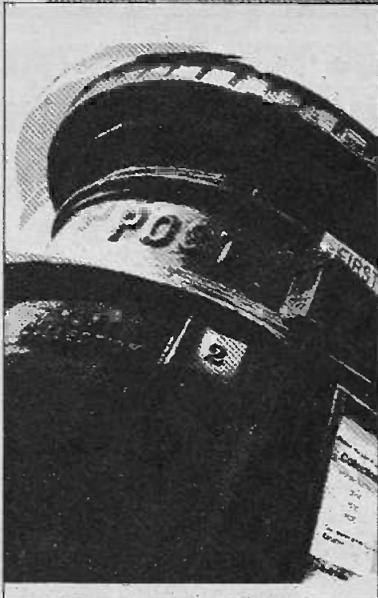
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### Testing Electrolytics

Ian Rees's capacitance tester/comparator (September) is unlikely to disclose the true condition of capacitors removed from switch-mode supplies or other high-frequency/high-current applications, where the capacitor may have to pass hundreds of milliamps of ripple current at anything from 15kHz to 150kHz.

Capacitance meters often show that an electrolytic has the correct value, despite a substantial lack of effective capacitance in circuit, because they measure at a relatively low frequency, often 1kHz. Using DC, as suggested in the article, would make a meaningful assess-

# Letters

We welcome letters from our readers and try to publish as many as we can. You can send them typed, handwritten or on disc, addressed to the Letters Editor - for address see page 7.

ment even less likely.

In view of this I offer the following notes:

(1) It is the low HF impedance of 105°C capacitors that makes them suitable for use in switch-mode power supplies. Do not fit 'standard' 85°C electrolytics in supplies that generate at HF, even if one was fitted originally. Also don't fit a capacitor which is physically smaller than the original, as its operating temperature will be higher.

(2) Wherever possible, check the ripple on the capacitor in circuit. Switch the scope's input to AC, and look for a ratio of DC to ripple of more than 100:1. It is important to connect both scope leads directly to the capacitor itself, as large ripple voltages can be developed across printed circuit tracks. A good capacitor should not show any narrow spikes on the ripple. Great care is obviously needed when working on the live side of power supplies, and an isolating transformer is absolutely vital.

(3) In many circuits a coupling capacitor is used to discharge the base of a power transistor. A check at the capacitor in situ will show if

the full drive voltage is being transferred. If in doubt, check that the collector waveform is fully saturated for the entire on portion of the drive cycle, with no spurious blips or ramp, which can look like LOPT failure.

(4) In my experience, leakage is usually accompanied by a DC offset, domino failure or obvious sign of distress, and is self-evident. Capacitors usually self-destruct if unlimited current is available when they start to leak. Rectifier diode failure is common in such cases.

To summarise, the eyes and nose, together with an in situ check, are usually the best guide. Beware of measurements that do not fully replicate the actual circuit conditions.

My capacitance meter now collects dust, as it has wasted more than enough of my time. In fact it is usually permissible to use electrolytic capacitor values of plus or minus 100 per cent of the original value, provided size and HF parameters are considered.  
C.N. Cory T. Eng., MIOA,  
Thatcham,  
Berkshire.

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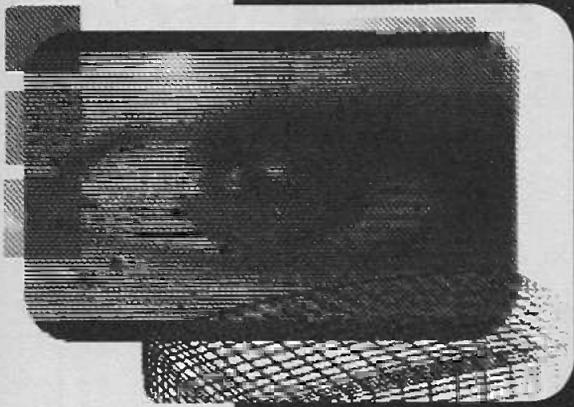
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Reports from Philip Blundell, AMIEEIE, Giles Pilbrow, Paul Hardy, John Edwards, Albert Browne, Roger F. White, Michael Dranfield, Brian Storm, Nick Beer, Michael Maurice and Graham Colebourn

### Tatung C Chassis

There was no remote control operation with one of these sets. Although the 5V supply was present, there was no output from the remote control receiver chip IC750. The TFMS4360N originally used in this position has been replaced by a TFMS5360 with a new mounting bracket. Fitting this restored normal operation. P.B.

### Grundig CUC3400 Chassis

This set was dead though the fuses were all OK and there was 300V at the collector of the chopper transistor T661. I decided to carry out some resistance checks on the diodes in the combined chopper/line output stage and found that D691 (BYV28/100) was short-circuit. It's the 20V supply rectifier on the secondary side of the circuit. P.B.

### GoldStar CIT9508

The relay would click as the set was switched out of standby but there was no line drive. We found that fusible resistor FR802 (1Ω) in the 22V rectifier circuit had gone high in value, removing the supply to the line driver stage. G.P.

### Matsui 1455

This set wouldn't come out of standby. The reason for this was a low supply voltage at pin 42 of the microcontroller chip - 3.5V instead

# TV Fault Finding

of 5V. Capacitor C612 (220μF, 25V) in the power supply had dried up.

For reliability, C607 (47μF, 25V) should always be replaced when one of these sets is serviced. G.P.

### Panasonic Alpha 2 Chassis

This set would fizz and the width would come in. The HT was correct, but the 2SD1441RL line output transistor was leaky. After replacing it I found that the real problem was dry-joints at the line driver transformer. Thermal fuse R567 (part no. TSF19102) was also replaced, to reduce the chance of a bouncer.

Whenever I see one of these sets now I resolder the line driver transformer's joints as a matter of course. If the customer is quick about switching the set off when the fault develops no other work is usually required. P.H.

### Harwood HAR14

The complaint with this set was that it would die intermittently. But despite extensive testing I was unable to fault it. I had no circuit, but the set bears a superficial resemblance to the Fidelity ZX4000 chassis. What I did notice was pronounced horizontal wriggle at times, which occasionally resulted in loss of sync. All the presets on the board had Sellotape beneath them, probably as an aid in production. I removed the presets and the tape and cleaned the board. On refitting the presets the wriggle had gone. I never did get to the bottom of the intermittently dead problem - the customer didn't want to spend too much on the set. P.H.

### Sanyo CTP6102

This was an ancient set and I'd no circuit diagram, but as there were only field problems I decided to have a go. C451 (330μF, 10V non-

polarised) had been getting warm and was low in value. Two 680μF electrolytics connected back-to-back seemed to work all right, but I was left with the lower half of the scan missing and the upper half distorted and varying in height. Voltage checks showed that the bias in the field output stage was varying. I tried replacing the driver and output transistors, also the thermistor, without luck. Finally, in desperation, I tried resoldering every joint in the field timebase section of the chassis. Miraculously, this cured the problem. P.H.

### Ferguson TX100 Chassis

This set took a very long time to produce the correct grey scale. When switched on it would produce a green picture for ten minutes, followed by five minutes of red, then a normal display would appear. C52 (1μF), which decouples pin 19 (grey-scale reference) of the TDA3562A colour decoder chip, was open-circuit. P.H.

### Hitachi G7PS Chassis

The complaint with this set was that it went into the standby mode almost immediately after powering up. I disconnected the line output stage, added a 40W bulb as a load and fed the set via a variac. The HT rose to 125V. With it reset to 112V and the line output stage reconnected the set worked all right. But checks in the power supply seemed advisable. R909 was then found to have risen in value from 39kΩ to 45kΩ. A replacement was fitted and the HT reset. P.H.

### Matsui 1422

A snowy raster was the complaint with this set, along with no signals and no channel display. The cause was loss of the LT supply because F602, which is in series with D610, was open-circuit. I have to say that this is a horrid bit of construction.

The fuse has wires soldered to both end caps. One end is soldered to the board, the other to the anode of D610, the whole lot being encased in a plastic sleeve. There's no room for a proper fuseholder. **P.H.**

### Hitachi G8Q Chassis

"Lots of smoke then dead" was the complaint with one of these sets. On investigation we found that there was charred print at one leg of C715, which is one of the capacitors in the EW diode modulator circuit. We scraped away the burnt remains of the print, then soldered the capacitor's leg to a good section of print. This solved the problem. **J.E.**

### Goodmans FST51TT/ Murphy CTV3540T

The display consisted of a white raster with flyback lines – there was normal sound. A check on the CRT base panel showed that the 100mA fuse and 220Ω resistor (R115) that supply about 190V to pin 4 of the TDA8153 RGB output chip IC100 had failed. After replacing the fuse, resistor and chip I carried out slight RGB preset drive adjustment to correct the grey scale. **J.E.**

### Panasonic TX21M2T (Z4 Chassis)

This set was dead with the surge limiter resistor R802 (4.7Ω, 5W) open-circuit and the STR54041M chopper chip IC801 and the two associated 2SD965 control transistors Q801/2 short-circuit. The overvoltage protection diode D854 also seemed to be faulty. C809 (0.1μF) was the cause of the trouble. It provides feedback to the base of the chopper transistor in IC801. Because it was faulty, there had been excessive HT. We replaced these various items, also C808 (10μF). A 105°C, 63V electrolytic should be used in this position. **A.B.**

### Hitachi NP84 Chassis

The customer complained about a horizontal line across the middle of the screen (the set was a Granada C14BA1). When I switched the set on without an aerial connected the top half of the screen was completely black. Increasing the tube's first anode voltage proved that there was a blanking rather than a field fault. When an aerial was connected there was a normal picture apart from a black band across the screen. This black band varied in size when the height control was adjusted. With the height at minimum, the black band disappeared. The cause of the fault

was R605, which had increased in value from 220kΩ to 400kΩ. **R.F.W.**

### Fidelity CTV1400

There was so little contrast that the picture was only just visible, the contrast control having no effect. R106 was found to be open-circuit. **R.F.W.**

### Philips GR1-AX Chassis

The picture was smeared and looked washed out, with bending verticals. The cause of the fault was traced to C2060 (680μF) which is the smoothing capacitor in the 12V supply to the TDA8305 timebase generator chip. **R.F.W.**

### Ssanyong STV9214R

This Great Wall portable produced a good picture but no colour. We were able to use a similar set to carry out detailed waveform comparisons around the decoder chip and found that those in the APC filter (pins 16 and 18) were of low amplitude. The cause of the trouble was an open-circuit resistor, R361. **R.F.W.**

### Matsui 1455

The sound was OK but there was no picture. The RGB outputs were being blanked because of a fault in the control circuitry. Q408's collector voltage was high – there was only 0.2V at its base. But there was 10V at the collector of the preceding DC coupled transistor Q407. So I replaced Q408, which made no difference. The cause of the trouble was D417 (1N4148) in Q408's collector circuit. It was leaky. **R.F.W.**

### Philips CP90 Chassis

The width changed as the brightness was turned up. When it was turned down the overvoltage trip came into operation. The cause of the fault was found in the chopper control circuit, where R3665 (4.7Ω) was open-circuit and D6665 (1N4148) was short-circuit. These two components are connected in series. We also replaced the CNX62 optocoupler. **R.F.W.**

### Philips CP90 Chassis

If the problem with one of these sets is a strange interference dot pattern on the screen, don't examine the IF department as we did. Replace C2703 and C2691 in the power supply. They are both 330μF electrolytics. **M.Dr.**

### Ferguson TX100 Chassis

This set was dead, with the start-up

resistor R116 getting hot. A scope check at pin 8 of the TDA4600 chopper control chip showed that it was producing a drive output, but this didn't arrive at the base of the BU508A chopper transistor because choke L15 was open-circuit. A replacement from a scrap set restored normal operation. **M.Dr.**

### Alba CTV600

This set was brought in because there was no sound, but on inspection we found that the picture was oversized. C910 (10μF, 50V) and C909 (47μF, 63V) in the power supply had dried up. As a result, the HT voltage had risen. This was probably the cause of the TDA1904 sound output chip's failure. **M.Dr.**

### Amstrad TVR3

This combined TV/video wouldn't tune. We found that there was no 12V supply at pin BU of the tuner. The culprit turned out to be the LA7913 band-switching chip IC2. **M.Dr.**

### Sharp DV5161H

Beware of some very odd faults when the field output chip fails. This set had no sound and no picture. The screen was lit up: it was covered in lines and one half was darker than the other. We might never have found the cause of the fault if the field output chip's heatsink hadn't been getting red hot. **M.Dr.**

### Panasonic TX25T2 (Alpha 2 Chassis)

A particularly nasty field fault occurs when R469 goes high in value. This resistor is part of a damping network that's connected across the field scan coils. Its purpose is to prevent line-frequency waveforms reaching the field scan circuitry, induced by the close proximity of the line and field scan coils. This line-frequency signal can show up as black lines across the upper part of the field scan. The value of R469 can vary from that given in the service manual. It's usually 150Ω or 180Ω. Check by reading the bands. Fitting a wrong-value resistor will produce a similar fault symptom. **B.S.**

### Panasonic Euro 1 Chassis

The display produced by this digital receiver consisted of a dark, blank raster. Its owner claimed that the picture was poor before this symptom occurred. Scope readings in the digital circuitry failed to produce any clues, but a burnt

finger told me that the ACVP2205 adaptive comb filter chip was faulty. When this had been replaced the picture, though restored, was decidedly solarised. This second fault was eventually cured by replacing the SAD2140 S-VHS analogue-to-digital converter chip IC1601. B.S.

### Panasonic TX25T2 (Alpha 3 Chassis)

Something was upsetting the field output chip (IC451) in this receiver. About twice a year bright flyback lines would appear across the top of the screen. A new field output chip would put matters right. Fortunately there's now a permanent cure. Kit TZS5EN001 consists of a replacement scan coil and output chip. Apparently some earlier scan coils used in this model proved to be a bit too much of a burden on IC451, leading to its premature failure. B.S.

### Panasonic Alpha 2 Chassis

This receiver was dead, with a plaintive whistle coming from the power supply. D854, the avalanche overvoltage protection diode that's connected across the 160V HT supply, was short-circuit. This usually means that the HT supply has risen to a dangerous level. So I replaced the chopper chip IC801 and D854 and checked the components that affect the regulation (D807, R815, C808 etc.). Then I checked the 2SD1441RL line output transistor Q551, which was faulty. As I couldn't find anything else faulty after replacing this item I switched on, and was immediately greeted by the friendly rustle of EHT as the set sprang to life. Fortunately no further damage had occurred and the picture was excellent. B.S.

### Matsui 1455

There was no line sync. Resetting VR203 restored a picture, but it was unlocked and at best there was hooking at the top of the screen. The line-frequency pulses that should have been present at pin 35 of the do-it-all chip IC202 were found to be missing. They come from the line output transformer, via R274 (27k $\Omega$ ) which was open-circuit. N.B.

### Samsung CI210R

This portable was dead apart from the standby LED. A check on the 11V 'HT' line showed that at switch on it pulsed to 2.5V then off.

Disconnecting the supply to the line output stage resulted in the HT pulsing to 11V before returning to standby. There was obviously a short in the line output stage, and one could be measured from the collector of the line output transistor to chassis. But it was in the parallel FR304 efficiency diode D106, not the transistor itself. N.B.

### Philips GRI-AX Chassis

I see quite a few of these sets since entering into a deal with the operator of a local holiday site, where quite a number of them are in use. Suffice it to say that I buy line output transformers in bulk. But it was nice to get a different fault for a change. There was a raster, the graphics were OK, but there was no sound or vision. Checks showed that there were no outputs from the TDA8305A multipurpose chip IC7020, though its supplies were present and the tuning worked correctly. A new TDA8305A restored normal operation. N.B.

### Samsung CI3351A

This portable produced a low brightness picture. Even turning up the first anode control on the line output transformer failed to produce adequate brightness for normal viewing. A check showed that the first anode voltage at the tube base was lower than expected, and varied over a period of time – as did the brightness. The cause of the trouble was a varying leak within the 1nF, 2kV decoupling capacitor C907 on the tube's base panel. I was able to lift it to prove the point. N.B.

### National Panasonic TR5030G

Most people wouldn't have bothered with this aged monochrome set, but it belonged to an aerial installer colleague who found it invaluable because of its portability, battery operation and VHF as well as UHF tuning. The problem was no EHT, because the line timebase wasn't working. Checks showed that there was no drive from the AN5750 chip IC41, whose supply was being pulled down. A new AN5750 restored normal operation. N.B.

### Samsung CI1213R

This set was dead: the power supply would start up, then shut down. I have to say that the PCB was a mess, with wires lashed everywhere in what looked like production modifications. The cause of the problem was that L110, in the HT

feed to the line output stage, was dry-jointed at one end. This was not clearly visible, but a meter check revealed the fault. N.B.

### Ferguson TX100 Chassis

This monstrous old 26in. set came in deadish, with a faulty line output transformer. When a replacement had been fitted the set ran up but the sound was permanently muted. Lifting the various lines that lead to muting brought me to the SAA5012 remote control decoder chip, which turned out to be faulty. N.B.

### Bush BC7100

This is the old Rank-Bush colour portable with the Saba chassis. The complaint was that after the first half hour or so the sound would disappear. The cause was found to be a dry-joint on the lead from the slider of the volume control to the front interface PCB. Despite the set's age its picture still looked very good and the dreaded button unit was OK. N.B.

### Goodmans 2875

This set was dead. On investigation I found that it was riddled with dry-joints – despite being only just out of guarantee. The cause of the fault was that the top EW modulator diode (BY448) was short-circuit (almost turned to dust) while the adjacent capacitor was severely dry-jointed. N.B.

### Hitachi M Chassis

If the mains switch was on and the set was switched on from the mains it would go to standby. Otherwise it was dead. Checks showed that the 2SD1577 line output transistor TB626 was leaky and that the wrong type had previously been fitted. In addition its heatsink clip wasn't attached. To fit the transistor correctly, it is best to remove the heatsink from the board – it's soldered to the main PCB by three lugs. Fit the transistor to the clip, then refit the whole assembly back on the board. A new 2SD1577 restored normal operation. M.M.

### B and O 20AX Chassis

This ancient set suffered from a purring sound accompanied by picture flutter. Replacing 5C10 (47 $\mu$ F, 63V) in the thyristor drive circuit cured the fault. M.M.

### Amstrad TVR2

When this set was brought in it was supposed to be intermittently dead. But several days of soak testing failed to reveal any fault. A week

later it came back, this time permanently dead. Checks showed that the primary side of the line driver transformer T401 was open-circuit. A replacement (part no. 152591) put matters right. **M.M.**

### Philips CP110 Chassis

This set seemed to be dead, apart from 'F1' in the display. A quick check showed that fuse F1653 had failed. A replacement restored some life, but the HT was pulsating. So I disconnected the supply to the line output stage, connected a light bulb as a dummy load, switched on and attempted to put the set into standby. Although the display showed standby, the bulb still glowed brightly and pulsed. A replacement CNX62 optocoupler (IC7670) provided a complete cure, proved by reconnecting the line output stage and switching on. This must be the only Philips chassis in which the power supply doesn't self-destruct when the optocoupler fails. **M.M.**

### Cascade TV511T

There was a sharp crackle of EHT at switch on, then the set tripped. A

check with the line output stage disconnected showed that the HT was too high. C909 (47µF) was responsible for this. We then found that ZD402 was short-circuit and R422 open-circuit. When these items had been replaced there were pictures plus distorted sound. A slight tweak on the sound trap coil restored normal sound. **M.M.**

### Philips CP110 Chassis

This set came in dead, with a short-circuit line output transistor. When we removed scan plug R13 and tested the power supply with a dummy load we were pleased to find that it ran normally. But when a new line output transistor had been fitted the results were awful. The line output transformer emitted a raucous scream, and the display consisted of a dark grey raster with a vertical band of lines near the left-hand edge. This slowly changed to a very low contrast picture, with no colour and false line lock.

A new line output transformer made no difference. Concentrating on the false line lock, we checked the waveforms around the IF/sync module and discovered that the

sandcastle pulses at pin 5 were incorrect – the short, high-amplitude pulse was delayed with respect to the longer blanking pulse. Adjustment of the line hold and phase presets simply made matters worse, and a new TDA2579 (plain or A version) sync/timebase generator chip didn't provide a cure. Philips don't show the circuit of this module in the CP110 manual, but the same circuits appear in the CP90 manual, where the sync and IF parts are separate. We finally traced the cause of the problem to the 3.9V zener diode D6067, which had developed a leak. **G.C.**

### B and O MX5500

Intermittent shut down with no pilot light display was the complaint with this set. We traced the cause to a cracked joint at the base of TR19, a small transistor right at the top of the power supply board. B and O tell us that this fault is common, being caused by mechanical stress from the nearby fixing screw. In some cases the transistor itself can break. The official advice is to slacken the screw off by a quarter turn as a routine servicing measure. **G.C.**

AN 3320K = 750  
AN 5135 = 585  
AN 5790 = 240  
AN 7320 = 100  
BA 514 = 150  
BA 4232AL = 190  
BA 7767 = 180  
CXA 1044P = 1485  
HA 11381 = 250  
HA 11714 = 380  
HA 13119 = 315  
KIA 8210 = 425  
LA 3210 = 060  
LA 3350 = 199  
LA 4282 = 350  
LA 4500 = 200  
LA 7294 = 150  
LM 317T = 150  
LM 1203 = 499  
M 710B1 = 610  
M 190B1 = 495  
M 51393 = 595  
M 54519 = 499  
M 54564 = 115  
MC 1377P = 425  
MC 3357P = 095  
MDA 2062 = 450  
MEA 2901 = 300  
SAA 1026 = 450  
SAA 1061 = 375  
SAA 1294 = 850  
SAA 3004P = 315  
SAA 3028 = 845  
SAA 5231 = 895  
SAA 5241P/A = 1000  
SAA 7000 = 899  
SAA 7274 = 650  
SAB 3021 = 399  
SAB 3035P = 545  
SAB 3209 = 450  
STK 050 = 1599  
STK 0029 = 300

STK 0049 = 500  
STK 0050/2 = 899  
STK 436 = 399  
STK 483 = 850  
STK 1050/2 = 800  
STK 2048/2 = 1299  
STK 2155 = 895  
STK 2240 = 650  
STK 3042/3 = 500  
STK 3082/2 = 725  
STK 4038/2 = 695  
STK 4131/2 = 650  
STK 4141/V = 750  
STK 4162/2 = 515  
STK 4211/V = 1200  
STK 4362 = 450  
STK 4773 = 820  
STR 4853 = 699  
STK 5322H = 450  
STK 5331 = 300  
STK 5337 = 485  
STK 5467 = 650  
STK 5490 = 450  
STK 7348 = 400  
STK 8050 = 750  
STK 736051 = 300  
STR 441 = 1899  
STR 451 = 2999  
STR 454 = 1499  
STR 5412 = 400  
STR 50092 = 550  
STR 50103A = 385  
STR 54041 = 350  
STR 58041 = 300  
STRD 1816 = 399  
STRD 6008 = 680  
TA 8210 = 300  
TA 8205 = 300  
TA 8200 = 350  
TA 8207 = 165  
TA 8216 = 390  
TA 8644 = 499  
TAA 550 = 030

TBA 1205 = 030  
TBA 120T = 030  
TBA 1013A = 299  
TDA 1022 = 530  
TDA 1060 = 325  
TDA 11705 = 135  
TDA 1520B = 330  
TDA 1540 = 420  
TDA 1600 = 360  
TDA 2009 = 250  
TDA 2170 = 1999  
TDA 2506 = 500  
TDA 2545 = 130  
TDA 2577 = 1299  
TDA 2577A = 200  
TDA 2579A = 250  
TDA 2600 = 425  
TDA 3300B = 2475  
TDA 3561A = 410  
TDA 3576B = 915  
TDA 3654 = 090  
TDA 4500 = 310  
TDA 4504B = 790  
TDA 5850 = 375  
TDA 7050T = 170  
TDA 8153 = 1599  
TDA 81795 = 999  
TDA 8180 = 1815  
TDA 8390 = 850  
TEA 1039 = 175  
TEA 2018A = 150  
TEA 2164 = 325  
TEA 6300 = 685  
UC 3842 = 150  
UC 3844 = 150  
UPC 1168 = 360  
UPC 1216V2 = 110  
UPC 4558C = 050  
2SA 839 = 140  
2SA 1232 = 250  
2SA 1302 = 300  
2SB 618 = 305  
2SB 1292 = 150

2SC 901A = 350  
2SC 1577 = 600  
2SC 2200 = 250  
2SC 3427 = 340  
2SD 1391 = 300  
2SD 1577 = 480  
2SD 1887 = 435  
2SD 2125 = 415  
BU 500 = 265  
BU 508A-PHIL = 80  
BU 508AF-PHIL = 125  
BU 5080D-PHIL = 110  
BU 2508AF = 250  
BU 2525AF = 410  
BUT 11A-PHIL = 070  
BUT 18AF = 120  
BUT 56A = 080  
S 2000AF-TOSH = 175  
S 2055A = 165

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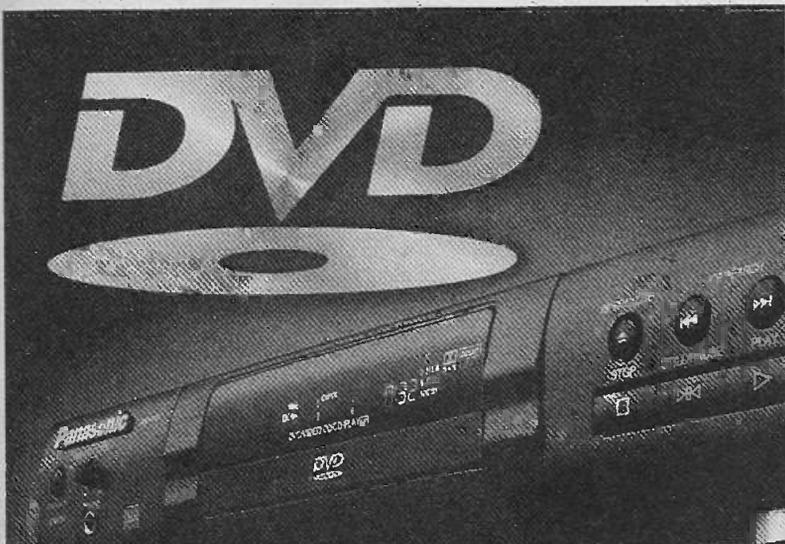
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# At The DVD Forum

**A recent international forum in Brussels set out to clarify the current DVD situation and press for agreement between the various parties involved. George Cole reports**

On September 16-17th the DVD Alliance, which consists of Time Warner and nine major consumer electronics companies including Philips, Sony, Toshiba, Hitachi, Thomson, Pioneer and Matsushita, hosted a forum in Brussels to discuss the current DVD format situation and latest developments. It also presented a chance to see prototype DVD players, drives and encoders in action.

The DVD system is almost ready to be launched on world markets, though the date when the first discs and players will be available is at present (mid September) still far from clear. There were numerous arguments and contradictions at the forum, with one company saying one thing and another saying something quite different.

## Specifications

First however a brief description of the DVD format – a more detailed specification will be provided in a later article, when certain details have been finalised.

DVD originally stood for Digital Video Disc. It then came to be known as the Digital Versatile Disc (since it can be used for purposes other than video storage). The official line now is that DVD simply means DVD!

The format is designed to take the compact disc into the 21st century. Although it is little more than a decade old, the CD – and in particular the computer version CD-ROM – is showing its age. When the CD-ROM was launched in 1985, many wondered how they would fill a disc that could hold over 600Mbytes of data, the equivalent of 500 high-density floppy discs. But with the advent of Video CD, multimedia CD-ROMs and complex video games, the CD is struggling to hold enough data. Indeed for this reason some games titles are spread over several CD-ROMs. As a result of all this there was a move to develop a high-density CD.

The DVD that has emerged is a hybrid of two rival high-density formats, the Multimedia CD (MMCD) developed by Sony and Philips and the Super Density (SD) disc developed by Toshiba in collaboration with Time Warner and others. The disc is of the same size and thickness as a conventional CD, i.e. 120cm in diameter and 1.2mm thick, the big difference being that the DVD

consists of two 0.6mm discs bonded back-to-back. This gives the disc greater mechanical stability and a higher storage capacity. DVD discs are also more resistant to heat and humidity than conventional CDs.

With the DVD the minimum pit length is 0.4 microns, the track pitch being 0.74 microns. DVD uses lasers with a shorter wavelength than those used with ordinary CDs (635-650nm, compared with 780nm for CDs). It also uses Reed-Solomon error correction and an 8-16 modulation system. The reference speed is 4m/sec CLV (constant linear velocity).

## Versions

DVD has been designed as a single- and dual-layer (i.e. two layers on each side of the disc) system, and as a single- and double-sided format. With the first generation of players at least, users will have to turn over a double-sided disc, but we will doubtless at some stage see players that switch sides automatically. There are thus four basic disc versions, ranging from a single-sided disc that holds 4.7Gbytes of data to a double-sided, dual-layer disc able to hold 17Gbytes of data.

DVD makes use of the MPEG-1 and MPEG-2 digital video systems, the latter being able to provide broadcast-quality pictures for material such as blockbuster films. The video data rate can be varied between 1-10Mbits/sec, the average for audio and video data being 4.69Mbits/sec. For computer applications DVD's data rate approaches that of a x8 CD-ROM drive. The variable bit-rate system improves coding and storage efficiency. There are two alternative audio systems: Dolby Digital AC-3 coding is to be used in 525-line/NTSC territories while MPEG-2 audio is to be used in 625-line/PAL areas. These audio systems both offer 5.1 multi-channel sound, but are not compatible.

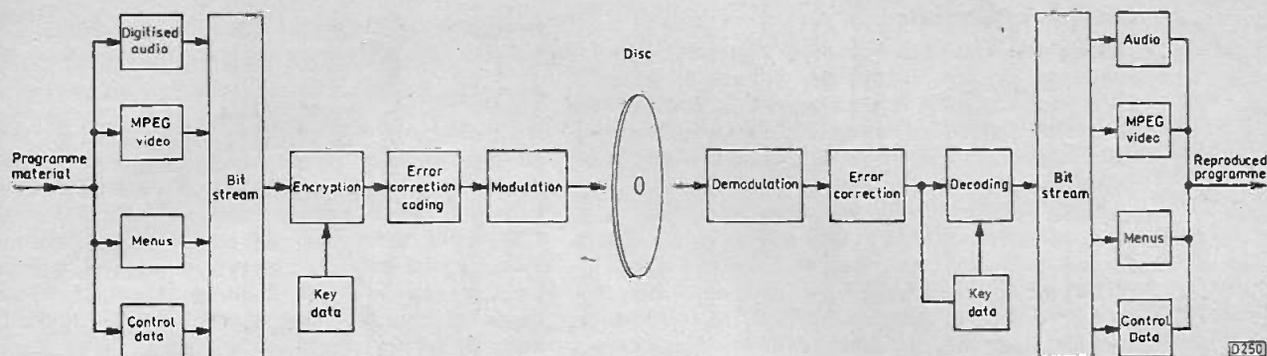
DVD is actually a family of discs, designed to store films, computer data, multimedia programs and games. The two basic formats are DVD Video (sometimes called DVD Movie) and DVD-ROM. The former has been developed as a means of recording and storing films and other video material. Up to 133 minutes of MPEG-2 video can be stored by a single-sided, single-layer disc. DVD Video can also store up to eight audio streams and 32 subtitled languages. There is provision in the specification for recordable and erasable-recordable discs.

## The Forum

Jan Oosterveld, president of Philips' key modules division, gave the opening speech. He immediately got to the heart of the problems that have led to the delay in

## STOP PRESS

*At the time of going to press Toshiba has announced that it plans to launch a range of DVD systems in Japan on November 1st.*



Television Nov. 1996. At the DVD Forum Fig.1 page 37. Reduce to 1/25th scale linear (1" wide).

Fig. 1: The DVD Video record and playback processes.

launching the DVD system: the differing needs of the film and computer industries. As he pointed out, a computer software package has a shelf life of around six months while a film may have a life time of sixty years or more (think of *Gone with the Wind!*). This has led to problems in deciding what copy protection systems DVD should use. According to Jan Oosterveld, the problem is "close to being solved".

Film companies not only want to stop people making high-quality analogue or digital copies of DVD material, they also want to preserve a system that one film executive calls "Intelligent Sequential Distribution", i.e. releasing films around the world at staggered intervals. Typically, a top movie will be released in the USA months before its European launch. By the time it reaches Europe it will already be available in video form in the USA. Until recently, film companies relied on the differentiation between NTSC and PAL regions to preserve this system of distribution, but by digitising everything DVD eliminates this divide. As a result a system to stop consumers importing DVD discs from other regions has been developed. It's called Regional Coding, and divides the world into six areas as follows:

- Region 1: The USA and Canada.
- Region 2: Europe, Japan and South Africa.
- Region 3: Asia.
- Region 4: Australia, New Zealand, Mexico and South America.
- Region 5: Africa.
- Region 6: China.

The idea is that DVD players and many discs will be developed for specific regions. Most DVD film discs will be encoded with a flag to identify the region for which they are intended. DVD players will contain a chip set that recognises the appropriate flag and refuses to play a disc when there is a regional mismatch.

Regional Coding takes DVD well away from the original aim of "one world, one disc". Some of those at the forum felt that the system would hinder rather than help DVD Video. One argument is that a group likely to be amongst initial buyers would be home cinema/film enthusiasts who probably already have Laser Disc players. Many of these are dual PAL/NTSC models, enabling users to choose from the thousands of titles available in the USA and Japan. The contention is that DVD would severely restrict disc supply, and without an adequate supply of titles the format would be unlikely to get off the ground as a consumer product.

### Copy Protection

The other major stumbling block has been copy protection. Film studios point out that DVD will give users access to a high-quality digital master, so there should be protection against both analogue copying (on to VHS tapes) and digital copying (on to digital tape systems and, when they are introduced, DVD players that can also record). This has led to disagreements with the PC industry, because the film industry wants to see copy protection systems applied to multimedia computers and DVD-ROM drives. At the time of writing this the following systems were close to being accepted by all concerned, though the situation remains fluid and could change.

DVD Video discs will be protected in the following way, see Fig. 1. The original programme material is first digitally encoded, producing a bit stream that contains a mix audio, video, control and other data. This is then encrypted, using a 40-bit key system. The Disc Encryption System (DES) has been developed largely by Matsushita. Error correction coding and modulation are then applied, after which the encrypted data is recorded on the disc.

The DVD player reads the disc to see whether an anti-copy flag is present. It then uses a key to decode the data. To prevent copying, Macrovision's Colour Stripe system is used during the analogue output conversion. This disrupts the colour subcarrier: as a result, green stripes appear on the screen when copied material is played back.

The PC system is more complex. A DVD-ROM drive will also sense whether an anti-copy flag is present on the disc. If so, the drive will encrypt the key but not the programme data (which is already encrypted of course). There will be a second key in the MPEG playback card or in MPEG software to decode the encrypted key, then the data. Why such an involved procedure?

If the DVD-ROM drive simply decoded the data, it could be digitally copied on to a PC hard disc or tape system. The double-key encryption arrangement gives you only the second part of the key system when copying the data. If you tried to use a DVD-ROM drive or player to reproduce the copied data, it wouldn't recognise the key and would refuse to play.

So far this system has not been adopted officially. Incidentally not all DVD discs will be copy protected. The computer industry is unlikely to encrypt DVD-ROMs, while there may be material – such as old films that have already been broadcast many times – that is not considered to be worth encrypting. Free, cover-mounted DVD discs are also unlikely to be copy protected.

### Launch Intentions

Despite the setbacks over copy protection, several companies are confident that they will be able to launch DVD players or drives before Christmas, in some markets at any rate. Toshiba and Matsushita have stated that this is their intention. Pioneer and Hitachi are also hoping to be able to achieve a 1996 launch.

Others, such as Philips and Sony, are being more cautious and simply say that they will not go ahead with a launch until all the specifications have been agreed.

There are also plans for DVD-R (write once) discs that hold 3.9Gbytes of data and DVD-RAM (recordable-erasable) discs that can store 2.6Gbytes. Many expect these discs to appear within the next two-three years despite the objections of the film industry.

### Players

A certain amount of information on how the DVD players will operate was available. The first thing the player will do is to read the disc to see whether the regional code is correct and whether it is copy protected. If the regional code is incorrect, the player will simply refuse to work.

One speaker stressed the importance of software designers creating good screen displays that tell the user clearly what's happening. If, for example, a player simply said "cannot play this disc", the user might take the disc back to the shop. If the player said "disc is not designed for this player" the user would know where the problem lay.

The players will be operated by six main buttons on a remote control handset. These will enable the user to navigate around on-screen displays. The buttons include title (to display the title screen), up, down, left, right and enter. There will also be VCR-type buttons for fast forward, still frame, etc. The on-screen cursor will jump from point to point instead of floating around the screen. Anyone who has used a CDI joystick control will know how tricky it can be to move a cursor to the right spot.

The DVD disc menus are known as sub-pictures. They will be used for a variety of purposes, such as choosing the preferred menu language (English, Spanish, etc.), selecting closed captions or subtitles and so on.

The DVD player adapts cleverly to your language of choice. You could for example choose to have captions in say English and the disc's sound track in French. If part way through the disc you select Spanish captions for example, the end credits will include information about the companies that provided both sets of captions.

In other words, the end credits will vary in accordance with the facilities you use while playing the disc.

### Options

Another session was hosted by Mike Fitzgerald, vice-president of MCA. He stressed how important it would be to prepare plans carefully before developing a DVD film title, and the need for the best source materials. DVD will offer disc developers many options, including 4:3 and 16:9 aspect ratio pictures, multiple language sound tracks, Surround sound, closed captions, subtitles, choice of camera angles, and extra material such as the director's views or an actor's biography. Although some film companies present (including MCA and Warner) pledged to make use of such options, others were not so sure. It's hard to see why film companies would want to invest in all the extra time and expense to produce multi-language discs. Differences such as censorship laws would make it hard to develop discs for multiple markets.

The general feeling was that DVD offers some fancy features, but that few of them will be used in practice. Mike Fitzgerald added that the average cost of developing a DVD title would be around £20,000, which seems very low when you consider the work that has to go into the creative process alone. He also suggested that some DVD titles may not need high-quality MPEG-2 video, offering hours of MPEG-1 video instead – one example given was of a DVD exercise video, whose users would not be too concerned about having the best picture quality as they went about their routines.

### Prospects

So will DVD be a success? Few doubt that it will sell well in the PC market, with sales of DVD drives probably fast replacing CD-ROM drives. In the consumer electronics market its prospects are less clear. DVD players will be expensive (around £500-£700), won't provide a record facility (to start with at any rate) and will not be able to play discs intended for other regions.

Although DVD will offer superior sound and picture quality, there is little evidence that the public is prepared to pay for this (S-VHS and Laser Disc have remained niche products). One delegate suggested that the DVD market would be more akin to the camcorder than the VCR or audio player markets. Until DVD machines can offer recording facilities, this is probably about right.

## NEXT MONTH IN TELEVISION

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### Servicing the Samsung P68 Chassis

A range of colour TV sets use this chassis, which is prone to several fault conditions. With John Coombes' service guide, you'll have little difficulty putting them right.

### Getting on the Internet

Why should you, and how do you go about it? Martin Pickering provides practical answers, in particular on equipment.

### Versatile Video Buffer Amplifier

If you want your video camera to drive more than one monitor you'll need a buffer amplifier. An emitter-follower is the obvious answer, but Keith Cummins describes a versatile alternative which has several advantages.

### At the Vision 97 Show

Hitachi recently hosted Vision 97, in Tokyo, to demonstrate its latest developments in the digital video field. George Cole describes the technology that was presented, including the MPEG standard camera.

### The ESD Danger

Most of the chips used in TV etc. control systems are based on MOS technology, which means that they are particularly susceptible to damage as a result of electrostatic discharge. Frank Harding outlines the problem and the precautions required, with tips on implementing them economically.

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1N4002	0.07	2SC2655	0.31	ANS435	1.46	BC558C	0.06	BRX49	0.43	CD4017	0.47	RC4558	0.55	TD41015	1.37	TDA4601	1.46
1N4004	0.04	2SC3153	2.05	ANS512	1.76	BC636	0.14	BRV55	0.28	CD4049	0.35	REGBABY10	15.90	TD41035T	4.27	TDA601D	4.02
1N4005	0.07	2SC3182	1.20	ANS515	2.79	BC637	0.11	BSX20	0.35	CD4053	0.54	RGP10G	0.26	TD41044	1.43	TDA605	4.18
1N4006	0.04	2SC3225	0.90	ANS521	1.98	BC639	0.21	BT139600	1.29	CD4093	0.32	RGP15I	0.17	TD41060	1.84	TDA650	1.78
1N4007	0.06	2SC3330	0.52	ANS610	0.94	BC640	0.11	BT151500R	1.12	CD4093A	1.29	RGP15M	0.44	TD41085C	2.08	TDA7052	1.70
1N4148	0.06	2SC3350	0.45	AN7171K	0.56	BC848	0.28	BT151800R	1.15	CH82A	2.10	RGP30M	0.30	TD41170	1.82	TD47240A	2.57
1N5062	0.26	2SC3795	2.69	BA157	0.89	BC848C	0.18	BZ208A	1.46	CH83A	2.55	S2000A3	1.54	TD41170N	2.57	TD48138	1.97
1N5400	0.11	2SC3795B	2.21	BA158	0.87	BC858B	0.24	BZ208D	1.61	CH75B	0.52	S2000AF	1.71	TD41170S	2.65	TD48140	4.82
1N5401	0.14	2SC3807	0.81	BA159	0.11	BC858C	0.19	BZ26A	1.38	DTA114ES	0.31	S2055AF	3.74	TD41180	1.89	TD48145	1.97
1N5402	0.12	2SC3885A	0.82	BA3910B	0.69	BC875	0.33	BU406	0.89	DTA124ES	0.19	SAA12930Z	10.37	TD41515A	3.16	TD48153	16.24
1N5408	0.14	2SC3892A	0.82	BA5406	2.14	BD131	0.26	BU426A	1.29	DTC124E	0.19	SAA501Z	3.34	TD41516Q	3.59	TD48170	4.78
1N6253	0.20	2SC4204	0.60	BA5412	2.48	BD132	0.26	BU500	1.41	DTC124ES	0.77	SAB3035	2.89	TD41518Q	4.27	TD48175	2.65
1N914	0.04	2SC4242	2.31	BAG109	1.85	BD135	0.33	BU500S	0.35	DTI44ES	0.19	SDA2516	2.09	TD41519	4.27	TD48175S	3.90
1S1555	0.07	2SC4517	4.70	BAG209	1.46	BD136	0.20	BU508A	1.29	FX749	0.43	SGSIF344	10.78	TD41520B	2.48	TD48178FS	4.87
2N2222A	0.23	2SC4517A	2.52	BAG209M	1.27	BD137	0.48	BU508AF	1.32	HA13001	3.05	SL1430	1.92	TD41524A	2.99	TD48180	3.59
2N2369A	0.19	2SC458	0.12	BAG219B	1.76	BD138	0.29	BU508D	1.56	HA13108	2.57	SL1431	2.82	TD415530	4.79	TD48190	2.53
2N3055	0.50	2SC4742	5.11	BAG222	1.70	BD139	0.31	BU508DF	1.88	HA13117	2.05	SL1432	10.17	TD415540	4.12	TD48380	2.93
2N3773	1.52	2SC536	0.30	BAG238A	2.91	BD140	0.24	BU508V	2.40	HA13118	1.88	ST4441C	3.86	TD415570	8.23	TD49503	2.13
2N3904	0.32	2SC8050	0.52	BAG247	1.95	BD233	0.23	BU806	1.93	HA13119	2.05	STK4132H	10.00	TD415580	7.89	TEA1039	2.19
2N4123	0.30	2SC945	0.12	BA718	1.08	BD234	0.24	BU807	0.51	HA13151	13.20	STK4141I	10.23	TD41670A	2.98	TEA2018A	2.29
2SA1013	0.35	2SD1207	0.57	BAT85	0.96	BD237	0.31	BU908	1.68	HA51338SP3	7.63	STK4142H	9.40	TD41675A	3.85	TEA2029C	7.84
2SA1015	0.11	2SD1266	0.82	BAV21	0.21	BD238	0.24	BUK444500B	2.57	HMG251	14.32	STK4152H	10.68	TD41964	1.63	TEA2160	4.26
2SA1015GR	0.11	2SD1275	1.41	BAW76	0.63	BD239	0.33	BUK454600C	2.99	KA2263	0.55	STK463	11.49	TD41968A	2.14	TEA2164	3.40
2SA1020	0.44	2SD1292	0.84	BAK14	0.17	BD243C	0.44	BUK454800A	4.99	KB109	1.42	STK5331	2.87	TD42004	2.57	TEA2165A	0.50
2SA1175	0.26	2SD1397	2.31	BC107B	0.29	BD244A	0.42	BUK455600B	2.54	KAG2120AH	6.15	STK5332	2.82	TD42005	1.83	TEA2260	2.48
2SA1286	0.60	2SD1398	2.14	BC108	0.24	BD244C	0.42	BUT11	0.65	LA1230	1.95	STK5333	15.90	TD42006	1.06	TEA2261	3.84
2SA1370	0.43	2SD1426	3.51	BC108C	0.25	BD433	0.29	BUT11A	0.95	LA4282	4.93	STK5342	4.87	TD42030H	0.86	TEA5101A	6.48
2SA1706	0.50	2SD1439	5.86	BC109A	0.28	BD434	0.31	BUT11AF	1.18	LA4440	3.45	STK5421	5.84	TD42030H	1.46	TEA5115	2.91
2SA608	0.24	2SD1441	5.98	BC141	0.36	BD437	0.20	BUT12A	0.31	LA4700	4.27	STK5471	4.87	TD42040H	4.34	TC1060	0.82
2SA673	0.10	2SD1453	3.05	BC147A	0.24	BD438	0.30	BUT12AF	1.87	LA6350S	0.60	STK5481	0.12	TD42050	0.90	TC225M	1.02
2SA733	0.18	2SD1497	4.74	BC148A	0.35	BD438	0.35	BUT12AF	1.37	LA6700	4.27	STK5482	5.82	TD42050	1.29	TC225M	1.02
2SA769	1.20	2SD1541	4.96	BC157	0.13	BD839	0.57	BUT12AF	1.37	LA6700	4.27	STK5482	5.82	TD42050	1.29	TC225M	1.02
2SA872A	0.35	2SD1546	7.69	BC158B	0.12	BD901	0.52	BUT12AF	1.37	LA6700	4.27	STK5482	5.82	TD42050	1.29	TC225M	1.02
2SA933	0.36	2SD1548	5.95	BC182L	0.14	BD902	0.14	BUT12AF	1.37	LA6700	4.27	STK5482	5.82	TD42050	1.29	TC225M	1.02
2SA966	0.41	2SD1554	3.25	BC184A	0.12	BD939F	1.80	BUT12AF	1.37	LA6700	4.27	STK5482	5.82	TD42050	1.29	TC225M	1.02
2SA970	0.19	2SD1555	2.85	BC184L	0.06	BD765C	1.68	BUT12AF	1.37	LA6700	4.27	STK5482	5.82	TD42050	1.29	TC225M	1.02
2SA984	0.30	2SD1556	5.11	BC184LC	0.10	BF180	0.38	BUT12AF	1.37	LA6700	4.27	STK5482	5.82	TD42050	1.29	TC225M	1.02
2SB1010	0.35	2SD1651	2.30	BC212	0.08	BF154	0.22	BUT12AF	1.37	LA6700	4.27	STK5482	5.82	TD42050	1.29	TC225M	1.02
2SB1143	0.77	2SD1710	2.52	BC212B	0.09	BF199	0.04	BUT12AF	1.37	LA6700	4.27	STK5482	5.82	TD42050	1.29	TC225M	1.02
2SB1243	0.60	2SD1877	2.14	BC212L	0.18	BF224	0.21	BUT12AF	1.37	LA6700	4.27	STK5482	5.82	TD42050	1.29	TC225M	1.02
2SB641	0.21	2SD1878	2.63	BC213L	0.04	BF240	0.11	BUT12AF	1.37	LA6700	4.27	STK5482	5.82	TD42050	1.29	TC225M	1.02
2SB649A	0.77	2SD1884	3.35	BC237B	0.19	BF244	0.13	BUT12AF	1.37	LA6700	4.27	STK5482	5.82	TD42050	1.29	TC225M	1.02
2SB686	2.05	2SD1887	3.58	BC238	0.07	BF245A	0.49	BUT12AF	1.37	LA6700	4.27	STK5482	5.82	TD42050	1.29	TC225M	1.02
2SB698	0.35	2SD1911	5.90	BC238C	0.87	BF245B	0.41	BUT12AF	1.37	LA6700	4.27	STK5482	5.82	TD42050	1.29	TC225M	1.02
2SB716	0.43	2SD350A	1.87	BC307	0.06	BF256A	0.24	BUT12AF	1.37	LA6700	4.27	STK5482	5.82	TD42050	1.29	TC225M	1.02
2SB764	0.30	2SD400	0.34	BC307B	0.15	BF258	0.03	BUT12AF	1.37	LA6700	4.27	STK5482	5.82	TD42050	1.29	TC225M	1.02
2SB772	0.50	2SD401A	0.77	BC308	0.09	BF324	0.18	BUT12AF	1.37	LA6700	4.27	STK5482	5.82	TD42050	1.29	TC225M	1.02
2SB774	1.61	2SD468	0.28	BC308B	0.19	BF391	0.18	BUT12AF	1.37	LA6700	4.27	STK5482	5.82	TD42050	1.29	TC225M	1.02
2SB891	0.60	2SD669A	0.84	BC309C	0.14	BF420	0.21	BUT12AF	1.37	LA6700	4.27	STK5482	5.82	TD42050	1.29	TC225M	1.02
2SB892	0.35	2SD716	1.63	BC327	0.10	BF421	0.24	BUT12AF	1.37	LA6700	4.27	STK5482	5.82	TD42050	1.29	TC225M	1.02
2SC1213	0.14	2SD756	0.47	BC328	0.14	BF422	0.14	BUT12AF	1.37	LA6700	4.27	STK5482	5.82	TD42050	1.29	TC225M	1.02
2SC124	0.48	2SD837B	1.12	BC337	0.14	BF423	0.14	BUT12AF	1.37	LA6700	4.27	STK5482	5.82	TD42050	1.29	TC225M	1.02
2SC1318	0.19	2SD856	0.70	BC338	0.06	BF458	0.31	BUT12AF	1.37	LA6700	4.27	STK5482	5.82	TD42050	1.29	TC225M	1.02
2SC1573	0.35	2SD898B	0.41	BC368	0.18	BF459	0.43	BUT12AF	1.37	LA6700	4.27	STK5482	5.82	TD42050	1.29	TC225M	1.02
2SC1740	0.16	2SD965	0.87	BC369	0.18	BF460	0.48	BUT12AF	1.37	LA6700	4.27	STK5482	5.82	TD42050	1.29	TC225M	1.02
2SC1815	0.17	2SK1118	3.40	BC372	0.40	BF469	0.32	BUT12AF	1.37	LA6700	4.27	STK5482	5.82	TD42050	1.29	TC225M	1.02
2SC1827	0.90	7406	0.84	BC517	0.16	BF470	0.37	BUT12AF	1.37	LA6700	4.27	STK5482	5.82	TD42050	1.29	TC225M	1.02
2SC1959	0.10	7407	0.69	BC546A	0.11	BF471	0.30	BUT12AF	1.37	LA6700	4.27	STK5482	5.82	TD42050	1.29	TC225M	1.02
2SC2001	0.23	74HCO4	0.34	BC546B	0.12	BF487	0.57	BUT12AF	1.37	LA6700	4.27	STK5482	5.82	TD42050	1.29	TC225M	1.02
2SC2023	3.10	7805	0.78	BC547	0.11	BF759	0.38	BUT12AF	1.37	LA6700	4.27	STK5482	5.82	TD42050	1.29	TC225M	1.02
2SC2060	0.30	7808	0.72	BC547A	0.04	BF763	0.23	BUT12AF	1.37	LA6700	4.27	STK5482	5.82	TD42050	1.29	TC225M	1.02
2SC2078	1.00	7809	0.69	BC547B	0.11	BF788	0.52	BUT12AF	1.37	LA6700	4.27	STK5482	5.82	TD42050	1.29	TC225M	1.02
2SC2120	0.23	7812	0.52	BC548	0.06	BF869	0.25	BUT12AF	1.37	LA6700	4.27	STK5482	5.82	TD42050	1.29	TC225M	1.02
2SC2230	0.55	7815	0.82	BC548A	0.11	BF869S	0.48	BUT12AF	1.37	LA6700	4.27	STK5482	5.82	TD42050	1.29	TC225M	1.02
2SC2235	0.36	78L05	0.35	BC548B	0.06	BF871	0.41	BUT12AF	1.37	LA6700	4.27	STK5482	5.82	TD42050	1.29	TC	

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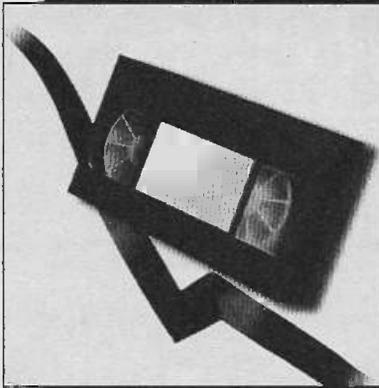
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Reports from Philip Blundell, AMIEIE, Eugene Trundle, Mike Leach, Terry Lamoon, Andrew Tebbutt, Gerald Smith, Steve Hague, John Coombes, George Whiteside, Chris Watton and Michael Dranfield

### **Mitsubishi HSB31**

No rewind was the complaint. The brakes failed to come off as the latch magnet was open-circuit (it should have a DC resistance of approximately 600Ω). The part number for the latch magnet is 299P124010. P.B.

### **JVC HRDX22**

This one caused me to scratch my head for a few minutes before I realised that the Phantom Fiddler had been at work. The symptom was faulty cassette lift operation: the machine would accept a cassette, but something prevented it going fully down.

I noticed that the pin was broken off the guide arm (exploded view reference 47) and was wondering whether the gears had jumped some teeth when I saw that the half-loading arm (reference 49) had two pins! Yes, someone had glued the broken pin on to the wrong arm. P.B.

### **Hitachi VT150**

This machine was nearly ten years old and still going strong – except that its E-E and recorded sound

# VCR Clinic

were quiet and 'buzzy'. Playback of a known good tape was fine. A check on the audio output from the IF module showed that it was weak and noisy. The culprit was a 4.7μF, 35V coupling capacitor (C08) in the module. There's a circuit diagram of this in the manual but no layout picture. E.T.

### **JVC HRJ210**

Intermittent picture jumping was the problem with this machine – for the very good reason that the playback video FM envelope was very ragged at the start of a scan. A check showed that the supply guide was a little sloppy in the V block. The cause of this turned out to be a latching loading arm assembly on the underside of the deck. Its part number is PQ43537B. E.T.

### **Samsung VIK316**

This machine was to all intents and purposes dead. The obvious power supply checks were carried out – fuses etc. – but everything appeared to be in order. Time to get the circuit and check some voltages. This revealed that the always 5.8V supply was low at 3.5V. I decided to replace C35 (400μF, 16V) and C36 (330μF, 16V), after which the machine fired up and worked perfectly. M.L.

### **Mitsubishi HSB41**

This machine came in because of mechanical problems: it needed a new pinch roller assembly and a good grease up. After doing this I tested the machine and found that there was no E-E or record sound. Perhaps a plug had come adrift? No, all the plugs were in place and no dry-joints were evident on the main panel. When I used the scope to trace the path of the audio output from the IF section I found that it

went to the front panel for the headphone take-off. The cause of the trouble turned out to be a dry-joint at transistor Q8B0 on this panel. After resoldering this transistor the machine performed correctly with good audio. M.L.

### **Hitachi VTF770**

If one of these machines shows "CODE -1" in the display when you press the operate button, try replacing C711 (33μF, 6.3V) and C771 (220μF, 6.3V). They are both on the front panel, beneath the display.

I've also had to replace the EEPROM (IC702) when the machine wouldn't change channels after replacing the two capacitors just mentioned. M.L.

### **Matsui VX1000**

According to the customer this machine intermittently chewed tapes and forward search was slow. When we put the machine on test it slowed down after a while. Application of freezer to the capstan motor got the machine going normally again, while warming the motor with a hairdryer shut it down altogether. A new capstan motor was the costly answer. T.L.

### **Mitsubishi HSB12**

The complaint with this machine was that it played at the wrong speed and produced Mickey Mouse sound. Sure enough, that's exactly what it did. When we removed the top we saw that the loading arm was sticking and in the wrong position. This was because the brake pad lining had come adrift from its lever. A replacement brake lever cured the fault. T.L.

### **Akai VSF33**

This machine suffered from the

usual problem: the display was missing. After fitting a modification kit the display was there but was so low that a new display tube had to be fitted to give normal viewing. The machine also needed a new pinch roller. T.L.

### Matsui VP570

This machine would intermittently shut down because the drum stopped rotating. Careful examination of the connector board that runs between the mechanism and the mother board revealed a dry-joint at pin 1. Resoldering this stopped the playing up. T.L.

### Sony SLVE25

There was no playback, just a blue screen. When the machine was put in the visual search mode a picture appeared. On checking out the mechanism I saw that the pinch roller wasn't engaging correctly. I then realised that the pinch roller was too high, because the circlip that should hold it in position was missing. Where it had gone remains a mystery, but a new one cured the fault. Perhaps it had never been fitted in the first place? Strange. T.L.

### Bush VCR802

As the cassette flap had come adrift this machine wouldn't accept a tape. After refitting the lever we inserted a cassette and found that it couldn't be ejected. The tactile eject switch had fallen to pieces. A new switch restored normal operation. Incidentally the deck looks very similar to the one in some Akai models I've seen. A.T.

### Ferguson 3V48, JVC HRD140

These two machines, which have similar mechanisms, had the same fault - they required new loading belts (remember the 3V30?). The 3V48 came back however with the complaint that it would only rewind/wind fast forward in the picture search modes. A plastic lever on the loading block had come adrift - it's used to free the brakes for rewind/fast forward. I can't quote a reference/part number for it as it's not listed as being separate from the loading block. A.T.

### Aiwa VXT1420K

This combined TV/VCR would eject a tape as soon as the loading cycle had been completed (tape fully around the head drum). The cause was failure of the drum to rotate. A new motor restored

normal operation. The mechanism in these units is the same as that used in some Orion VCRs. A.T.

### JVC HRD520

This machine damaged tapes on eject. I replaced the mode switch as usual, but the tape was still a little loose and sometimes caught on eject. The cure was to replace the capstan belt and clean the capstan brake. G.S.

### Finlux VR3724

This machine wouldn't memorise or change channels or tune in properly. A replacement memory chip (IC602) put matters right. G.S.

### Nokia VR3615

Intermittent failure to rewind or leaving tape out on eject was the complaint with this machine. When the fault showed up I noticed that the reel gear didn't come over far enough to touch the reels. Thus no take-up on eject or rewind. A replacement reel gear assembly cured the fault. G.S.

### Samsung SI3240

There was a tape stuck in this machine and the quarter load arm was out of sync with the mechanism. If you get this problem, check the gears and arm for damage, replace any defective parts and align the mechanism. The most likely cause of the fault however is a broken brake trigger spring on the loading motor spindle. So check this as well! G.S.

### Nokia VR3615

The customer complained that there was intermittent loss of the playback or E-E picture. We found that the on/off 5V output from the power supply occasionally disappeared. The cause was dry-joints at Q854. G.S.

### Sharp VCH81HM

There was no play, fast forward or rewind with this machine, which also damaged tapes on eject. A faulty capstan motor was the cause. On closer inspection however I found that C6 (10µF, 25V) was open-circuit and that the leakage from it had corroded the print that links the 12V supply to the motor. I was able to get the motor going again by repairing the print and replacing the capacitor. G.S.

### Sanyo VHR190

There was an odd fault with this centre-deck machine. When rewind was selected it would wind the tape

forwards, though the display said that the machine was in the rewind mode. As we didn't have a service manual, we gave Sanyo a quick call and were told that a forward-reverse switching voltage is applied to pin 1 of the capstan motor drive unit connector. A meter check showed that this was happening. So we were left with the LB1688 motor drive chip as the only possible culprit. Unfortunately it's not available as a separate item. You have to replace the complete motor unit (ouch!). Anyway, this cured the fault. S.H.

### Mitsubishi HSB20

This one gave us a hard time. It was reputed to run slow, refuse to accept commands, eat tapes and in general exhibit some pretty expensive sounding symptoms. After many hours of soak testing the capstan motor seized up. So we fitted a replacement, gave the machine a soak test for several hours then returned it to the customer.

Two days later it came back with the same complaints. After several more hours of soak testing the fault put in an appearance. It transpired that the microcontroller chip was applying a gradually increasing braking voltage to the capstan drive chip. A new micro was the answer. S.H.

### Panasonic NVJ30/35

Poor (noisy) playback, which gives the impression that the video heads are dirty or faulty, can be caused by a poor connection on the lower drum. The solution is to remove the heads and resolder the connections to the lower drum assembly. J.C.

### Toshiba V212

Intermittently poor playback was the complaint with this machine. The fault could be instigated by tapping the head preamplifier. We found that CQ05 was faulty but have also had CQ06 go open-circuit. J.C.

### Panasonic NVJ45

If there's no colour with the machine's own recordings and the drum servo is hunting, check whether the 4.43MHz NTSC switch on the front panel is switched to on. It should be in the off position - the switch should be in the on position only in the dubbing mode. J.C.

### Akai VSF30

Tape chewing with this model is usually caused by failure of the loading block mechanism to seat properly. Replacement of the

loading block unit may be necessary. If it's all right, check the retaining clip. If this is loose the eject gear will jump a cog. The only way round this one is to insert a piece of plastic of the correct size to prevent it happening. J.C.

#### Panasonic NVSD40

This machine wouldn't accept tapes. On checking it we were perhaps lucky to find the cause of the problem first time: there were dry-joints at plug/socket P1506. It's connected to Q1503 (2SB941), which is mounted on the diecast chassis. J.C.

#### Akai V5F200

To cure tape creasing at the top only, replace the pinch roller with the modified type. If the old type with a U-shaped insert and the spring tension on the side is fitted, replace it with the new type. Make sure that you read the modification sheet carefully and set the machine up correctly for an even FM video envelope. J.C.

#### Sony SLV415

There was no picture and a smell of burning. When we took the top off we saw that the drum motor wasn't rotating. It was pulsing instead, but if spun would build up speed. After finding that the motor drive chip was OK (by replacing it) we suspected the Hall chip within the lower drum and, taking the easy course, replaced the lot. The fault was still present however. The cause of the trouble was actually C014 (0.1 $\mu$ F). Failure of C013 or C015 would have had the same effect. It's best to check all three capacitors by replacement. J.C.

#### Panasonic NVG21/25

For intermittent loss of playback colour, check C1023 (1,000 $\mu$ F, 10V) in the power supply. It may be open-circuit or just dried up. J.C.

#### JVC HRD580

There was a line, about 1.5in. wide, across the picture. It looked like a very wide noise bar, the sort of thing you get with poor back tension or a badly worn lower drum. The cause turned out to be a faulty 3.3 $\mu$ F, 50V chip capacitor (C6) on the drum motor PCB. J.C.

#### Panasonic NVSD40

One of these machines gave us a lot of trouble. Sometimes the symptom was tuning drift on one or all channels. Alternatively there could be a flashing or flickering picture

that varied when the tuner/IF panel was tapped. We eventually cured the fault by removing the 0.1 $\mu$ F chip capacitor C706, cleaning the paint mark off the PCB and then refitting it. J.C.

#### Sony SLV353/373 Series

This one comes under the heading "how could I have missed that?" The machine couldn't be switched off and would only play, rewind or wind fast forwards. As disconnecting it from the mains supply and waiting a few seconds had no effect, I started to dismantle the machine to check whether any of the front-panel buttons were jammed on. When I went to remove the rotary control I noticed that the play arrow pointed down instead of to the right. Gently pressing it and rotating it counter-clockwise enabled me to gain full control of the machine.

The culprit turned out to be the customer's granddaughter. This 'fault' could be an ideal way of keeping a toddler amused: by inserting a favourite tape and selecting continuous play. G.W.

#### Toshiba V110

The tape would load but the pinch roller wouldn't engage. The machine would then go to standby. When the tape was ejected we noticed that the drum was rotating too fast. A check at BT33 (drum PG/FG in) showed that the waveform was missing. This is the drum tacho – a squarewave should be present here. The optocoupler on the drum motor PCB had failed. C.W.

#### Panasonic NVJ40

The customer complained that when he used this machine in the visual search mode all he got was a blank screen. Various checks were made, which brought us to the lower drum. This seemed to be worn. If the tape tension in the search mode was increased the picture reappeared. As the drum unit is so expensive we tried to revive it by polishing with Brasso and Duraglit. Needless to say, the lower drum soon found its way to the bin. A new drum restored perfect operation. C.W.

#### Samsung VI7220

This machine did everything it should but the pictures were poor. So something was amiss. As the machine was loading I noticed that a kink appeared in the picture. This gave me a clue as to where the cause of the trouble lay. A check on the power supply's outputs quickly

took me to C102, which had dried up. C.W.

#### Hinari VLX10

This machine worked in the E-E mode, but when any tape function was tried it started up then reverted to standby. The cause of the trouble was traced to bridge rectifier D502 on the power supply PCB. C.W.

#### Philips VR727

Failure to load, with mechanical noises, should lead to a check on the pulley shaft that transfers the loading motor drive to the deck. The small plastic cog at the end splits and just spins on its shaft. To replace it you have to remove the capstan motor, the loading block, the deck and the cassette housing. The part number is 4822 528 81462 – it's item 47 in the exploded view. This is the only item that's available on its own. All other deck components are supplied in kits. This applies with all Turbo deck VCRs. M.Dr.

#### Hitachi VTM722

Fuse F852 in the power supply had blown. Checks showed that there was a dead short across the 12V rail. Many items were disconnected before we found that the RF booster was the culprit. A splash of solder was shorting out two pins. M.Dr.

#### Sharp VCM60

We'd sold this top-of-the-range model some ten months previously. It came back dead, and on inspection we found that the 4.7 $\Omega$  surge limiting resistor R904 was open-circuit and the 2SC4231 chopper transistor Q901 short-circuit. Replacements brought the machine back to life, but we noticed that heat had discoloured the PCB below Q901. So we decided to fit a small heatsink to it. An old Ferguson 9000 chassis sound output transistor heatsink proved to be an ideal fit. M.Dr.

#### Samsung VIK326

This machine would power up then return to standby. In fact it did this so quickly that we didn't have time to carry out any checks in the power supply. So we placed a short-circuit across the collector and emitter of the power control transistor Q158, thereby keeping the supply lines switched on. In this condition we found that the 5V supply was low at 3.5V. The culprit was the 8V supply's smoothing capacitor C35, which had dried up. It's a 470 $\mu$ F, 16V 105°C electrolytic. M.Dr.



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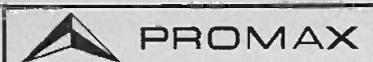
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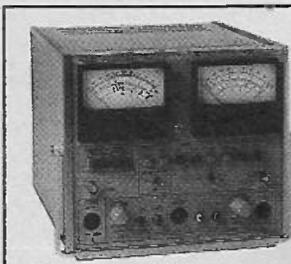




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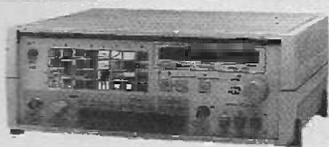


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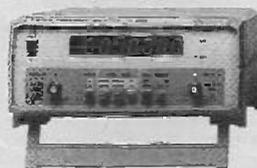
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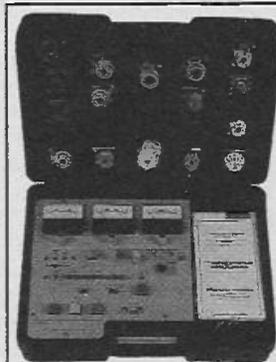
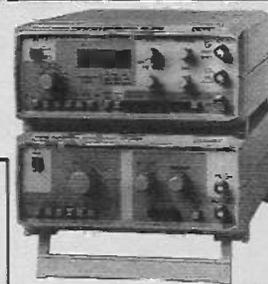
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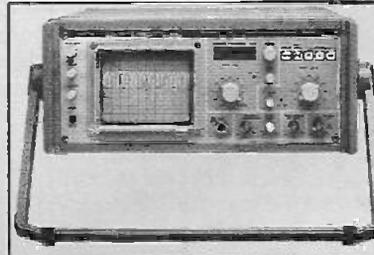
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# What a Life!

## Donald Bullock had a hard time with son Steven's oddball clientele while Steve was away on holiday in Greece

I've had a terrible time while son Steven has been away on holiday somewhere in Greece. Before he went he wired his soldering iron to the front of the bench. Since I don't walk like a German, I kept getting my foot caught in its long lead. He's nothing like as intellectual as I am – follows Greeneyes I suppose – and seems to encourage thickheads and oddballs just for the laughs. For the last fortnight they've all converged on me. I've had about enough, I can tell you.

### Drop of Solder, Please

The first was Norman Kneejerk, the happiest sap I know. He called last Monday morning, when it was raining hard. I'd just caught my foot in that cable again and upset my tea down my shirt when he marched in with a Panasonic TX2 television set in his arms and a screwdriver in his

mouth. Since he's a walking warehouse of jokes that make you cringe, I decided to get rid of him quickly. I shook the tea off my cuffs and pulled a job card towards me.

"Mornin' sunshine" he bawled, "likes your drop of tea then."

He plonked the set down. "Bunches into lines when it's hot. But have no fear – Norman's 'ere." That was followed by a peal of insane laughter.

Then he slipped the back off the set and pointed to the line driver transformer T531. "This 'un's dry-jointed" he blared. "Drop a bit of solder on his legs, will you?"

I did as I was told and he quickly reassembled the set, put his screwdriver in his mouth and swept out.

### Liney Pictures

After changing my shirt I returned to see the postman arrive. "Duck" he said. I looked around me then saw that he had left the post. Electricity bill. Gas bill. Rates . . . And they're big money nowadays. As I stood nursing my misery, a thin dark cove with bright eyes pranced in nursing a Panasonic VCR. He smiled and pointed at me.

"Super forehead" he said, "but it's being liney." I decided to ignore the jibe and drew up a job card.

"Name?" I asked.

"Ramonshab Habeshamwee-Skwy!" he smiled.

I put my pen down. "Pop in tomorrow" I said.

The machine was in NVJ45 – Super 4 head. I tried it in the E-E mode and the picture was terrible – all lines and interference. Then I played a tape. The results were even worse. Was there one fault or two?

I decided to concentrate on the E-E fault symptom first and approached the power supply with

the hairdryer. A single blast at C27 (330µF, 10V), the slyest looking electrolytic I could find, made the picture much worse. A blast of freezer improved it. The same applied with the playback picture. Our meter said C27 was OK, but a replacement cured the trouble.

### A Dead Maspro

Then a lanky misfit sauntered in. He looked like a dyspeptic question mark. "Where's Steve, mate?" he asked.

I looked behind me, then at the questioner. "Greece" I said.

"You any good?" he asked, producing a Maspro SRE250S satellite receiver. "Cos this 'un's dead, mate."

He was just too much. I waved him out and opened the Maspro. It's identical to the Pace PRD800, and as usual required a full rebuild on the primary side of the power supply.

I reached for the usual bits and replaced the TEA2018 chopper control chip U1, the BUT11A chopper transistor Q1 and the various capacitors and resistors. After this it sprung to life. I wondered what sort of kit would be required to get its owner right, and decided that a ten-year spell in the army might be a good start – but tough on them.

Just then my journalist daughter Rebecca popped in. "What's a spin doctor, dad?" she asked. "Dunno" I said, and she fled.

### Sprained Wrist

The next caller looked like a sprawling birthmark. As though he'd been bleached then unsuccessfully dyed strawberry pink. He had a couple of feathers in his ginger hair and was clutching a Matsui 209T TV set.



"Hwahna hwuppnah hweep chwah" he said. His guttural voice made Jimmy Knapp sound like a falsetto. I looked at him and passed him a job card and a pen. "I've sprained my wrist" I said.

He picked up the pen, shut one eye, pulled his mouth open and wrote "Herb McHaggis" and a phone number on the card.

When he'd left I pulled the set on to the bench and tried it. The picture was good, apart from a bright line across the centre - like field collapse superimposed on a normal picture. The set has a discrete-component field output stage, with complementary pnp and npn transistors.

"What causes that bright line?" asked Greeneyes.

"The spot that writes the picture is writing two lines in the same place before carrying on." I said.

"Why?" she asked. "Well, one transistor writes the top half of the picture, then the other takes over to write the lower half." I said. "There's a bit of a problem where they meet, and while it's waiting for instructions the spot is hanging about and writing away out of cussedness."

I spied a 10 $\mu$ F, 50V bootstrap capacitor nearby (C302). Now I don't like low-value, high-voltage electrolytics. Their crime rate is high. This one added to it. Its value had fallen, a replacement curing the fault.

### The Mouse

A bit later Nick and Doris came in. Doris and Greeneyes went into a huddle and Nick dived his hand into his pocket.

"I've brought you my mouse" he said. "Perhaps you can do something with it. It won't work."

I looked at him. Didn't even know he kept mice, let alone working ones. Then he produced this computer mouse.

When I looked inside I saw that there were three tiny, round pressure switches. They were sticking. I picked up an old VCR front that used identical switches. When the faulty ones had been replaced the mouse was OK.

"That's clever of you" Nick said. "You know I recommend you all over our club."

As they were leaving Nick pointed to the sun blind above the shop front. "There's a big belly of rainwater up there" he said. He picked up the sweeping brush and pushed the blind up - just as McHaggis came to collect his set.

He collected the deluge first.

"Hrupplahnnoop. Kwaaahahruppnah Twoen hwopper" he bellowed. "Ai cannah fwalpren. Bluddahwhall sokenwhait!!"

"Sorry" said Nick, skipping off.

### Crackles and Flickers

A huge old car pulled up. The Reverend Goode clambered out, hugging a Panasonic NVL20 VCR.

"Good to see you, Donald" he boomed. "You've met Curate Blande before I think . . ."

"Er, good to see you" said the Curate, three octaves higher.

"Crackles and flickers like the devil" bawled the Reverend. "Not the bally Curate, the set!"

"Like the . . . er . . . devil" said the Curate. ". . . the set."

"Always did, mind, but it's intolerable now" the Reverend continued.

"Intolerable now" squeaked the Curate.

The E-E picture and sound were unstable, and touching the PCB almost anywhere made it worse. I took out the tuner subpanel, resoldered some very dry joints, then reassembled it. The fault was still present. Further tapping and flexing took me to the RF demodulator can. There were a couple of poor joints inside, but resoldering them made no difference.

Then I noticed a ribbon of fifteen conductors that connected the main PCB to the clock/control panel. It was connected to the main PCB directly, but was connected to the front panel via a plug and socket arrangement. Or rather half connected. The plug wasn't pressed fully home, and its covering of dust showed that it never had been. Pressing it home cured the trouble.

### James's Problem

As I was boxing up the Panasonic VCR unit son James came in, looking a bit down in the mouth.

"The disc drive motor in my Amiga A500 computer seized last night" he said. "So I took the computer to my room and carefully removed the motor assembly. It's mounted on a 9 x 7cm PCB, with its metal backing plate, and there's a sync magnet attached to the rim. I slid the disc platten off the motor shaft, placed it carefully on a keyed drawing on the desk, and took the motor to the workshop to clean and lubricate it. The motor's all right now."

"Good" I said. Then he told me

the bad news. While he was in the workshop Greeneyes had gone into his room, seen the mess on his desk and tidied it up. The platten and keyed drawing were separated. So far his attempts at achieving the correct reassembly position have been unsuccessful. The motor spins, but fails to boot up the disc and stops.

Does anyone have any alignment information? Or perhaps someone has a surplus replacement motor panel assembly or replacement disc drive?

### Jammed Switch Mayhem

My last tussle of the day was brought in by Phyllis Puke. It was a 20in. NEI set, Model 2051R.

"There can't be much wrong with this set" she announced, "it's almost new. My husband always reckoned it to be a loose wire or the valve. He's dead, that's the problem."

"I'm sorry to hear that" I said, "er, what happened?"

"Dunno" she said, looking at the set. "He was OK last night. When I tried him today he was just dead. Can you get him right by tomorrah?"

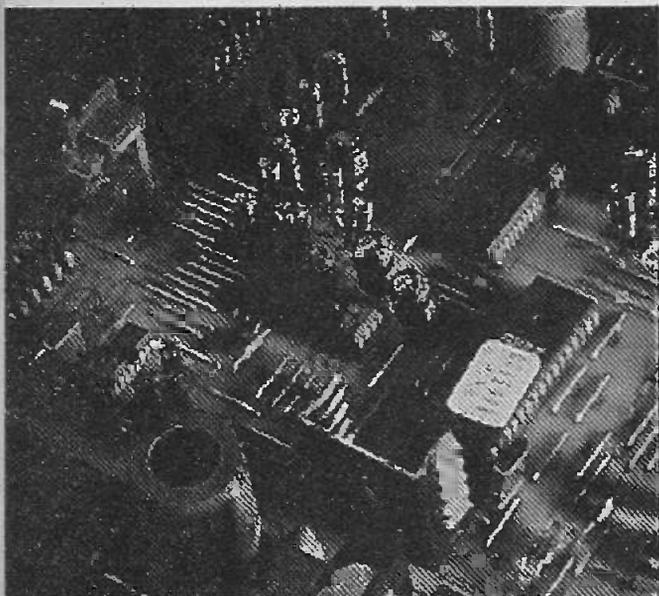
I waved her out and pulled her set on to the bench. If I pressed the on/off button enough to close the mains switch, but not enough to short the pulse contacts, the set went into standby and couldn't be brought out by either manual or remote control. If I pressed the switch in all the way there was a rustle of EHT but nothing appeared on the screen.

I marked the position of the first anode preset carefully, then turned it up. A milky raster with pronounced flyback lines appeared. Then I noticed that a button on the front panel was jammed in the on position. It was the 'select' button, for colour, brightness etc., and was made of flimsy plastic. By jamming in, it had disabled the micro-controller chip. I found a better replacement in our junk box and this cured the trouble.

I boxed the set up and, as I was putting it down, caught my foot in Steven's loop of soldering iron lead. The hot iron flew up and I did an impromptu juggling act with it and the set as the phone rang and rang. When I picked it up it was Steven calling from Greece.

"I've had a terrible time" he said. "It's been raining every day. I've never seen so much."

A wicked smile creased my face. "Good!" I bellowed, "good, good, good!!"



# Satellite Notebook

Reports from Chris Hawkins, Philip Blundell, AMIEIE and Hugh Cocks

## Cambridge ARX200

If the mains fuse has blown, check the MA2810 hybrid switch-mode regulator chip U14. The internal chopper transistor has its base, collector and emitter connected to pins 3, 2 and 4 respectively and can thus be easily checked for shorts. C.H.

## Grundig GIRD3000

"Decoder not working" was the complaint with this receiver. It was very reluctant to come out of standby at power up, though it did after a few minutes. Reception of clear channels was OK, but with VideoCrypt ones the picture didn't clear and there were no "insert card" etc. messages.

A check on the outputs from the power supply showed that the +5V rail was low at 4.5V and had at least a volt of ripple on it. C25 (2,200µF) had dried up. To avoid future problems I replaced the capacitors in the other 'hot spots' as well. P.B.

## Lightning Strikes

We had a call to a Pace MSS100 following a thunder storm. A tree 100m away from the house had been struck by lightning, and after this the receiver wouldn't come on. The LEDs on the front panel were all out, and the terrestrial TV signals didn't pass through the modulator module, though plugging the aerial into the TV set directly produced good pictures.

I removed the satellite receiver's lid and checked the mains fuse FS1, the 10Ω surge limiter resistor R1 and the TOP202 chopper device. All were OK. When I reconnected the receiver to the mains supply it powered up normally. The TOP202

seems to be able to shut itself down where necessary, an admirable feature!

The same storm produced a call to a Pace MSS500. The customer knew that it was wise to unplug his receiver when lightning was around, but had been keen to listen to the end of The Archers on Radio 4. The strike had taken out the telephone and burglar alarm, though the TV set worked when the aerial was connected to it directly.

The inside of the MSS500 looked innocent enough – a very slightly blown mains fuse appeared to be all that was wrong. The chopper control chip U1 was producing drive, and the chopper transistor Q1 measured OK. So I refitted Q1, replaced the fuse and switched on. Several of the reservoir/smoothing electrolytics exploded, which was an unnerving experience to say the least.

Further checks showed that optocoupler U2 appeared to be open-circuit on its secondary side, thus removing the regulation feedback to the primary side of the circuit. In this situation the power supply outputs appear to go sky high.

The lightning must have hit the dish and struck the receiver via the feeder rather than the mains supply – the LNB had also died, lending weight to this theory.

As the receiver was a write-off, I thought I would find out how high the power supply's DC output voltages could rise with no feedback from the secondary to the primary side of the circuit. The chopper part of the circuit was still working of course.

I disconnected all the rectifiers on

the secondary side of the circuit except the one for the 5V supply, then connected this rectifier to a 400V electrolytic capacitor. As the 5V rectifier was intact I left it – ideally it should have been replaced with a higher voltage type.

When power was applied I obtained a reading of 100V and hurriedly switched off! Surely some form of overvoltage trip could have been included at minimal extra cost?

The owner decided to keep the MSS500 as a 'dummy' – he's away a lot. If someone steals it they will be in for a surprise! H.C.

## SVA1 Sky Decoder

This old decoder displayed the message "your card is invalid" even when there was no card in the slot. Diagnosis is fairly easy. Disconnect the mains power from the unit, insert a card in the slot, reapply the power and a picture should be seen. But when the card is removed the "invalid" message will return and remain even when the card is reinserted.

On removing the top of the card reader you'll see two contacts at the rear. They are pushed open-circuit when a card is inserted in the slot, and should make contact when the card is withdrawn. Otherwise "your card is invalid" will be displayed. Cleaning the contacts should restore normal operation. As they are normally open-circuit, with a card in the slot, they become oxidised.

If operation seems to be intermittent after cleaning the contacts, replace the card reader. Sometimes the card contacts don't make good connection – pushing down on top of the card reader brings a picture back. We've had a

couple of cases where something has been forced into the slot violently, bending the contacts beyond repair – and usually ruining the user's card when it is reinserted.

I normally use an old viewing card for initial decoder tests. If everything is OK, the message displayed will be "your card has expired". It's all too easy to destroy a current card accidentally when working on a decoder. **H.C.**

### Motorised Dish Systems

A common problem with motorised systems is poor dish reset accuracy after a few years' use, i.e. the dish doesn't return to a satellite position precisely each time. Modern receiver/positioners get round the problem by means of an autofocus system, which uses a kind of AGC arrangement for final control of the dish drive so that the dish settles at the highest signal strength position with each change of position. With an autofocus system you will, when the dish mechanics are poor, be warned by the receiver when storing a new channel (this applies with an MSS500/1000 motorised system anyway) that the dish position is not the same as that in the receiver's memory, though you can continue storing channels with no ill effects.

The first and most obvious thing to check is that the nuts and bolts that secure the actuator to the dish mount are secure. This is often the cause of the problem.

In stubborn cases, replace the actuator. In a recent case where various dish resetting troubles occurred with a Drake ESR250 receiver/positioner a new actuator solved the problem.

I think that the main trouble is often to do with the motor movement sensing system, which generally uses a reed switch and rotary magnet. But in view of the fairly low cost of a new actuator, it's not worth replacing these items – the cause of the problem could as well be the gearbox mechanics.

Some older actuators require frequent oiling to prevent them becoming excessively noisy. Modern ones are better in this respect.

When replacing the motor, ensure that the dish movement sensor and motor drive lead pairs do not get mixed up – a reed switch doesn't appreciate the motor voltage being across it at all!

Don't forget to set the mechanical limit switches in the motor box. The west limit is normally with the

actuator nearly closed. We usually set the east one just beyond Astra (Turksat at 42°E is not available in this part of Europe).

Don't just rely on the positioner's electronic limits. Some years ago the first Connexions 8520R receiver/positioners had no electronic motor limits, relying solely on the installer to set the limits at the motor. After a power failure the dish would always move 10° or so by itself. This would confuse users no end. After rekeying the satellite via the remote control, the dish would happily return to where it should have been.

In one case the installer hadn't bothered to set the motor limits and the dish was fairly near a wall: the actuator worked well, driving the 1.8m dish so hard against the wall that it was a write off. Needless to say, electronic limits were introduced with later production of the 8520R. **H.C.**

### Cable Trouble

I recently received a call for help from someone with three 1.2m prime-focus dishes with magnetic polarisers. The dishes were all looking at Astra, as the owner had been told by the installer two years previously that "this was the only way to connect different types of receiver".

Dish no. 3 was used less than the others, being linked to a part of the house used only in summer. It had been disconnected all winter. The receiver worked for a few hours, after which it provided reception of only the higher-frequency channels – above 1,500MHz. Similar results were obtained when one of the other receivers in the house was connected up.

The owner was keen to upgrade the system and run all the receivers from a single dish for Astra, using one of the other dishes for Eutelsat at 13°E. This was going to mean installing a 'magic switch', a dual-output LNB and supplying some new receiving gear, to say the least. Since this couldn't be done on the spot, and the customer was keen to have reception that evening, I removed the suspect LNB from the dish. It was no great surprise to find that it was corroded inside, water having entered via the bare F connector during the winter.

I replaced the LNB (the magnetic polariser DC resistance reading was correct at about 100Ω) and was rewarded with good pictures across the entire IF band. After about half an hour however the signals became

## Viewing Card Problem

We've had several cases of intermittent VideoCrypt decoding recently. The decoding fails for a few seconds every minute or so then returns to normal. After spending a lot of time on the problem the first time we had it we discovered that the viewing card was the cause. In every case it has been subjected to excessive heat because the decoder-receiver was enclosed in a TV cabinet with glass doors.

Decoding often seems to cease with pictures that contain a large white area. This tends to raise suspicions about the level and quality of the video input to the decoder. **H.C.**

very erratic at all frequencies. Since the LNB and the receiver had been changed, the only thing left was the cable. Connecting a new run proved the point. When the original cable was cut back for the first few metres, evidence of corrosion was revealed. It's essential to cover F connectors with self-amalgamating tape at least, and if possible use a cover to protect the LNB from the elements. **H.C.**



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# HELP WANTED

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

**Wanted:** LOPT for the Pericom 7800 terminal CP/M microcomputer system, or rewind of existing transformer. Alan Kilby, 3 Silkmill Row, Eckington, Worcs WR10 3AT. 01386 750 474.

**For disposal:** SM111 18MHz dual-trace portable scope with two x10 probes, x1 probe, cables and service manual, £65. Avo Model 8 Mk III with leads and leather case, £35. Avo EM4 electronic testmeter with leads, x10 multiplier and handbook, £25. Or £110 the lot. All in excellent condition and performing to specification. To collect. G.M. Kitchen, The Nook, The Butts, Colyton, E. Devon EX13 6NU. 01297 553 301.

**Wanted:** Aerial and RF rear tuner input box and remote handset for the Akai VS467EK; remote handset (type V803B) for the Akai VS301EK. Have for disposal working panels for the Ferguson 3V23 and a Philips VR6460 with a power fault. R. Bruce, 11 New Zealand Way, Rainham, Essex RM13 8JP.

**For disposal:** Quite a lot of memorabilia. Copies of *Television* back to 1974 almost complete to 1989 and a few copies to 1992. Hunts capacitance bridge, Advance signal generator, Beamax tube tester, *Trader* service sheets, valves, etc. Anyone interested should phone 01543 491 695. John Bates, Armitage, Staffs.

**Wanted:** Copies of *Television* from 1990 on, also books on TV faults. Arthur Norton, 17 Portland Avenue, Seaham, Co. Durham SR7 8AN. 01915 813 775.

**Wanted:** An IMI Polar II rotary UHF tuner or any other type of rotary UHF tuner converted to feed TV sound to an FM tuner. John Lawless, 71 Langdale Avenue, Mitcham, Surrey CR4 4AJ. 0181 646 0002.

**Wanted:** Service information for or someone with repair experience of Nufax teletext adaptors. Phil Blundell, c/o Television, Quadrant House, The Quadrant, Surrey SM2 5AS. 0181 652 8120.

**Wanted:** Circuit diagram (photocopy OK) for the Bush CCD5500 car CD player, also a Sony CXD1130Q IC. Paul Ewers, 12 Brae Hill, Brill, Bucks HP18 9TF. 01844 237 131.

**Wanted:** Back issues of *Television* from 1990 to 1993 inclusive. R. Oldfield, 103 Leeds Road, Harrogate, Yorks HG2 8EZ. 01423 870 172.

**Wanted:** Circuit diagrams for the Sanyo VTC5300P VCR, particularly the loading circuits. J. Abram, 11 Derwent Gardens, Ilford, Essex IG4 5NA. 0181 550 8546.

**Wanted:** LOPT for the Panasonic Model TC492EUD, or its TLF number. M.P. Nalletamby, 57 Upwood Road, Lee, London SE12 8AE.

**Wanted:** Front control panel for the Fidelity 51TRS TV set, or source of this item. Have Sony VO2860P U-Matic VCR for disposal - offers or exchange please. Service TV, 18 Benfleet Road, Hadleigh, Essex SS7 1QB. 01702 558 444.

**Wanted:** User's manual or channel tuning

set-up procedure for the Sharp 21BN21 multi-standard TV set. Dennis O'Sullivan, Inniscarra, Nursery Hill, Ansley Common, Nuneaton, Warks CV10 0PY. 01203 397 886.

**Wanted:** Circuit diagram (photocopy OK) for the Hikona RM2000 colour TV receiver. J. Naughton, 40 Gala Crescent, Wishaw, Strathclyde ML2 7JR.

**Wanted:** Lens assembly for the Panasonic NVM1 video camera. R.J. Hughes, Glandy, Dinas Cross, Newport, Pembro SA42 0XP. 01348 811 255.

**Wanted:** TCM1705A and TCM1512P ICs. Also a photocopy of data on each would help. Peter Ward, Petgra, Forest Corner, Ringwood, Hants BH24 3JW. 01425 475 445.

**Wanted:** Data sheet or any other information on the TDA3300B colour processing chip and Secam adaptor for the Rediffusion Mk 4 chassis. Paul Eaves, 51 Victoria Road, Garswood, Wigan WN4 0SZ. 01942 273 883.

**Wanted:** Cassette deck for the JVC 5DD stereo cassette player, or a complete unit. J. Austin, 5 Cranwell Road, Greasby, Wirral L49 3PP. 01516 779 048.

**Wanted:** Circuit diagram for a Portavision 5in. monochrome TV set. Circuit diagram or user manual for an Excelerator DSZ6EVTH409 5-25in. disc drive made in Taiwan. Or photocopies or source of this information. G. Cannon, 16 St. Cuthbert's Road, Holy Cross, Wallsend, Tyne and Wear NE28 7JF. 01912 620 712.

## Answer to Test Case 407

- See page 17 -

When servicing TV sets - and many other things, which include ailing people! - an apparent but temporary cure can often be achieved by treating the symptom rather than its true cause. This is what had happened with the Hitachi C2118. Plainly the HT voltage was not stable, rising erratically, sometimes to a point at which the set would trip, sometimes to a level at which the protection zener diode would be destroyed. The extreme setting of the HT preset VR901 should have indicated to Cathode Ray that something else was wrong, especially when ZD902 and Q905 had been replaced with little effect.

In a case like this it pays to bear in mind that drift in either the reference or the sample voltage applied to an error detector/amplifier transistor will affect its output. The cause of the problem here lay in the sampling voltage circuit. R909, one of the resistors in series with the preset control, had become both unstable and high in value. When it was checked the resistance reading was closer to 47kΩ than the correct 39kΩ, and the reading was erratic. Ted supervised the fitting of a replacement 39kΩ, 0.5W resistor, which restored the mid-travel setting of VR901 for the correct HT voltage of 112V - and a steady picture.

What about Warner Rogers? He was making a largely academic point, as was his wont. Any such device operating above 7V is, he declared, an avalanche diode. "He theorises about them, while we actually mend them" commented Ted.

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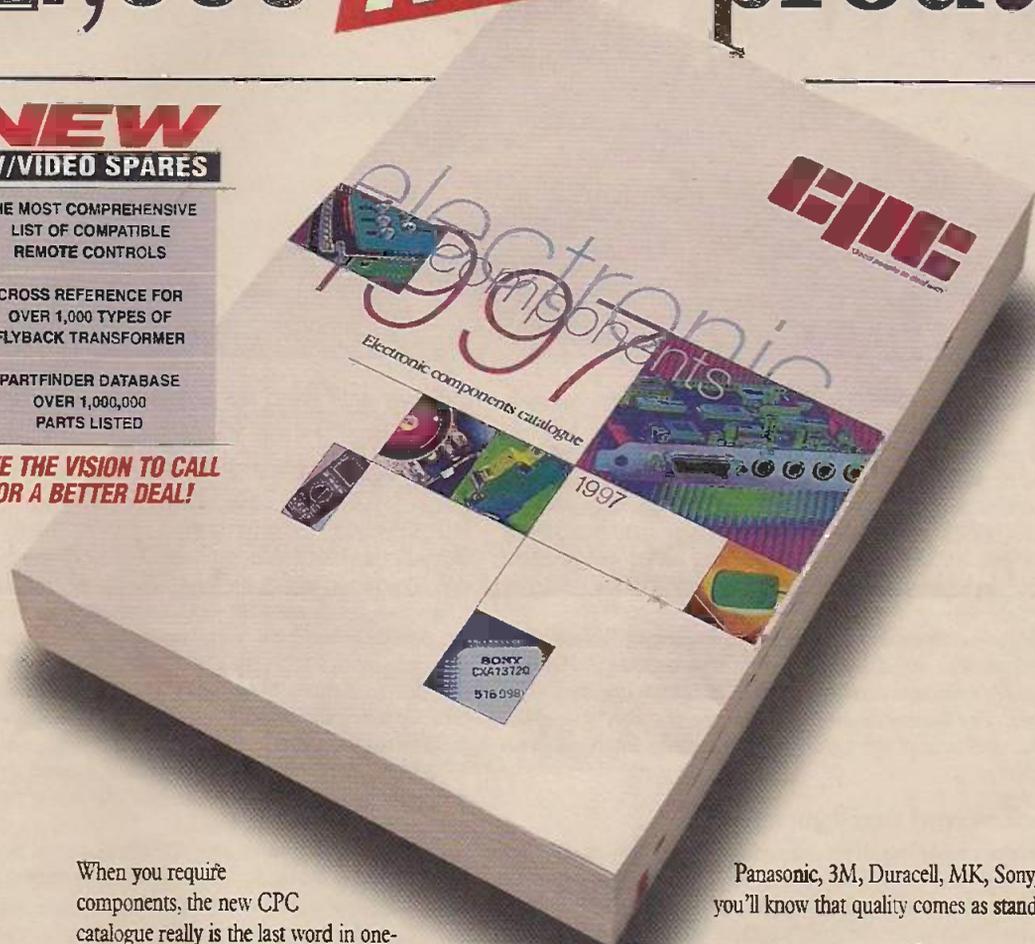
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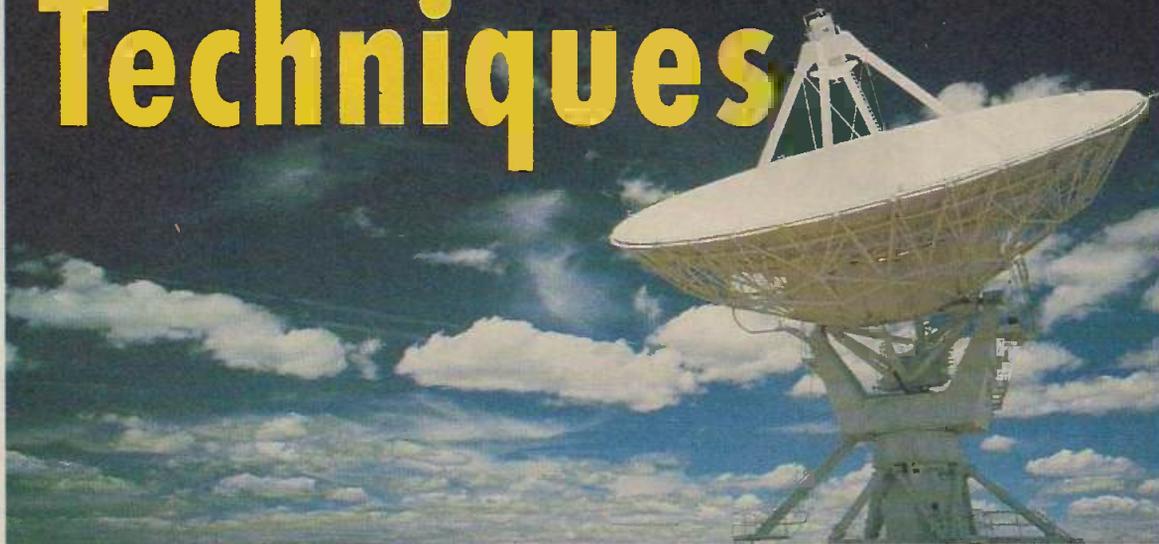
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# Dish Drive Techniques



## J. LeJeune describes the technology used in the Pace MSP200 dish-positioner unit

The Pace MSP200 dish positioner will operate as a slave unit in conjunction with many Pace satellite receivers and their equivalents in other ranges and can also be used as a stand-alone unit. Three configurations provide operation with Pace MSS series receivers, Models PRD800/900 and MRD950/960; earlier models like the SS9000, SS9200 and MRD920; and as an independent unit. There are two versions, with or without a polariser module.

When used in conjunction with a compatible satellite receiver the MSP200 receives instructions from the receiver's microcontroller chip via an interconnecting scart cable. The connection is between the receiver's decoder scart socket and the positioner's receiver interface scart socket.

### Modes and Configurations

The positioner has three operational modes, two of which are used only for initial setting up or if changes are to be made to the satellite line-up. The 'set-limits' mode is used immediately after the dish actuator's limit switches have been set and before any other parameters are entered. The 'program' mode is then used to enter the satellite position data and skew (if used). For everyday operation the positioner will be in the 'normal' mode, to which the unit switches each time it is powered up from standby.

Of the three configurations provided, Config 1 is

available only when the unit incorporates the polariser control circuitry.

### Controlling the MPS200

Data is sent to the positioner's own Z8 type microcontroller chip from the receiver's microcontroller chip via the scart cable interface. For MSS series receivers and their equivalents the code consists of eight bits, the first seven being used for the satellite number (1-64) while the eighth is used for polarisation control (horizontal or vertical). With PRD series and MRD950/960 receivers the 8-bit code denotes the satellite number only: as all eight bits are used, the satellite numbers can be from 1 to 128. With earlier models such as the SS9000, SS9200 and MRD920, seven of the eight bits are used to pass the program number to the positioner, allowing satellite numbers up to 90 to be used.

Thus Config 1 passes satellite number and polarisation information, Config 2 passes satellite numbers only and Config 3 passes program numbers only.

### The Power Supply

The MSP200 contains a straightforward power supply (see Fig. 1) with a mains transformer and two bridge rectifiers. Low-voltage outputs are obtained from the toroidal mains transformer T1. These are 36V for motor drive via relays and a 12V supply. The 36V supply is isolated from the rest of the receiver to ensure that no harm can come to the positioner's circuitry should a wrong motor connection be made. The 12V supply is unregulated, but an LM340T5 regulator is used to derive from it a 5V line for the processing sections of the unit.

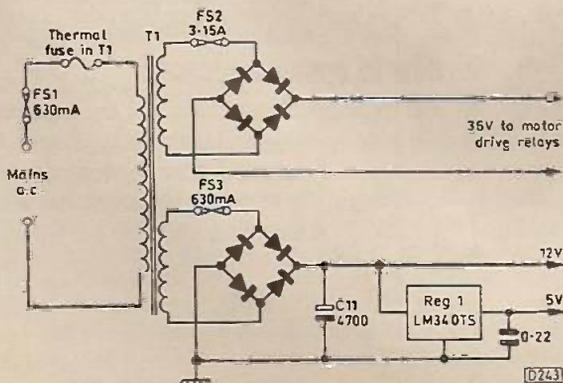
Relays are used to switch and reverse the motor drive supplies. When the relays are de-energised their contacts short-circuit the motor to provide dynamic braking.

### The Microcontroller

The Z8 microcontroller chip U1 (see Fig. 2) oversees all the positioner's functions. Commands can be entered via infra-red remote control. There is also a more limited set of commands available via front-panel keys.

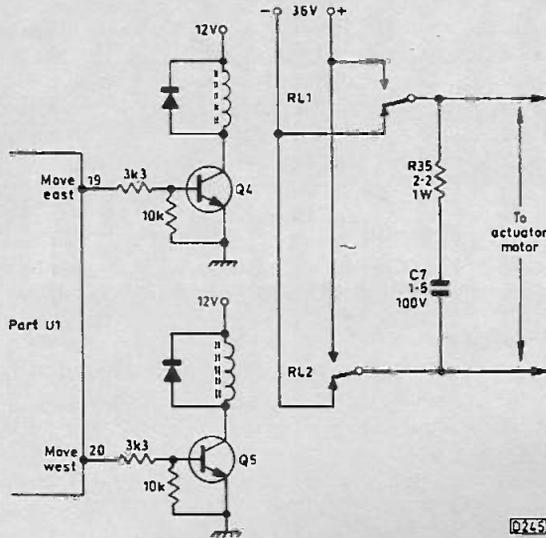
The infra-red commands are received by IR1 and are passed to pin 39 of U1. The front-panel standby on/off

Fig. 1: The power supply circuit used in the Pace MSP200 dish positioner unit.





**Fig. 3: The motor drive circuit.**



three common-anode indicators.

Four individual LEDs to give mode indication (normal, program and set limits) and IR receive are fed via buffer/driver amplifiers U4A, B, C and F. They are controlled by pins 16, 17, 18 and 4 of U1 respectively.

The remaining section of U4 (D) is used to invert the reed switch pulses from the actuator assembly. Diodes D3 and D4 at its input clip any transients from an actuator motor with a 'sparky' commutator or static picked up by the cables as a result of storms or local fields. To cater for a photo-interruptor type of pulse generator, 5V is available at the red connector on the unit's rear terminal block.

**Motor Drive**

The motor drive arrangement is similar to that used in the MSS501IP module described last month. Fig. 3 shows the circuit. For eastwards dish movement pin 19 of U1 goes high, switching Q4 on to operate relay RL1. The contacts change over and 36V is applied to the motor. For westwards movement pin 20 goes high. Relay RL2 operates, applying the motor voltage with reversed polarity.

R35 and C7 are included to provide transient limiting – important since the motor is an inductive load.

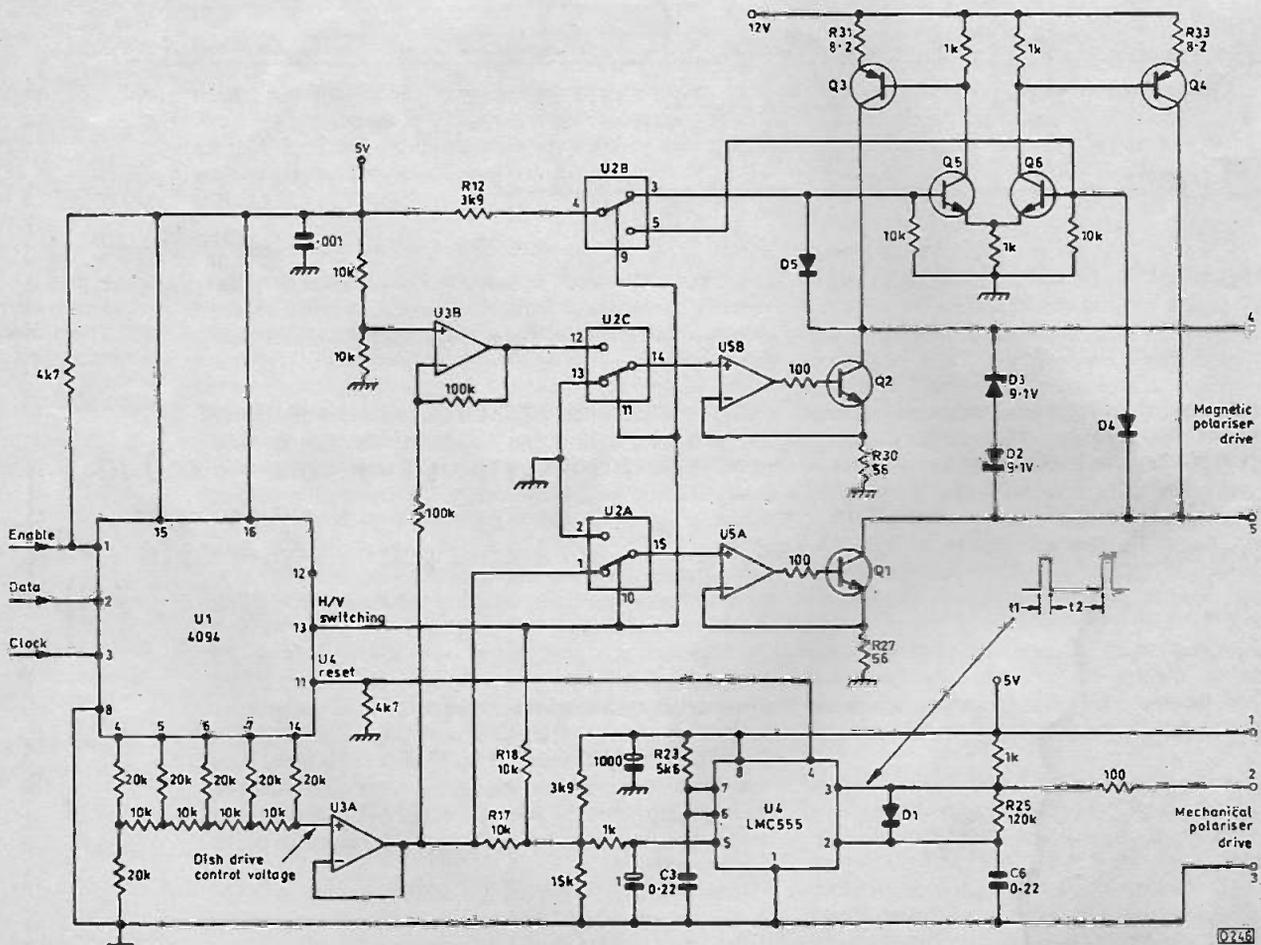
**Polariser Drive**

Fig. 4 shows the polariser drive circuit, which can control either a magnetic or a mechanical polariser. The control chip on this separate PCB has the same circuit reference number U1, but is type 4094 (shift register) instead of type Z8. Commands are sent to U1 from the Z8

U4E inverts the pulses for feeding to pin 5 of U1. This data is used primarily for automatic dish positioning by reference to the satellite or program number, but in Config 1 polarisation information can also be sent to the unit using the last bit of the 8-bit code.

U1 also drives the three seven-segment LED indicators on the front panel. A multiplexed drive from pins 21-28 is passed via the eight-channel driver chip U3 to the cathodes of the LEDs. Three strobe lines (pins 13-15 of U1) drive switching transistors Q1-3 which supply the anodes of the

**Fig. 4: The polariser circuit, which can be used to drive a magnetic or mechanical polariser.**



chip in serial form: pin 1 receives an enable signal, pin 2 the data and pin 3 the clock signal.

The resistive ladder network connected to pins 4-7 and 14 forms a digital-to-analogue converter whose output is buffered by U3A.

Voltage-to-current conversion is required for the magnetic polariser drive. Operational amplifiers U5A/B provide this conversion, the following output stages providing a current swing between -80 and +80mA. U2A and U2C control the current switching, with U3B providing inversion for reverse drive.

Pin 13 of U1 provides the H/V switching level to control U2A and U2C. At the same time U2B is switched to provide forward or reverse current drive.

If pin 13 of U1 goes high, U2A selects the input at pin 1 – the non-inverted output from U3A – and U2C selects the input at pin 13, which is at chassis potential. U3A's output is directed to U5A and then output transistor Q1. The voltage at pin 9 of U2B goes high, moving the switch contact to pin 3. Thus forward bias is applied to Q5, which switches on. Q3 in turn conducts, current flowing via R27, Q1, the polariser, Q3 and R31, with control of the current being exercised by Q1 and U5A.

If pin 13 of U1 goes low, the conditions are reversed. The outcome is that current flows via R30, Q2, the polariser, Q4 and R33, this time in the reverse direction.

The 9.1V zener diodes D2 and D3 provide protection against voltage transients on the output lines. D4, D5, Q5 and Q6 provide short-circuit protection.

Mechanical polarisers require a different type of drive, which is provided by the 555 timer chip U4. This produces a variable pulse-width output at pin 3.

The output from the AD converter network connected to

U1 is summed with the H/V control signal by resistors R17 and R18, altering the bias at pin 5 of U4. This input is compared with the voltage at pin 6, which is connected to the timing components R23 and C3. These set the period  $t_1$  shown in Fig. 4. R25 and C6 at pin 2 set period  $t_2$ , which starts when the output at pin 3 decreases. At the end of period  $t_2$  the voltage at pin 7 also decreases, initiating the discharge of C3. This starts the next timing period.

The variable mark-space ratio waveform thus generated can move the polariser backwards or forwards, setting it accurately. The pulse width varies between 0.8-2.4msec.

### Servicing

Servicing the MSS501IP module or the MSP200 unit should not present any problems. The control logic is straightforward, and the components are readily available.

The only faults we've encountered have caused dish positioning errors: the diodes in the reed/optical sensor input circuit can develop leakage, the result being a count error or count failure.

One case of mains-borne spikes causing spurious dish movement has been recorded. This called for modification by the manufacturer, after which the installation behaved perfectly.

### In Conclusion

Only satellite TV buffs nowadays insist on a polariser. A low-noise, universal LNB with a polar-mounted dish is adequate for the vast majority of installations where multi-satellite reception is required. In most locations an LNB with a noise figure of 0.9dB and a 1m dish suffice, though north of the Caledonian Canal I would suspect that the dish size should be increased to 1.2m. ■

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# Long-distance Television

**DX conditions and reception. Satellite sightings and news. LNBs for sat-zappers. Roger Bunney reports.**

**A**ugust turned out to be a relatively quiet month for terrestrial DX-TV reception. It was the tail end of a less than enthralling Sporadic E season, though there were a few openings. The warm summer weather helped to lift tropospheric conditions in the middle of the month, giving Band III/UHF reception from the Benelux countries and NE France in the southern and south eastern UK. Conditions were most active on the 17/18th. During this period Roger Fussell (Torpoint, Cornwall) logged numerous Spanish Band III/UHF stations – no less than twelve on the 18th.

During the latter part of the month I was on holiday in Guernsey, where I spent a bit of time aerial spotting. There were no bowties anywhere. The directions of the UHF Yagis varied between the main Guernsey transmitter and the St Peter Port relay. A few were directed towards Cherbourg, including a magnificent Triax MTH13 Band III Yagi. Several relics of the 405-line days remain, mainly five-element

*This caption, with sound-in-sync, was snapped by John Locker using the new Dutch EBU decoder. It was received from Eutelsat II F4 at 7°E.*



combined Band III Yagis.

The rather sparse August SpE loggings are as follows:

- 5/8/96 Syria ch. E2 (at 0900 BST); RAI (Italy) ch. IA; TVE (Spain) chs. E2-4; NRK (Norway) E2, 3; SVT (Sweden) E2-4; DR (Denmark) E3; C+ (Canal Plus France) L2.
- 7/8/96 SLO (Slovenia) E3; HRT (Croatia) E4; DR E3; an unidentified E2 signal from the SE with what appeared to be Russian/Serb sound.
- 10/8/96 SVT E2, 3; TVE E2; NRK E3, 4; DR E3; Russia R2; RTP (Portugal) E3; RAI IA, B; ARD (Germany) E2.
- 11/8/96 NRK E2-4; YLE (Finland) E4; ARD E2; SVT E2-4; LTV (Latvia) R2; RTP E2 (a 35W relay), 3, 4; TVE E2-4; RUV (Iceland) E3, 4; RAI IA; SLO E3.
- 12/8/96 NRK E2; RAI IA, B; C+ L2; DR E3; an unidentified Arabic E2 signal at 0827.
- 13/8/96 TVE E2; DR E3; Russia R1.
- 14/8/96 TVE E2; Video (Italy) E2; an unidentified Arabic ch. E2 signal at 1845 BST.
- 15/8/96 RAI IA, B; TVA (Italy) IA; Video E2.
- 16/8/96 RAI IA; Video E2; TVE E2-4; RTP E2, 3.
- 17/8/96 TVE E3.
- 18/8/96 TVE E2-4; Video E2; SLO E3.
- 19/8/96 NRK E3; DR E3; SLO E3; RAI IA.
- 20/8/96 TVE E2.
- 21/8/96 SLO E3
- 22/8/96 SLO E3; RAI IA, B; Video E2.

23/8/96 SVT E2; Russia R1; Video E2; an unidentified logo (T.R. ?) on ch. E2.

26/8/96 An unidentified ch. E4 signal.

My thanks to Cyril Willis (King's Lynn), Roger Fussell (Torpoint) and Peter Schubert (Rainham) for sending in reception reports.

## Satellite Sightings

It's been Fun in the Sun for those Brits who hiked to South Spain for their holidays only to find the GMTV Outside Broadcasting Unit transmitting early morning song, dance and entertainment routines to the folks back home. The SNG UKI76 truck's output was relayed back via Intelsat K (21.5°W) at 11.5GHz horizontal. At the time of writing, the summer series has been running for well over a month – nice for the lucky crew!

On a more sombre note, there was extensive on-site reporting of the Watford train crash on the 8th, from UKI40 via Intelsat K.

On the 14th, not sleeping too well, I checked out the Clarke Belt at 0330 hours. Intelsat K was alive and well with Bob Dole's electoral speech from San Diego, California. That put an end to my insomnia!

Fred Pilkington has retired to Malaga, Spain with his 1m tracking dish and receivers from Maspro and Nokia. He was delighted to find the new home of MED-TV, at 11.075GHz vertical aboard Intelsat 705 (18°W). It has moved from Eutelsat II F2. No luck however with Amos-1 at 4°W. On the 11th he had the Orangemen's march from Intelsat K via the Reuters 11.497GHz lease. The news footage etc. came from Intrax UKI22.

A call from John Locker (Wirral) alerted me to the arrival of Turksat

1C at 31°E, with 11.45GHz test transmissions. Unfortunately it's behind the trees here at my location. There are apparently still stable though weak signals from GALS (38°E), with NTV at 11.912 and 12.16GHz.

Many C band transponders were used for the Olympics in addition to the numerous Ku band ones. Ian Waller (Lincoln) counted seven aboard Intelsat 512 at 21.3°W. There were feeds via TDRS at 41°W and TDRS-6 at 47°W. All were using NTSC.

Malcolm Dewis (Nuneaton) has sent in a long VHS tape of his reception from 42°E to 45°W, using a 1m Lenson Heath dish driven by a Satman motor, a triple-band 0.8dB Echostar LNB and a Nokia 1700 receiver. One particular set of pictures shows NTL feeding MPEG-2 transmissions as received/recorded then played back for inspection and quality degradation, showing how quality was maintained despite changes in the symbol bit rate and FEC parameters. I suspect that they were relayed via Orion 1 at 37.5°W – an impressive catch.

Bandula Gunasekera (Sri Lanka) is now receiving good Ku band signals from PAS-4 at 68.5°E. Earlier poor-quality reception had been caused by incorrect setting of his 60cm offset dish (prime-focus dishes are the norm in his region). Now that the dish has been correctly set up, the NHK Tokyo-Paris circuit at 12.591GHz comes in crystal clear. Heavy rain hasn't introduced too much loss, since the signals are received at a very steep vertical angle (elevation 78°).

There's an interesting advertisement for a Winersat WR3000 manually-tuned receiver in the August 1996 issue of the NZ magazine *SatFACTS*. "Last of the Manual Receivers" a caption claims. Certainly a manual receiver is the most effective type for sat-zapping, enabling each satellite to be checked rapidly. Long may they continue to be manufactured!

### News Items (Terrestrial)

**USA:** The first digital terrestrial TV stations should be licensed by the summer of 1997. Broadcasters are being encouraged to adopt dual analogue/digital transmission. The Federal Communications Commission is suggesting that the 1,600 or so terrestrial stations move to digital only operation after a period of dual-standard transmissions. One suggested target date for the close down of analogue services is 2010.

**Canada:** A leading cable company is testing MPEG decoders and plans to start marketing them this autumn.

**Spain:** The following regional services are to be privatised: Madrid TM3; Valencia TVV; Andalucia Canal Sur; Catalonia C33 and TV3; Basque region ETB1 and ETB2; Galicia TVG. TVE-2 is to remain under government control until the end of 1999, after which it may be privatised.

**Pakistan:** Shaheen Pay TV has opened MMDS (microwave multi-channel distribution system) operations in Islamabad and Karachi, with eight satellite-sourced English-language channels. There are plans for further expansion.

**UK:** Tyne Tees Television, which opened in 1959, has changed its name to Channel 3 North East.

**France:** There are plans to run the La Cinquieme day-time and Arte prime-time services as a single operation to save costs. An alternative suggestion is to merge Arte with the France 3 service.

### Satellite TV

A new series of satellites, Intersputnik 8, is being developed by the Russians. The first launch is expected in late 1997/spring 1998. The satellites will each have 24 C band and 16 Ku band transponders, with EIRPs of 40dBW and 52dBW respectively. Provisional slots are at 16°W and 75°E, covering the Europe/Africa and Middle East/India/SE Asia regions. The Russian NTV network is to launch a new satellite network early next year in conjunction with Gazprom, a state-owned gas company. There will be five 24-hour channels, with a satellite launch planned for October.

Arabic broadcaster Orbit has switched from Intelsat 704 at 66°E to 705 at 18°W. The change should provide improved coverage across North Africa, where dishes down to 1m should suffice for the digital service.

SE Asia is getting more analogue TV, with AsiaSat-2 providing MTB (Mongolian Television Broadcasting) at 4.17GHz and two Chinese stations, Guangdong Satellite TV and Henan TV, at 4.01GHz and 4.13GHz respectively. AsiaSat-3 is to be launched next year, taking up position at 105.5E with AsiaSat-1 moving to 122°E to provide additional commercial services. AsiaSat-4 is planned for 1999, with C, K, L, Ka and X band transponders for TV, commercial and general communications use.

The Indian satellite TV market is



booming, with a production studio complex to be opened in Bombay by December for the Star TV India service and more centres planned in Bombay and New Delhi.

**A teleport caption, again received by John Locker via Eutelsat II F4.**

### Sat-zapper's Guide

This month we'll consider the low-noise amplifier/frequency converter block (LNB). The Ku band LNBs used in most 'package systems' operate without a preceding in-line polariser. Instead, a polarisation selection voltage is sent up the

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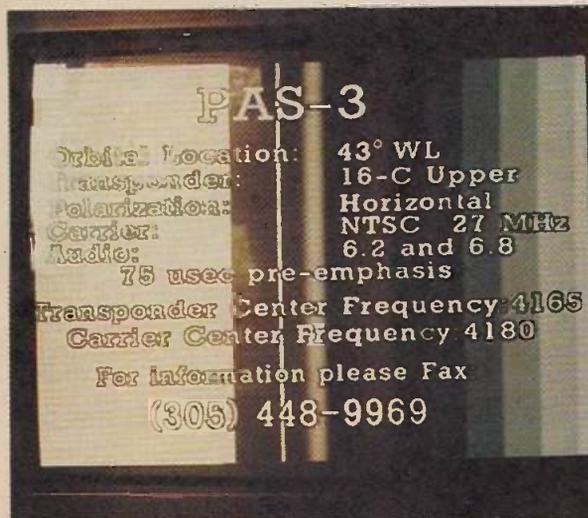
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**This nice, informative identification caption was received from PAS-3R at 43°W.**

coaxial lead from the receiver to switch between microstrip probes for either vertically or horizontally polarised signals. This is a cheap yet very effective approach. The LNB is aligned for optimum vertical/horizontal reception with an attenuated signal (a wet J-cloth progressively folded over the feedhorn acts as an excellent attenuator). The screws are then tightened.

This is OK for fixed reception from a single satellite, e.g. Astra, but a tracking dish tilts as it travels from one extreme to the other to scan the satellite belt. Thus polarisation correction is desirable to maximise signal pick-up. The non-variable LNB is not really suited for use with a tracking dish, and the sat-zapper interested in reception of the weaker signals is best advised to use an in-line magnetic polariser, such as the Racal wideband one, with his selected LNB.

Some ten years ago the standard LNB covered 10.95-11.7GHz and

had a noise figure of over 2dB. We now expect a noise figure of 0.5dB to 1dB maximum, with a coverage of 10.7-12.75GHz. The receiver's bandwidth has also increased. It's common for receivers to be tunable over 700MHz-2,100MHz, or selective bandwidth chunks between these limits.

While scanning the satellite belt the sat-zapper will encounter signals of varying strength from very high, e.g. Astra/Telecom, to low, e.g. Amos-1, GALS and the signals from inclined orbiting craft. With a dish of say 1.2m it's unlikely that overloading will occur, but such a dish will certainly bring in many weak signals.

The most important LNB characteristic is its noise figure. Low noise means better performance but a higher price. Other factors to look for are good linearity (i.e. no overloading or instability, fairly level gain, strong-signal handling capability etc.) and reasonable gain. I'd be happier with an LNB that had a quoted noise figure of say 0.7dB and a gain of 56dB than one with an 0.9dB noise figure and a gain of 90dB. Remember that to minimise those sparklies with weak signals a low electronic noise level is vital. Buy an LNB of reputable make from an equally reputable supplier.

The more advanced LNBs switch bands (Lo and Hi) when 13V or 17V is fed up the feeder. Since you are using a separate magnetic polariser with its own two-wire control, you can make use of this fact. Packaged LNBs of the Astra variety cannot use 13/17V switching to change bands, so a 22kHz signal is used instead – again sent from the receiver to the LNB via the coaxial feeder.

While looking through satellite component/LNB advertisements you'll come across reference to

single-band, triple-band, quad-band, multiband and universal LNBs. A single Ku band LNB will cover a specific spectrum such as 10.95-11.7GHz (the FSS band), 11.7-12.5GHz (the DBS band) or 12.5-12.75GHz (the Telecom band). A triple, quad or multiband LNB will cover the whole 10.95-12.8GHz spectrum, usually in two sections (10.9-11.8GHz and 11.7-12.75GHz – the Lo and Hi bands) with voltage or tone switching to select them. An enhanced LNB extends the coverage down to 10.7GHz, intended for Astra 1D but also useful in including the Russian MIR video downlink! As its name suggests, the universal LNB covers 10.7-12.75GHz.

When the LNB switches from Lo to Hi its local oscillator frequency changes. As an example, the MTI quad-band LNB switches between 10.7-11.75GHz and 11.7-12.75GHz. Its local oscillator is switched between 9.75GHz and 10.75GHz. Thus the IF output to the receiver remains at around 950-2,050MHz. Incidentally the gain is quoted as 56dB, with a noise figure of 0.9dB when running at 200mA. The input flange is a rectangular WR75 type.

To obtain an exact frequency readout from the receiver it may be necessary to program a small offset oscillator variation – check with the user instructions.

When connecting the coaxial lead to your LNB always use the correct F plug crimping tool. Smear a touch of silicone grease on the LNB socket, and once tightened carefully wrap the plug/socket and first few inches of cable with self-amalgamating tape. It's best to provide the LNB/polariser assembly with weather protection. I use a modified washing-up liquid bottle. After two years' use the LNB head still looks like new! ■

## Book Review

# Seeing by Wireless, by Ray Herbert

Some 70 years ago John Logie Baird gave a public demonstration of his production of moving images, or television, using a combination of mechanical and electronic technology. He had produced shadow images three years earlier. During the following months his research and development led to an application for a TV transmitting licence. This was granted on August 5th, 1926, with the call sign G2TV.

Within a year the first ever DX-TV occurred: his 30-line transmissions were received in Hartsdale, New York. Transmissions were also received at sea, by the Berengaria in particular. Baird International Television was formed in June 1928.

Ray Herbert, who was himself involved with Baird's work, has written a fascinating account of the early days of Baird Television, with descriptions of receiver developments and transmission equipment. It's an impressive work, both in terms of the content and the many quality

illustrations. The slim volume (26 A4 pages within a card cover) take us from the early Hastings days through to Alexandra Palace. Baird also carried out work on stereoscopic and colour TV, and patented the Telechrome tube in July 1943.

This is in fact a remarkable document, which deals with a vital part of British TV development. It includes little known facts about Baird's work. Anyone interested in television should obtain and read the book – progress through the past 70 years has been dramatic. Financial support for the production of the book was provided by Quantel Ltd. of Newbury, which is well known for its progressive video equipment, both analogue and digital. I am very impressed with this publication, which I feel is underpriced at only £3 including postage (UK). To obtain a copy, send a cheque to Ray Herbert at 24 Norfolk Avenue, Sanderstead, South Croydon, Surrey CR2 8BN. **R.B.**



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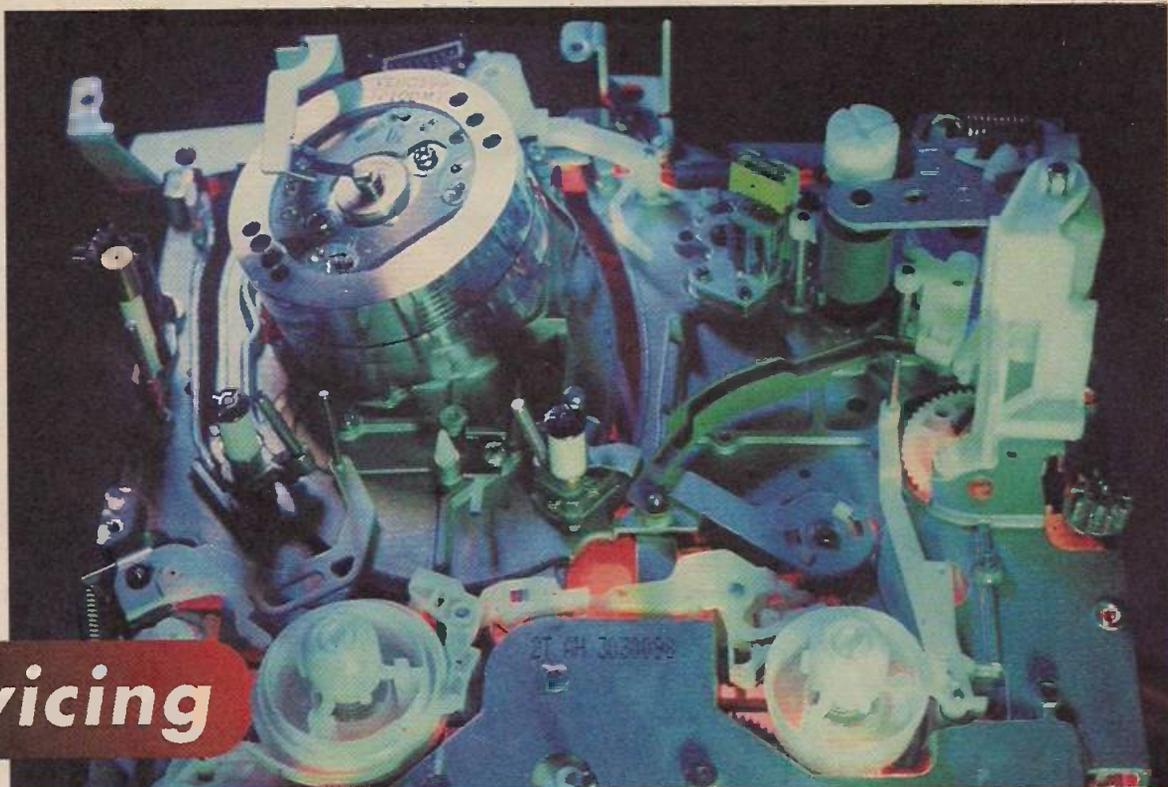
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## Servicing

# The Panasonic K Deck

It's three years since Panasonic VCRs started to use the K deck, long enough for a service history to be prepared. **John Coombes** describes the various fault conditions he has encountered

**T**he design of the Panasonic K deck, used in NVHD and NVSD series models, follows the line adopted by all VCR manufacturers in recent years, with a substantially reduced number of parts in the drive mechanism.

### Design Features

A separate motor is used for loading and mechanism control, with the brakes and loading gears directly driven via a multi-function lever. There are no sub-levers or solenoids. A tape end/beginning detector LED is used instead of a slide switch: this reduces the wiring required. There are fewer joint parts, and a smaller and thinner top plate and rack.

There is no longer any take-up reel incline position or P5 post height adjustment. Gear phase position alignment is also reduced. The K deck has only six gear phase alignment positions in comparison with the G deck's twelve positions.

The VCRs that use the deck are easy to dismantle, with the deck coming away from the main PCB. This enables mechanical parts to be replaced very easily. To help with fault finding, the VCR software has a built-in self-diagnostic test system.

### The Servicing Position

The K mechanism can be removed from the main circuit board assembly, but an extension cable (part no. VFK0889) between the loading motor and PCB socket P2001 has to be used to maintain operation. With the deck in the service position, its condition and the gear phase alignment can be checked. The loading/unloading operation can also be checked. This can be done by connecting a 4.5V battery across the loading motor pins, or by manually turning the worm gear or worm wheel gear.

If eject occurs when the cassette carriage has been removed, on reinserting it after repair the main cam gear will not engage with the carriage connection gear and will not rotate. To set up the eject operation with the cassette carriage disconnected you have to rotate the carriage connection gear by hand in the anti-clockwise direction.

### Faults Encountered

As with so many decks, the most common problem is tape damage because of a faulty pinch roller (part no. VXA2246). The symptom can be tape creasing or chewing. There may also be tape looping, which can cause damage in playback or when the tape is ejected –

you can get looping around the guide poles or the pinch roller itself. The tape can ride up and down a well polished pinch roller, the result being creasing at the bottom and/or top of the tape and possible damage. This problem can also affect the sound and/or picture quality. If there is wow on sound, or picture jitter with missing control pulses, but no tape damage the cause can again be incorrect tape drive because of a polished pinch roller.

If playback of a machine's own recordings produces a noisy picture (poor sound and picture), check whether the audio/control head is dirty. The cause of the problem is missing control pulses. Cleaning the audio/control head usually suffices, but on a few occasions we have had to replace it. Although we have not had any electronic faults in this respect, the control pulses come from pins 34 and 35 of the MN6743VRTB chip IC6001. If there is no sound with a machine's own recordings and the output at pins 34 and 35 of IC6001 is correct, replace the AC head.

A worn lower drum can also affect the sound, and we've had this with a few machines. Because of the wear, the tape wanders up and down the AC head.

Mechanical noise in the fast forward mode can be caused by the tape itself or a faulty idler arm unit. If the VCR won't load correctly after replacing the idler arm unit, check that the idler control lever is correctly fitted and is not broken – replace it if you are not sure.

If the tape becomes stuck when eject is selected, check whether the take-up brake arm unit has come off or broken – this will mean that the take-up reel is unable to rotate.

If the playback picture is noisy, check the lead connections to the lower drum. Be sure to check the RF envelope. If the lead is broken, there will be no FM output from the video heads or upper drum.

On a few occasions we have had a machine whose playback has been spoiled by noise bars. They have been very noticeable with prerecorded tapes, though the machine's own recordings have been free of the fault. The cause has been dust or dirt on the inclined base assembly (guide poles).

Always check whether anything is obstructing the inclined base assembly. If this is OK but the VCR goes into the cuc mode when the play button is pressed, check whether the inclined base units (supply and take-up) are completely locking. Ensure that the V stopper and inclined base assembly is well greased.

If the machine won't accept a cassette, check the cassette holder plate unit. The cause may be just a broken release lever at the side of the unit.

If the video head cleaner arm unit is broken or incorrectly positioned, the head cleaner can be left in contact with the head all the time. This can result in a very badly worn upper drum.

There are several possible causes of chewed tape, including the pinch roller (see previous note). If necessary check the P5 arm unit, which may be bent. This can prevent tape ejection, with damage to the tape. Also check P5's stopper base, which can crack. Visual inspection will show whether either of these faults is present. If the P5

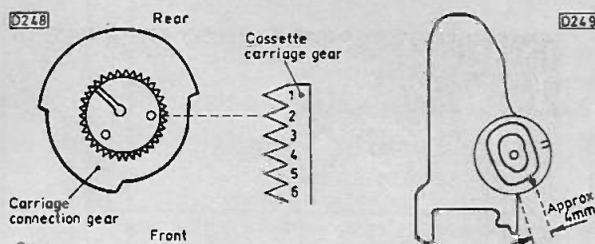


Fig. 1 (left): Carriage connection gear phase alignment.

Fig. 2 (right): Mode switch alignment.

post stopper retaining clip is broken there can be incorrect mechanical functions.

If the cassette blinder flap doesn't close, check the operation of the carriage connection gear with the side plate unit (right-hand side). There may be a phase error between the two assemblies. Remove the cassette unit and ensure that the tape will go in and out of the housing freely by hand. If this is OK, set up the carriage connection gear as laid down in the service manual. If the two side plate units and the carriage connection gear are incorrectly set, the tape may be ejected immediately after it's inserted. For smooth loading and unloading, the carriage connection gear must be set up to fit into the cassette carriage gear as shown in Fig. 1.

For correct operation of all mechanical functions the mode switch must be set correctly. Set it as shown in Fig. 2, in the eject mode, so that there is a 4mm gap between the edge of the switch and the arrow marked on the dial.

Note that if eject is selected when the cassette carriage is not in position, when it's refitted the main cam gear will not engage with the carriage connection gear which will not rotate. To reset, rotate the carriage connection gear by hand so that, as shown in Fig. 1, it's in alignment with the cassette carriage gear.

The mode switch causes its share of problems, many of which are intermittent. No play, fast forward in play and no rewind for example. If any of these operations works intermittently, try cleaning the contacts on the switch and the PCB before resorting to mode switch replacement.

For noisy rewind and/or fast forward operation, check that the take-up and/or supply reels are lubricated so that their rotation is free.

### Earlier Models

We've had forward visual search problems with some earlier models, such as the NVSD30 and NVSD40. Because of a worn lower drum unit, line lock is lost during search. The fault has been experienced with three- and four-hour tapes. Playback and cue have remained stable.

The cause of the excessive wear has been a broken take-up brake arm unit. As a result the back tension is increased. A new unit may cure the fault, but the drum assembly will need replacement in the near future. ■

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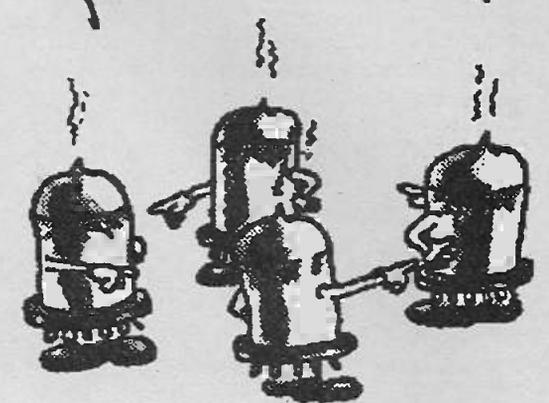
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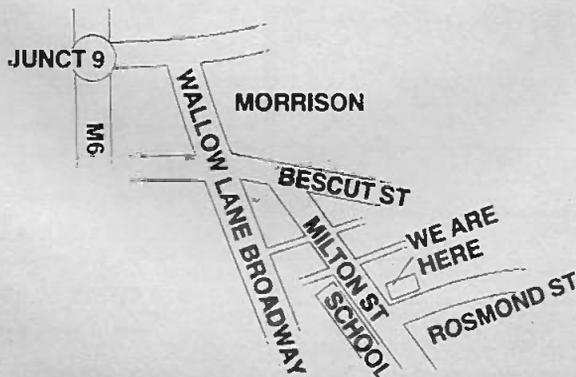
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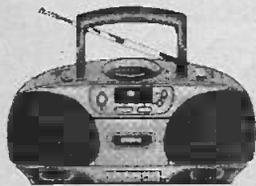
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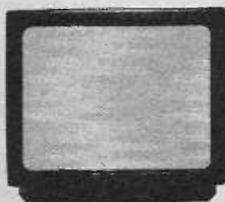
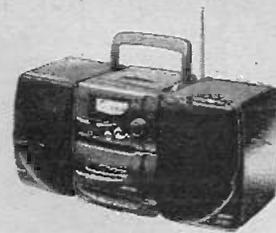
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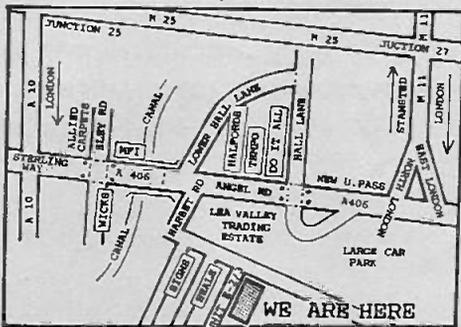
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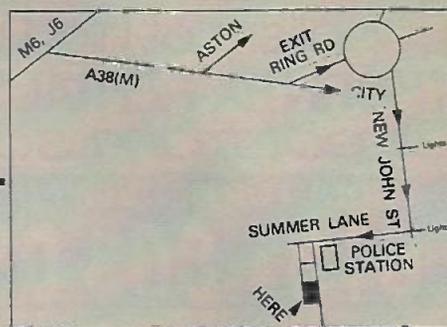
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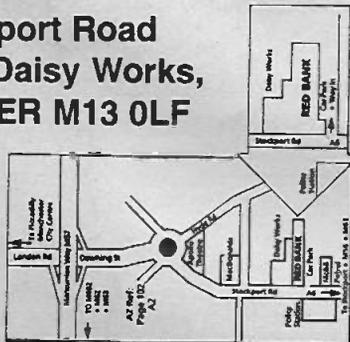
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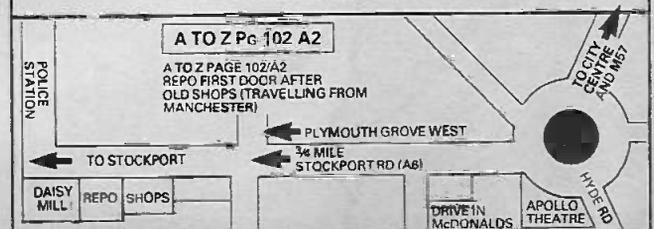
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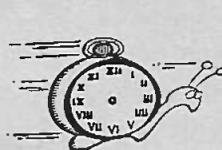
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<b>U411 - U412 Tuners</b>	
	each £5.00
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	£2.00
<b>No Guarantee</b>	
<b>Bridge Rectifiers</b>	
	10 for £1.00
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<b>FERGUSON CHASSIS</b>	
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	Post £5.00
<b>TX98 Chassis</b>	
	£15.00
<b>Ferguson FV31R</b>	
	£5.00
<b>Remote and Power Supply FV31R Display</b>	
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<b>Quartz Halogen</b>	
<b>500w. 200v. For outdoor lamps</b>	
	£1.00
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<b>Plastic Front with Flap 8, 900</b>	
	£3.00
<b>Clock Display Panel 8, 900</b>	
	£5.00
<b>Sharp Tuner &amp; IF</b>	
<b>1810587 PA1 UK</b>	
	£3.00
<b>KT3/K30 Tripler</b>	
	£5.00
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	£4.00
<b>Grundig Tripler with Focus Pot</b>	
<b>Grundig Universal Tripler.</b>	
<b>Upright Printed Circuit type</b>	
	£7.00
<b>BG 2087-642-1005 Triplers</b>	
	£7.00
<b>BG 2032-642-3002</b>	
	£7.00
<b>PERDIO PV 1188 Handsets</b>	
	£3.00
<b>BU 208A, BU 508A, BU 508D,</b>	
<b>BU 508AF, BU 508DF</b>	
	£1.00 each
<b>BU 801</b>	
	60p
<b>2SD 1398</b>	
	£1.00
<b>2SC4589 10A/500V</b>	
	£2
<b>FERGUSON Sat. Modulator SRD-3-4</b>	