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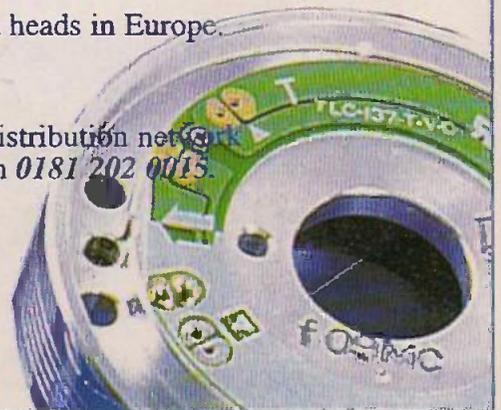
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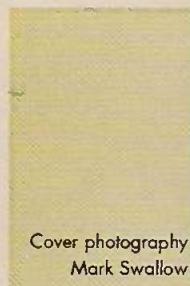
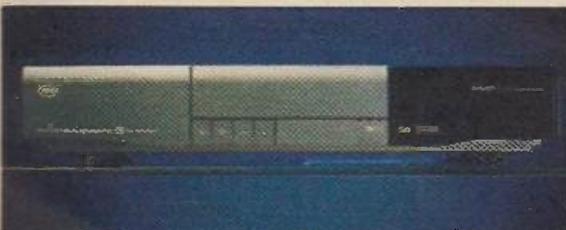
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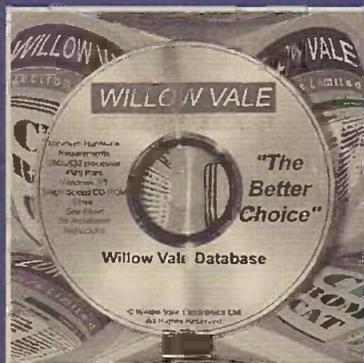
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# Oriental Conundrums

Over the past thirty years the UK electronics industry has depended more and more on investment by overseas firms. In fact without this investment there would be virtually no consumer electronics, semiconductor or computer industries in the UK today. Whether this overseas investment is a good or a bad thing hasn't mattered too much to date. It has continued to come in, often encouraged by government action of various sorts (grants, tax benefits etc.). Plants have been established and jobs created: thousands of them. Now alarm bells have suddenly started to ring, because of financial problems in East Asia.

Fortunately many of the current batch of plants are now in operation – for example production started recently at Korean manufacturer LG Electronics' computer monitor plant at Newport in South Wales. Far Eastern investment in electronics in the UK started with the Japanese back in 1974. In more recent times Taiwanese and Korean firms have appeared on the scene. It is Korean investment that's causing most of the current concern.

Hyundai has decided to put a hold on its £3bn investment in two semiconductor plants in Scotland. Samsung has postponed the start of the next phase of its £450m development in the North East – semiconductor and PC manufacture were to have been added to its colour TV and microwave oven plants at Wynyard Park. Daewoo has announced that its overseas investments are being reviewed, including its VCR plant in Antrim, Northern Ireland.

What's behind all this? There is, in Eastern Asia, a far greater tendency to save and invest than in the West. Because of the savings, banks have money to lend. Large companies borrow and invest. Everything is just fine so long as the economy remains in an expansionary phase. But no economy continues to

expand indefinitely without pausing for breath. What happens when the rate of economic expansion decreases? Excess capacity then becomes evident, firms start to make losses, loans may cease to be serviced, the banks come under pressure, confidence in the economy is lost and a sort of self-feeding collapse can set in.

Traditional business practices in East Asia have made the problem far worse than it might otherwise have been. Banks have not been entirely open in reporting on their activities, auditing is often poor, and the banks and major firms tend to have rather too close relationships. So banks don't ask too many questions and continue to provide loans against collateral that they see as appreciating in value – even if only in paper terms. Any bad debts are simply shunted aside instead of being written off. This is asking for trouble when economic expansion slows down. Increased losses and bad debts can soon destroy confidence. In Korea the result of all this has been a full-blown economic crisis, with the International Monetary Fund having to be called in to try to save the situation.

There are many consequences of this sort of situation. Firms cease to invest both at home and abroad: hence the decisions by many Korean firms noted above. Investors may try to sell overseas assets to pay for loans that are called in, thus exporting their problems. Or they may try to move funds abroad when the domestic currency loses value, making the currency problem worse. This is why so much depends on that vague quality confidence. When a currency loses value, the country's exports become cheaper for others. You can thus try to export your way out of the problem, but this damages the economies of other countries. It is very difficult to assess the balance of all these effects, which don't show

up in an expansionary economic context. But once they appear they do no one any good.

A major contributory factor in the current situation has been asset inflation, which occurs when the price of assets – houses, shares, whatever – increases rapidly because there is more money available than there are opportunities to use it. This can lead to excessive investment because paper collateral is generated and loans are extended against it: this is the real bubble economy condition, the basic cause of situations like the USA in 1929 and the East Asian problems today. Central banks and international banking operations then have to do their best to sort out the problem.

It is always clear enough in hindsight what has caused an economic upset. It is not so easy in day to day banking and business to do anything about it. A bank that refuses to lend will simply lose business to others. Central banks try to impose some order by altering interest rates, but this is not a precise weapon. We have to live with business cycles, and to hope that excesses in some countries do not plunge us all, as a result of increasing internationalisation of trade and banking, into economic difficulties.

It is a pity that some sort of middle way cannot be established between the reluctance of many Western firms to invest and take chances and the tendency of East Asian firms to invest and plough on regardless, seeing increased production and market share as their aim rather than a reasonable profit margin. We all have a lot to learn – and one problem is that each generation tends to make its own mistakes instead of learning from past experience. What can be done is to ensure adequate financial supervision, which may or may not work. In time it all blows over, but a lot of people can suffer in the process.

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the subject doesn't stand still. New models, new faults - there is always something to add. So here we have the fourth edition, which has been completely updated and now has 240 pages - the previous edition had 135. In addition to receiver fault notes and general information you'll find many useful button sequences for resetting parental lock codes, resetting installation choices to factory defaults and other less well known operations, practical information on LNBs with typical current drains, a list of manufacturers and suppliers addresses and other useful material, all presented in a nice Wire-O binding so that the book lies flat on the bench.

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2SA950	0.18	2SD1541	4.96	BC182L	0.14	BD438	0.38	BUZ80	3.52	CNY755	0.52	S2000AF	1.46	TDA1670A	2.98	TC1060	0.82
2SA966	0.41	2SD1548	5.95	BC184A	0.12	BD681	0.47	BUZ80A	4.15	DTA114EF5	0.31	S2055AF	3.74	TDA1675A	3.85	TC246D	1.54
2SA992	0.31	2SD1554	3.25	BC184L	0.06	BD826	0.43	BUZ90A	3.40	DTA124ES	0.77	SAA129302	10.37	TDA1904	1.63	TC1060	0.60
2SB1010	0.35	2SD1555	2.65	BC187	0.47	BD839	0.43	BUZ90AF	3.30	DTA144ES	0.19	SAB3035	1.71	TDA1908A	5.61	TC1100	0.35
2SB1066	0.82	2SD1556	5.11	BC212	0.09	BD901	0.52	BUZ90AF	3.30	FR605	1.90	SGS8344	10.70	TDA2002	1.12	TP112H	0.77
2SB1143	0.77	2SD1651	2.39	BC212B	0.19	BD902	0.60	BY133	0.08	FX7749	0.43	SGS8344	12.88	TDA2005	1.83	TP120	0.40
2SB1243	0.60	2SD1858	0.43	BC212L	0.18	BD911	0.52	BY206	0.28	HA13001	3.85	SL1430	1.92	TDA2006	1.06	TP122	0.40
2SB560	0.43	2SD1877	2.14	BC237	0.12	BDT64C	1.18	BY227	0.13	HA13151	2.05	SL1431	2.82	TDA2006	0.91	TP2955	0.89
2SB643	0.29	2SD1878	2.63	BC237B	0.19	BDT65C	1.68	BY228	0.26	HA13151	13.20	SN74141N	0.17	TDA2030H	1.06	TP2955	0.89
2SB647	0.57	2SD1878	3.16	BC238	0.11	BF194	0.22	BY2291000	1.31	HA51338SP3	7.69	STK4132H	10.00	TDA2030V	1.46	TP2955	0.77
2SB649A	0.77	2SD1884	3.35	BC238B	0.16	BF195	0.07	BY255	0.14	HM6251	14.32	STK4141H	10.23	TDA2050	4.56	TP3051	1.08
2SB688	1.61	2SD1887	3.56	BC307	0.06	BF197	0.18	BY299	0.18	ICH28H	0.26	STK4142H	9.40	TDA2541	1.12	TP31C	1.82
2SB698	0.35	2SD288	0.85	BC307B	0.15	BF199	0.18	BY397	0.20	IP9594	15.79	STK4152H	10.95	TDA2541	1.12	TP31C	1.82
2SB716	0.43	2SD350A	1.97	BC308	0.09	BF258	0.04	BY398	0.16	IRF6C40	5.98	STK4192H	14.64	TDA2577A	3.45	TP42C	0.52
2SB772	0.50	2SD381	1.66	BC308A	0.09	BF420	0.21	BY399	0.12	KA6210AH	6.15	STK5332	2.82	TDA2578A	3.20	TP42C	0.52
2SB774	1.61	2SD400	0.34	BC308C	0.26	BF421	0.24	BY448	0.30	LA4270	2.73	STK5342	4.07	TDA2579A	4.91	TP42C	0.52
2SB891	0.60	2SD401A	0.77	BC309B	0.10	BF422	0.19	BYD14J	0.35	LA4270	3.12	STK5372H	6.84	TDA2581Q	2.57	TP42C	0.52
2SB892	0.35	2SD468	0.28	BC327	0.10	BF423	0.14	BYD33D	0.12	LA4282	5.11	STK5421	9.52	TDA2582	3.85	TP42C	0.52
2SC1008	0.24	2SD667	0.38	BC328	0.14	BF445	0.43	BYD33M	0.16	LA4445	3.45	STK5481	8.12	TDA2583	3.85	TP42C	0.52
2SC124	0.48	2SD669A	0.64	BC337	0.14	BF471	0.37	BYD33M	0.26	LA4460	2.50	STK7253	7.69	TDA2593	1.12	TP42C	0.52
2SC1318	0.19	2SD718	1.90	BC338	0.06	BF487	0.57	BYV1040	2.55	LA4700	4.27	STK7308	6.41	TDA2600	0.69	TP42C	0.52
2SC1473	0.21	2SD756	0.47	BC368	0.18	BF491	0.41	BYV95B	0.21	LA6324	2.05	STK7348	5.74	TDA2611A	7.69	TP42C	0.52
2SC1573	0.52	2SD837B	1.12	BC369	0.18	BF494	0.12	BYV95C	0.28	LA6510	2.94	STR11006	7.37	TDA2611AQ	1.32	TP42C	0.52
2SC1675	0.14	2SD856	0.79	BC372	0.53	BF759	0.38	BYV96D	0.27	LA7830	1.88	STR4211	9.40	TDA2653A	4.70	TP42C	0.52
2SC1685	0.21	2SD882	0.43	BC546A	0.11	BF869	0.38	BYV96E	0.53	LA7832	2.40	STR50020	9.38	TDA3390	14.21	TP42C	0.52
2SC1740	0.16	2SD898B	0.61	BC546B	0.12	BF871	0.41	BYV96E	0.31	LA7835	2.99	STR50103	4.48	TDA3390	14.21	TP42C	0.52
2SC1815V	0.11	2SD965	6.47	BC547	0.11	BF959	0.18	BYV95C	0.21	LA7837	4.19	STR50103A	5.56	TDA3560	6.13	TP42C	0.52
2SC2001	0.23	2SD965R	1.05	BC547A	0.04	BF960	0.30	BYV95E	0.30	LA7837C	4.70	STR54041	5.15	TDA3560	6.13	TP42C	0.52
2SC2023	3.18	2SK1117	3.40	BC547B	0.11	BF970	0.43	BYX55600	0.23	LED3G	0.10	STR5412	4.02	TDA3561A	4.62	TP42C	0.52
2SC2073	1.03	2SK1118</															

# TELETOPICS

## Progress with Digital TV

Agreement on a standard decoder specification for digital terrestrial TV (DTT) was reached in early November. Several groups were involved, including the Digital Multiplex Group (DMUX) which represents the main UK terrestrial broadcasters, also British Digital Broadcasting (BDB) which has the DTT franchise. Broadcasters, set-makers and semiconductor manufacturers have all been involved.

The decoder is to be sold at a subsidised price of around £200. BDB has invited twenty or so manufacturers to tender for initial orders, including Pace, Philips, Toshiba and Grundig-Hyundai. The decoder will offer a number of standard features, including selection between 4:3 or 16:9 aspect ratio displays, a quarter-screen picture with text information, enhanced teletext and data services, an electronic programme guide and stereo sound. Interactive operation is not included in the initial basic specification. Viewers will be able to receive pay-TV channels by taking out a subscription with BDB, a smart card being used for access. For access to BSkyB's digital satellite TV service an additional module and subscription will be required. A further module will be

needed for Audio Described sound tracks, which are designed for those with sight problems.

SGS-Thomson Microelectronics (STM) and Philips have developed a four-chip decoder design which is to be jointly marketed by the companies and is now in the sample production stage. Motorola has also been supplying sample production chipsets to manufacturers.

At much the same time as the DTT decoder announcement, a reference set-top box design for digital satellite TV was announced by BSkyB, which has reached an agreement with SGS-Thomson Microelectronics to provide the chips for the basic operation of the initial set-top boxes. These chips include STM's ST20-TP2/TP3 32-bit microcontroller, STVi119 PAL/NTSC encoder, STi3520L MPEG-2 decoder and other microcontrollers. The software to be used was jointly developed by SGS Thomson and the OpenTV venture between Sun Interactive and Thomson Multimedia. Pace, Matsushita, Sony and Nokia have already entered into agreements with BSkyB to produce the set-top boxes.

Sony has announced that it will be launching digital TV receivers

in the UK next year: no specifications or price details have been released.

BSkyB and Cable and Wireless Communications (CWC) have agreed to co-operate on the launch of digital TV services, with joint promotion and marketing. Under the agreement CWC will offer its subscribers BSkyB's pay-per-view services in both analogue and digital form. A fibre-optic link will connect BSkyB's Isleworth studios to CWC's digital head-end. This is not a technology agreement: CWC will use its own decoder, EPG and conditional access system.

The European Broadcasting Union (EBU) and the European Association of Consumer Electronics Manufacturers (EACEM) have called for an open, unfragmented digital receiver market, both set-top boxes and TV sets. The organisations want to see standard software and hardware interfaces in all receivers. On the software side they consider that Java or a combination of Java and another system represents the most promising basis of a generic standard for use with digital broadcasting. They also want patent royalties to be "reasonable, fair and non-discriminatory".



### Monitor Production

*Production of computer monitors has started at Korean manufacturer LG Electronics' new plant at Newport, South Wales. It took just over a year from the initial announcement of plans to the start of production. When the plant reaches full capacity it will be able to produce 2m monitors a year, creating 6,100 jobs - 500 staff are already working at the factory. Our photograph shows Mr Oak Mo Lee, LGE's director of finance and administration, at the production line.*

*Lite-On Technology of Taiwan, at present the world's fourth largest manufacturer of computer monitors, plans to increase production by over 50 per cent, from 3.5m to 5m units, during the present year (1998), with new plants in the UK and Mexico. The UK plant in Scotland was opened late last year and is expected to produce 1.2m monitors this year, building up to 2m a year by the end of the century. Most of Lite-On's monitors are sold to computer manufacturers, including IBM, Compaq and Hewlett-Packard. The company expects to be manufacturing 8-10m monitors a year by 2000. Total world production of monitors in 1997 was estimated at 75m. The other manufacturers currently in the top four are understood to be Samsung, Philips and Acer.*

## Business/Trade News

CPC of Preston has entered a distribution agreement with Grundig and is now an officially approved distributor from which authorised Grundig dealers can obtain warranty spares. Products available include spare parts for all Grundig manufactured TV sets, music systems, car stereos and satellite receivers. CPC has set up a database, containing over 100,000 part numbers, dedicated to Grundig spares. The company's partfinder service enables parts to be quickly identified in cases where the customer does not know the part number: staff can then immediately provide the relevant order code, price and availability. CPC can be reached on 01772 654 455.

Satellite equipment supplier Longreach Supervision Group has added a new depot at Borehamwood, Herts to its nationwide network. The company now has nine depots and stocks more than 400 satellite product lines. It offers

same-day collection, free technical assistance and free training. Longreach's head office is at Bath, Avon (01225 444 894).

The distributor of BASF and Memorex brand audio and video products in the UK has, from January 1st 1998, changed its name to EMTEC Magnetics UK Ltd. The change follows the purchase by Korean group KOHAP of BASF's worldwide magnetic tape business early last year. EMTEC Magnetics UK Ltd. can be reached on 0181 908 8203.

Matsushita is to expand its operations in Wales with a £15m investment programme. A new research and development centre is being set up at the company's Cardiff base, creating 160 new jobs. Satellite TV decoder manufacture is also to start. At present the company employs more than 2,000 staff at the site producing colour TV sets and microwave ovens for the European market.

## Fuse Warning

The Electrical Installation Equipment Manufacturers' Association (EIEMA) has issued a warning about certain mains plug fuses, manufactured in China, that carry the BS1362 approval mark. Based on many years' experience, EIEMA members have identified the following three factors as being vital for safe fuse performance:

(1) The ceramic tube must be completely filled with an appropriate material, usually quartz sand. The purpose of this filling is to absorb the enormous energy released when a short-circuit fault occurs. Without it, the fuse could explode.

(2) The fuse element must not touch the tube's inside wall. If it does, the element will not be completely surrounded with energy-absorbing material.

(3) The tube must have sufficient

strength to withstand the high temperature and pressure generated during fuse operation, after which it must comply with the test requirements of the standard. This is to ensure that the fuse remains intact after operation.

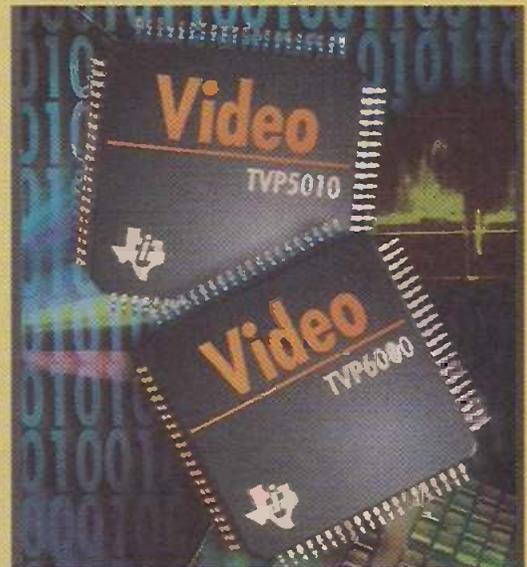
EIEMA members routinely test their own and other manufacturers' products. During recent tests certain Chinese-made fuses were found to have seriously inadequate quantities of arc-quenching material, and fuse elements that touched the inside wall of the tube. The result was critical rupturing of the fuse tube, producing an explosion within a type BS1363 approved plug whose cover sheared off and flew across the test bay. This, in an everyday situation, could cause injury and be a fire risk.

The Association does not suggest that all Chinese-manufactured fuses are unsafe.

## DAB News

Three UK radio companies, Emap Radio, Capital Radio and DMG Radio, have signed an agreement with cable operator NTL to bid for a national commercial DAB licence. The Radio Authority is to advertise licences this spring. Services are due to start in 1999.

Great Western Radio, parent company of Classic FM, is to bid for a licence but would like to see the rules relaxed on the extent of the data services that DAB can offer: at present the limit is ten per cent. GWR is running a series of multimedia radio test transmissions in the London area in conjunction with BT, the BBC and others.



Texas Instruments has introduced two new video encoding and decoding chips that enable a PC to be linked to an analogue video source such as a camcorder, VCR or TV set.

The TVP6000 encoder converts digital video into analogue form in either the NTSC or PAL format. It incorporates a filter to eliminate the flicker associated with displaying fine-lined computer imagery on a TV screen, and over-scan compensation to scale the imagery so that the entire image is displayed.

The TVP5010 decodes analogue signals in formats such as NTSC or PAL from a VCR, camcorder or other device, producing a digital output that can be fed to a PC's graphics processor. It incorporates comb filtering for both colour and luminance: the dual comb filters reduce distortion without sacrificing image content. The TVP5010 also has a genlock feature that can be used with a compatible encoder to resolve timing differences, ensuring accurate colour even when the video comes from a non-standard or unstable source such as a VCR. It can provide an output in any of several digital video formats.

Both devices come in an 80-pin TQFP (thin quad flat pack).

## Internet TV Service

NetChannel UK, a wholly-owned subsidiary of the US company NetChannel Inc., has launched its Internet TV service in the UK. This is intended as the first step to providing the service throughout Europe. The idea is to offer subscribers easy access to internet e-mail and the web (selected sites) via a NetStation set-top box which is connected to the TV set and a phone line, with remote control. There is no need for a PC. The box costs £299, a monthly subscription £14.95. Access is controlled by a smart card that plugs into the NetStation. Over thirty channels are available. Users are offered a selection of "best internet" sites and can personalise their own service.

Sharp has launched a Mini hi-fi system, Model MDX811, which can be linked to a PC to enable music to be downloaded from the internet and recorded on a blank Mini Disc. Suggested price is about £700.



# Camcorner

Reports from  
David. C. Woodnott

## Samsung VPUI2

We were told that the tape would "run on" all the time when the unit had been switched on. The cure was a replacement capstan motor – the FG sensor had failed. It's becoming a common problem with units that use this mechanism. D.C.W.

## Sony CCDTR55E

Intermittent monochrome playback was the complaint with this machine. The loss of colour appeared to be related to the length of time the machine had been in operation. Capacitors C203, C204 and C206 on PCB VS37 were the culprits. They were all leaky, and

had contaminated the print with electrolyte. A clean up and three new capacitors cured the fault. The luminance signal level had also been affected, but the customer had apparently not noticed this. D.C.W.

## Sony CCDTR50E

No viewfinder picture was the fault with this early Handycam model. The cause was C924 on the EVF PCB. Not a surface-mounted type this time: it's a 68µF, 16V radial electrolytic capacitor. A service completed the repair. D.C.W.

## Canon UC15E

This camcorder would power up and produce E-E pictures, but wouldn't operate mechanically. Loading/unloading was possible when the loading motor was powered from an external source. The MPC1720 loading drive chip IC1006 was faulty. It's on the power supply PCB at the rear of the unit and is thus unusually easy to get at. A replacement restored normal operation. D.C.W.

## Sanyo VMD6P

The fault report said "playback marred by a noise band at the bottom of the picture and flashing white lines". Tracking faults are

generally very rare with this Sanyo mechanism – except when there has been an impact of one sort or another. The drum assembly is sprung, and if knocked can assume a curious 'angled' position that gives rise to the noise-band symptom.

A small amount of corrective pressure will usually release the assembly so that it returns to its normal position. The 'flashing lines' were dropouts caused by failure of C2106 (10µF, 16V) on the main PCB. D.C.W.

## Panasonic NVM7B

This old timer worked in all modes but wouldn't record pictures on tape (sound was OK). Everything seemed to be all right when record was selected – the mechanism operated correctly and 'REC' appeared in the EVF – but nothing was recorded. The cause of the trouble was open-circuit print, as a result of which there was no 9V REC supply at the emitter of Q026 from the collector of Q6003 (9V switch) in the syscon PCB area.

A wire link cured the trouble. The PCB was cleaned in case there had been capacitor leakage problems – the exact location of the break couldn't be determined. D.C.W.

## JVC GRAX7E

There was a mechanism problem with this unit. It had failed because the supply side guide rail base was broken. After fitting a replacement assembly I checked the mechanism by powering the loading motor from an external source. It seemed to work all right, but when the unit was powered up normally and a tape was inserted it loaded half way then a clicking noise came from the mode motor. I dismantled the motor and found that there was a damaged plastic gear in its attached gearbox. So, with growing confidence (misplaced!) that all would be well, a new motor unit was fitted.

When an attempt was made to load a tape it once more stuck at the half-way position, then unlaced – this time, thankfully, without the gearbox noise. The cause of the trouble was this time found to be the M54543 loading drive chip, which behaved in a very unusual way. It would drive the mechanism correctly until the point of maximum torque was reached (as the pinch roller assembly began to move). It would then fail to produce the drive current required and abort the

sequence. Once a new chip had been fitted all was well – except for the estimate, but you can't always get it right!

The unit was finally serviced, tested and returned to the customer, who immediately took in on holiday with him. A few weeks later he called to say that the unit had worked well on his holiday and that he was pleased with the repair. Good, I thought – but?! Well the only problem was that the tape remaining display and counter occasionally "did funny things".

On test I found that the counter would intermittently stop, miss a few counts then continue. The tape remaining data was also erratic. The cause of this problem was the supply reel which, during the previous trouble, had scraped the deck, damaging its alternate reflective/black surfaces. There was a circular scratch that exposed more reflective surface than was required. This was a bit confusing, as the mechacon didn't register a faulty reel pulse train and stop the normal tape transport operation. A new reel cured this final (I hope!) problem. D.C.W.

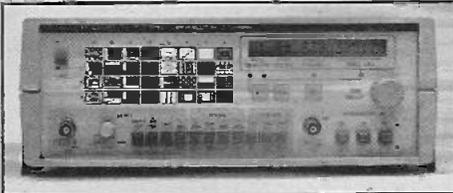


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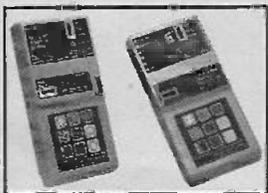
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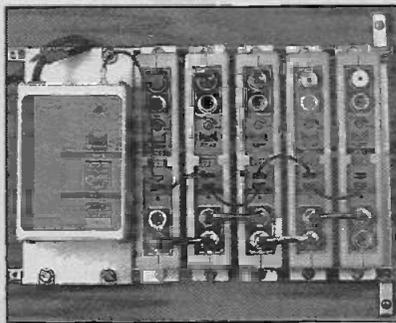
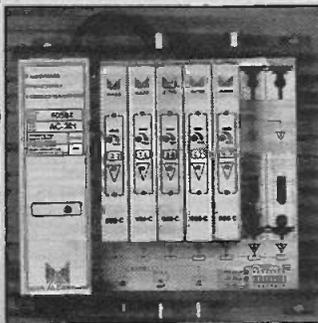
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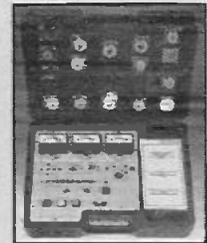
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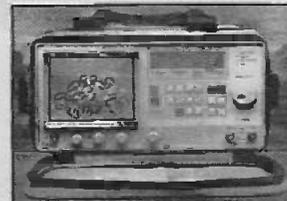
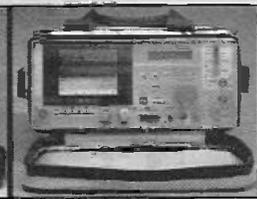
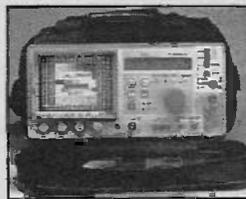
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CX18	59D2, 59D3	£16.65	CI25-P759	Contour M27	£18.90	CB338	£24.00
CX30	59H2, 59H3, 59H5	£16.65	CI25-P759	Contour T28, T24	£16.80	CB340	£24.00
CX4	59J7	£16.65	CI25-P759	Contour S28, T24	£21.00	CB349	£24.00
ALBA	59K5	£15.00	CI25-P759	Contour T28, T24	£16.80	CB389	£24.00
CTV10	59L5BQ, 59L7	£15.00	CI25-P759	Contour S28, T24	£21.00	CB394	£15.00
CTV14RS	59M2	£19.50	CI25-P759	Contour T28, T24	£16.80	CB505	£24.00
CTV55	59M5	£18.90	CI25-P759	Contour S28, T24	£21.00	CB512	£24.00
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CTV742	66H3	£19.50	CI25-P759	1410	£15.00	CB512	£24.00
CTV743, DCF2077A	66H3	£19.50	CI25-P759	1420	£15.00	CB512	£24.00
CTV743, KF5602261	66H3	£19.50	CI25-P759	1420A	£15.00	CB512	£24.00
CTV744	66H3	£19.50	CI25-P759	1420B	£16.50	CB512	£24.00
CTV747	66H3	£19.50	CI25-P759	1422	£15.00	CB512	£24.00
CTV752	66H3	£19.50	CI25-P759	1435	£15.00	CB512	£24.00
PTV10	66H3	£19.50	CI25-P759	1440A	£15.00	CB512	£24.00
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2453	66H3	£19.50	CI25-P759	1440L	£15.00	CB512	£24.00
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26D1, T6045L	66H3	£19.50	CI25-P759	1440O	£15.00	CB512	£24.00
26D2, 26D3, T6033H	66H3	£19.50	CI25-P759	1440P	£15.00	CB512	£24.00
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36140, 36141	66H3	£19.50	CI25-P759	1440U	£15.00	CB512	£24.00
37140, 37141	66H3	£19.50	CI25-P759	1440V	£15.00	CB512	£24.00
41H2	66H3	£19.50	CI25-P759	1440W	£15.00	CB512	£24.00
51A0-51A5	66H3	£19.50	CI25-P759	1440X	£15.00	CB512	£24.00
51AR	66H3	£19.50	CI25-P759	1440Y	£15.00	CB512	£24.00
51G2, 51G3	66H3	£19.50	CI25-P759	1440Z	£15.00	CB512	£24.00
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## Book Review

**Guide to Satellite TV**, by D.J. Stephenson, B.A., I.Eng., F.I.E.I.E., published by Butterworth-Heinemann under the Newnes imprint. Fourth edition, 383 pages, £18.99.

A welcome to the fourth edition of this excellent book, which has become firmly established as an essential guide to satellite TV techniques and a reference source for all those concerned with installation, reception and repair. This latest edition contains a new chapter on digital satellite TV, also new sections on fixed dish systems capable of reception from two or more satellites, universal wideband LNBs suitable for analogue and digital reception, and simplified downlink budget calculations for specifying digital receiving equipment.

Naturally the first thing I looked at was the chapter on digital satellite TV. It clarifies what is involved in this complex subject and provides a helpful, practical guide to what you need to know.

In his preface the author says that the book is pitched "between a simple installation guide and an involved theoretical textbook". That sums it up. You won't find that you get bogged down in unnecessary theory: you will find clear explanations of what is involved in satellite reception, practical information on installations of various types including IF distribution systems, and a lot of relevant reference data. In short, it's a book you will need if you are in any way involved in satellite TV.

The book can be obtained from the Customer Service Department, Heinemann Publishers Oxford, PO Box 382, Halley Court, Jordan Hill, Oxford OX2 8RU. Phone 01865 314 301 for any further details you require. J.A.R.

## 20% reader discount Audio signal generator

The AG2601 audio signal generator spans 10Hz to 1MHz in five overlapping ranges and features floating output and low distortion. This stable sine and square-wave oscillator is being made available to Television readers at the fully-inclusive special price of £129. Its normal selling price is £129 excluding VAT and delivery.

Please use the coupon to order your signal generator, and address all correspondence relating to this order to Vann Draper Electronics at Unit 5, Premier Works, Canal Street, South Wigston, Leicester LE18 2PL, fax 0116 2773945 or tel. 0116 2771400.

### AG2601 audio generator – specifications

#### General

Frequency range	10Hz to 1MHz
Frequency stability	within $\pm 2$ Hz
Output waveforms	sine, square
Output impedance	600 $\Omega$
Accuracy	$\pm 5\% + 2$ Hz, 10Hz-1MHz $\pm 3\% + 2$ Hz, 100Hz-100kHz
O/P floating voltage	within $\pm 1.5$ dB

#### Sinewave characteristics

Distortion	<0.05%, 500Hz to 50kHz <0.5%, 50Hz to 500kHz
Output voltage	8V rms, max
Output flatness	$\pm 1.5$ dB (1kHz)
Output impedance	600 $\Omega$

#### Squarewave characteristics

Output voltage	15V pk-pk, min
Rise time	0.5 $\mu$ s

#### Synchronization input

Input impedance	10k $\Omega$
Maximum input	10V rms

#### Supply

115/230V, 50/60Hz

#### Physical data

Dimensions	150 by 250 by 130mm
Weight	2.5kg

\*Test leads supplied as standard



AG2601 is a portable mains-powered instrument covering 10Hz to 1MHz in five overlapping decades. Sinewave distortion between 500Hz and 50kHz is just 0.05%.

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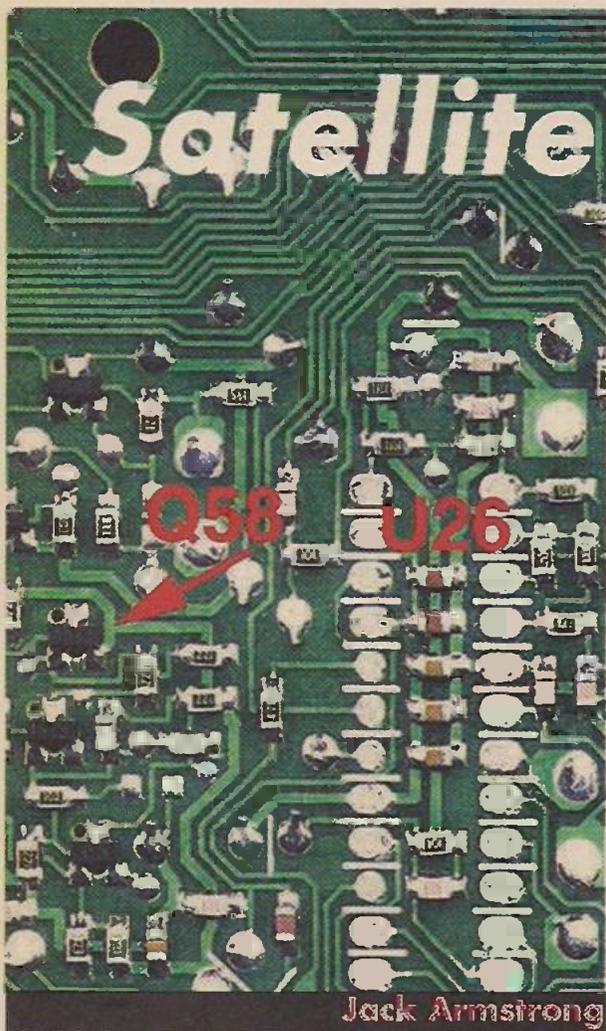


Fig. 1: The position of transistor Q58 in the Pace Model MSS1000.

### Pace MSS1000

Why do people put their receivers inside closed cabinets? The man who brought me this Pace receiver told me he was a "computer engineer". I think he had something seriously wrong with his firmware: the receiver was, apparently, installed in a narrow gap inside his 'Hi-Fi' cabinet, with a VCR beneath it and a D2-MAC decoder on top!

Now, surprise, surprise, the decoder was intermittent "except", he said, "with the contrast set at 8, and even then it comes and goes". Usually the receiver won't work with the contrast set at maximum, so I guessed that the video level must be low.

As the fault was now permanent it took very little time to trace the cause, using my oscilloscope, to the surface-mounted transistor Q58 (see Fig. 1). A BC856B cured the trouble. Must remember to order some more!

Interestingly, I get lots of calls from repair 'engineers' who complain about decoder faults, low video levels, interference from the

# WORKSHOP

power supply and so on, but when I ask how far they got with scope checks to trace the cause I hear "oscilloscope?!" I'm beginning to think that I am the only person in the world who even owns one let alone knows how to use it! Maybe I should set up a basic training course.

I explained the overheating problem to the "computer engineer". These receivers will run happily for years if they are installed on an open shelf. When they are inside a cabinet they really need a fan. Unfortunately he was not won over by my salesmanship – he told me that he'd already found the supplier of the fan kit "at the web site" and would order one himself. Damn these experts!

### Amstrad SRD2000

You don't see many of these receivers, though they rivalled the Pace MSS1000 with their Surround Sound connections and other nice features. They have been sold off at ridiculously low prices recently. This is a worry to me – because the owners will be less inclined to pay me lots of money to fix them!

A dead one was brought to me from a town about ten miles away. It was not too difficult to repair, as the TOP204 chopper chip had failed. You need a really hot soldering iron to do this job, because the the chip's TO220 case is soldered to a broad area of tinned copper on the underside of the power supply board.

The first time I repaired an SRD2000 it fooled me. I fitted a TOP202 chip by mistake. This has a lower current rating than the TOP204, and as a result the receiver would work only when the audio board was disconnected. Guess who wasted an hour looking for a fault on the audio board!

### Galaxis Digital

Wow – my first digital receiver! This one is really neat inside. At £525 it ought to be, but I was impressed. The gentleman who brought it in was less impressed.

"Loop-through won't work" he announced.

"What, E to E?" I asked, then added "I mean TV aerial loop-through?"

"Nah, analogue receiver loop-through. You know, you connect your digital receiver to the dish, then your Amstrad through the digital. The signal goes through – except it doesn't any more."

I thought I understood, so I had a poke around. As the nature of the problem wasn't immediately obvious, I rang Satellite Scene at Derby. Technical Director Mike Hancox suggested that I check a diode next to the tuner. Sure enough, it had a dry-joint. A quick dab of solder and all was well.

But I told the customer to come back next week because "I wanted to soak test it to make sure". I'd never come across this loop-through feature before. It seemed that the Galaxis receiver had to be "parked" in standby on a vertically polarised channel, so that it sent 13V to the LNB. The analogue receiver could then control the LNB. Interesting. No need for a twin-output LNB or an additional cable.

### Pace MSS1000

Pace MSS500 and MSS1000 receivers are beginning to come in more often. It's the usual problem: the customer has kept his pride and joy nice and warm for two years, and the electrolytics are now drying out.

The symptoms can be wonderfully varied however, and it can be quite a challenge to work out why a capacitor might have caused a particular fault. I now replace a set of capacitors that come in the Relkit 6 kit from SatCure (phone 01270 753 311). If the fault persists, I then start to hunt down the cause using conventional methods. But the kit usually fixes the problem.

An MSS1000 arrived by carrier last week. The customer's lucid description of the fault was all of two words long, "intermittent dekoding"! There was no sign of any fault during a two-hour soak test, but the diagonal, dashed lines that swirled across the picture indicated that the electrolytics had

passed their 'sell by' date. I fitted the power supply capacitor kit and, for good measure, replaced C208 (1µF) which is next to the PTV111 sync separator chip on the decoder panel – it's often the cause of decoder 'dropout' when it has been cooked.

There were now no decoder messages, and the channel name and on-screen menus drifted gently from right to left. Oh dear! After spending a fruitless hour with an oscilloscope in one hand and a helpful Pace engineer at the end of a telephone in the other hand I had to give up. There comes a time when "you can't see t' wood fer t' trees".

I packed the unit carefully and sent it off to Ian at Satfix, Swansea. He spotted the cause of the problem immediately of course, and phoned me to gloat.

"A tiny thread of solder, isn't it. You left it across a surface-mount capacitor. Want me to post you the magnifying glass, do you? Or perhaps new spectacles are required? And by the way you always complain that I leave the screws out. So why was the Dolby board hanging loose inside?"

I wondered where those extra screws on my bench had come from!

### Nokia SAT800

The nice blonde girl who brought this receiver along said that it displayed a blank screen when warm and had been "looked at" by Wossname up Church Street. Fearing the worst, I began to remove the screws. But the young lady interrupted me.

"He said there's nothing wrong with it" she volunteered, "so he didn't even look inside. But it's still faulty."

I put my screwdriver down and breathed a sigh of relief. "In that case, madam, it will be ready this time tomorrow" I said with a smile. A few years ago I wouldn't have let her go as quickly as that. I left it on the soak test bench while other matters were receiving attention.

Once the SAT800 had warmed up nicely the picture vanished. Sound was still present – my TV set doesn't mute when there is no video – but the screen was blank. Out came the hairdryer and freezer. With these aids the culprit was

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:

**jack@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 first class stamps.

soon located. It turned out to be a surface-mounted transistor, RE101.

Since I don't have a service manual for this receiver I checked the transistor and found that it was a pnp device. A BC856B restored normal operation and will, I hope, last as long as the original transistor.

When the young lady came to collect it I told her to keep it cool. She told me to "stay cool".

Strange. I wasn't even wearing my pullover!

## Test Case 421

Sage was in a bad mood, for two reasons. First, Television Ted was grumbling about the cold, as he always does in winter. Secondly, Sage had a VCR with a nasty fault on his bench. There's no known cure for Ted's trouble, other than to run the heating at about 30°C. There was, finally, a cure for the Sony SLV315 that was troubling Sage so badly. See if you can do a better diagnostic job than he did!

The Sony VCR's symptom was noted down as "keeps switching itself off". What it actually did was to auto-eject the cassette, either immediately after tape threading or after playing for anything up to two minutes. The machine would then go to standby or the on/stop mode. There are several possibilities for this sort of thing. Sage began by checking the various monitoring inputs to the syscon microcontroller chip. He found that the supply and take-up spool sensor pulses were present and correct right up to the moment when the cassette was ejected. Likewise with the end-sensor inputs: they stayed at the logic-low level until the cassette shell had come up. Remembering a Sony VHS machine in which hash from an end sensor had caused obscure problems, Sage connected the microcontroller chip's end-sensor pins (IC501, pins 21 and 22) to chassis. This had no effect on the fault.

A thought occurred to Sage. Although he could find no mention of it in the service manual, he believed that this model has an error-code readout. To check, he shorted out the take-up reel sensor pulses. After deck shut down, the fluorescent display panel came up with code L 30 01 all by itself. He next tried stopping the drum by hand, and was rewarded with code L 30 03. Leaving the deck to itself, Sage watched as the play mode came to an end and

the tape was unthreaded. There was no error code on the display panel however. What to do next? Sage decided to replace the mode switch – this item can be responsible for some very odd faults. The original one must have been OK however, since the machine continued to play its tricks with the new switch installed.

Back to square five! If there was no error code, perhaps the microcontroller chip was receiving an instruction rather than responding to a distress call. Where could a false instruction come from? The front panel (MF125), Sage guessed. There's a second microcontroller chip here, IC001, which processes commands from the remote control system and from the front panel keys. But everything looked OK, and the front control keys and the zapper worked correctly. No liquid spillage or corrosion was evident, and no electrical leakage could be detected in the power or the eject tact switches. Nor were there any spurious pulses or hash on the SIRCS (remocon) control line to the chip. The connections between boards MF125 and MF126 were good and tight. Sage got the deck going in play and tried disconnecting board MF125 altogether. This was no good. There was instant shut down, as the main microcontroller chip seemed to miss its friend up front.

Sage tried resetting the front microcontroller chip with the key provided. This didn't help. He felt that its oscillators and supply voltage must be OK, as it was operating and producing the front panel display. But the cause of the fault had to be somewhere, and it seemed likely that a stop/eject command was being sent along the bus from the front panel to the main microcontroller chip. Sage eventually got to the bottom of it all. Can you, without going first to page 215?

Satellite dish alignment meters can be tricky to use. The null-method is a reliable alternative that requires no measurements. **John Pitt-Francis** shows how to go about it and the equipment required

# Null-method Dish Alignment



I do a lot of satellite installation work and have a small dish alignment meter that was bought for the purpose. It sits in its little case however, with its original batteries unworn. I dislike using it because the reading jumps about too much as I home in on a satellite transmission. And as it's not channel specific, I wonder whether I have the right satellite – there are two strong sources of signals within 6° of Astra. To me, there is nothing as reassuring as picking up Sky News or CNN.

The reading also jumps about in response to body radiation, giving my reflexes conflicting signals. So how do I know that the azimuth and elevation settings are at maximum? The alternative null-method of dish align-

ment described here solves these problems. It's not difficult once you've got the hang of it.

## Theory

The theory is simple enough. Fig. 1 shows a comparison between the polar responses of a typical UHF Yagi aerial and a 60cm Ku-band dish. The main difference is that the response of the dish is much sharper. Whereas the half-power points (-3dB) are at a beam width of 15° with the UHF aerial, they shrink to a beam width of 1.5° with a Ku-band dish.

When a dish is swung through its forward acceptance range there are two sharp thresholds at which the sound disappears into the background noise. This applies with both elevation and azimuth adjustment. Since the polar response of a dish is symmetrical, it follows that the optimum alignment position is half way between the points at which the sound is lost.

## Method

In practice, the null-method is as follows:

- (1) You need a satellite receiver which has been pre-tuned, using an aligned rig, to a channel that's unique to the satellite you are after, for example Sky News with Astra. Use an independent cable between the LNB and your receiver. Connect its UHF output to a small monochrome portable.
- (2) Fit the dish with its adjustment screws just slack enough to allow movement of the dish. Find the satellite required – usually Astra. The adjustment is not precise at this point.
- (3) Tighten the elevation nuts, then swing the dish slowly through 3-4°. The sound will cut in then out again. While doing this, note the position of the LNB in relation to the objects behind it: you must keep your head still. It's now a simple matter to find the mid-point

between the two null points. With the adjustment in exactly this position, tighten each nut half a turn at a time in rotation.

(4) Slacken off the elevation nuts then repeat the above procedure, this time for elevation. As before, tighten the nuts half a turn at a time in rotation.

(5) You can repeat steps 3 and 4, but if reception was good at step 3 this is not really necessary.

(6) Don't forget to skew the LNB (about  $-20^\circ$  for Astra).

The dish is now set at its optimum reception point – without making any measurements!

### Alignment Receiver

I use an old Ferguson SRB1 which has been converted for PAL with a 'Trac' conversion. It provides a useful menu with which to identify the required channel, without the irritating mute arrangements used in more modern receivers. The null method is not really practical unless such muting has been disabled. The AFC must also be disabled or switched off.

### Audio Amplifier

By fitting a small AF amplifier and a mini speaker within the receiver you can do away with the need for a TV set for monitoring. An AF signal can be picked up at pin 1 of the scart socket with the SRB1. Use a suitable supply line and make a chassis connection.

There are plenty of AF modules about but I use a home-built one. Fig. 2 shows the circuit diagram. It's made up on a small piece of Veroboard and sits in the

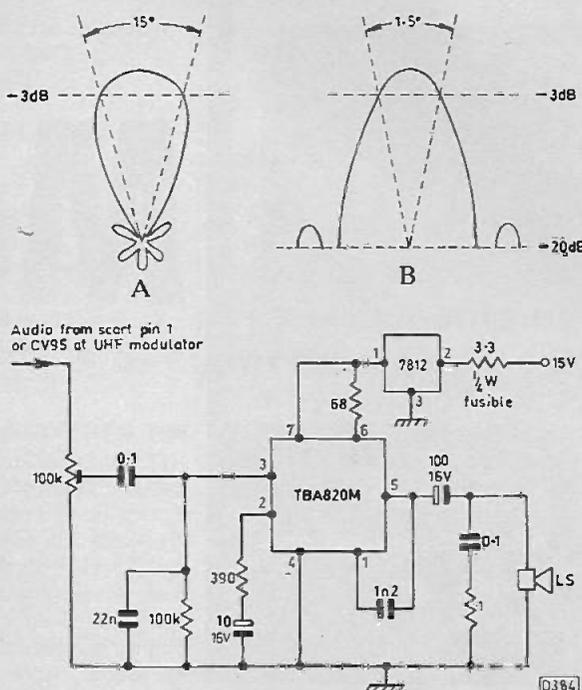


Fig. 1: Comparison between the polar response of a UHF Yagi aerial (a) and a 60cm Ku-band dish (b). Because of the sharp beam width ( $1.5^\circ$ ) of a dish, the sound disappears into the noise at well-defined points on each side of the optimum reception position. Prior to this sparklies appear with a strong signal.

Fig. 2: Suitable AF amplifier circuit using a TBA820M chip. The circuit can be built on a small piece of Veroboard. Use an 8 $\Omega$ , 0.1W 1.5in. speaker.

front corner, squeezed into the gap at the right-hand side of the D2-MAC decoder box.

### In Conclusion

To date the null method has resulted in null revisits! It's a worthwhile alternative even if you get on all right with your satellite finder.

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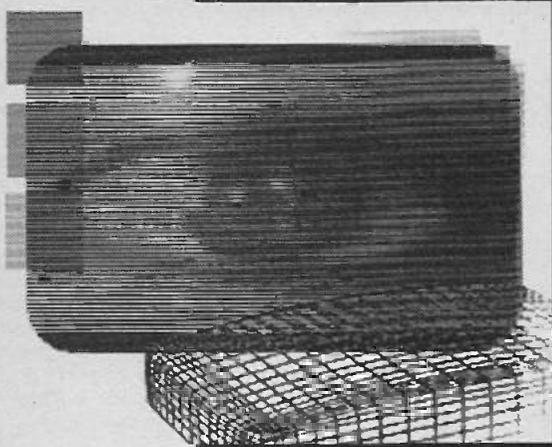
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#### **MTC EM1428**

If you get one of these monitors with a dead power supply, the chances are that the IP38421 chopper control chip has failed. Check or, better still, replace C512 at the same time. A.S.

#### **Unisys PWM100COL**

This monitor was dead. We found that the 15k $\Omega$  MOX resistor in the secondary switch-mode power supply was open-circuit. There is no component reference number for it. A.S.

#### **GoldStar 1505**

This monitor had an EW fault. To restore normal operation we had to replace the TDA8172 field output chip and the GN324N EW amplifier chip. A standard LM324 IC was used to replace the latter device. To check whether TDA8172 chip is the cause of the fault, disconnect pin 3 and measure the voltage. If it's positive, the chip is faulty. A.S.

#### **Hewlett-Packard 700/41**

If one of these terminals is dead with a blown BUW11A chopper transistor, check the four metal-glaze resistors for damage and replace them if necessary before powering up. There are three 5-6k $\Omega$ , 3W metal-glaze resistors and a 15k $\Omega$ , 3W one.

The power supply and timebases are silent, so if you are attempting to repair the unit without a keyboard it is useful to know that a green cursor will appear at the top, left corner of the screen when all is well. A.S.

# Monitors

#### **HIT KT81-144C/8M**

HIT stands for High Tech International Trading GmbH. One of these monitors came in because it was dead. The screw that secures the 2SK1118 chopper FET had been driven in at an odd angle and had jammed before it tightened the FET to its heatsink. R826 (0.22 $\Omega$ ), the source resistor, was open-circuit and the 18V gate protection zener diode ZD809 was short-circuit. Surprisingly there was no other damage, but I replaced the transistor to be on the safe side.

Don't make assumptions about the optocoupler in this power supply. It's for "green control", not regulation. Release of the optocoupler biases a transistor that shorts out the 3842 control chip's CR network, thus disabling the supply. Regulation is implemented by monitoring the 3842 chip's chopper-transformer derived supply. I.F.

#### **KD1430**

We had to rebuild this monitor's power supply – it arrived in a state of severe neglect. When we'd completed the repair we found that there was patterning on the screen. We were suspicious about the floating heatsink and damped this with a CR network. This improved matters considerably.

Subsequently the patterning got worse and the monitor was brought back. The culprit turned out to be a 100 $\mu$ F, 16V electrolytic on the secondary side of the chopper transformer. I.F.

#### **Samtron SC428PSL**

The ticket said "flashed and died". At some stage the spring clip on the heatsink had been fitted clumsily. In fact it had dug into the copper-foil EMC shield on the chopper transformer. The stressed insulation on the windings had eventually broken down and arched to the copper board. Fortunately our cus-

tommer had sent along an identical, damaged monitor to break up for parts. I.F.

#### **Mitac AM4037R**

"Pulsing and smokes" it said – possibly the most accurate fault description I've ever seen on a job card. This was another victim of brown glue! The line output transistor's collector pad had tracked across to the driver transformer's earth pad. Some work was required to file a guard ring and remove carbonisation from the PCB. The solder on the transformer pin's winding wrap had been oxidised by the heat, and a fair amount of soot had to be cleaned off.

Take care when remaking the transistor's connections. It's on a heatsink away from the PCB, with fly leads – and the collector wire is not in the middle! I.F.

#### **Atari Pattern Monitor**

This is a monochrome model: the ones we've had in have a badge on the front saying System Solutions and a label at the back saying SM14 Target Model X-1448T. Several have had blown power supplies. It's a simple self-oscillating arrangement with a bipolar chopper transistor, similar to that used by Wyse Technologies. The square ceramic 3.9 $\Omega$ , 4W resistor that feeds the bridge rectifier blows – this may save the fuse. You are likely to find that the 2SC3150 chopper transistor Q101 is short-circuit and its 1.5 $\Omega$ , 1W emitter resistor is open-circuit.

It is as well to replace any resistors that look well done. R102 and R103 (both 150k $\Omega$ ) should be replaced to ensure reliable starting. They are high-voltage types. R106 (100 $\Omega$ ) should be upgraded – it limits the current flowing in the LOPT's sync overwinding. Check the value of R105 (120 $\Omega$ , 1W): if it goes high the chopper drive will be weakened. Although the opto-

coupler is protected by a BA157 diode (D105) I tend to replace it to be on the safe side.

The basic cause of power supply failure seems to be the HT rectifier on the secondary side of the circuit. Being unable to find any data on the type fitted, I have used a UF5408 which seems to be suitable.

The problem I had with one of these monitors was loss of video drive. A short length of coaxial cable runs from the video amplifier/contrast control to the CRT base panel. The solder joint to the inner conductor looked fine, but a gentle tug pulled it clean from the solder fillet.

Another thing to watch with these monitors is the resistor and diode that are mounted on the track side of the PCB between the chopper power supply and the frame output stage. The resistor gets hot: if it springs away from the PCB it can touch the plastic case and cause untidy melt damage. Secure it to the PCB with a blob of silicone rubber. Place a couple of ceramic ICs clipped together beneath the board to push the resistor against it while the unit is being soaked.

This will ensure that the resistor is set firm, away from the plastic, when the unit is cased up. I.F.

**Taxan MV788LR**

This monitor came in dead with the line output transistor short-circuit. The unit worked when a replacement had been fitted, but a more careful examination showed that there was a bulge in C433 (4.7µF, 50V non-polarised) and that R416 (2.2Ω) was scorched. I replaced these items then put the monitor through its paces.

Sometimes, when it switched to a higher-resolution mode, a flash was seen in the line output area of the chassis. Careful observation brought me to the BY329-1200 diode D405, whose heatsink had not been deburred properly. As a result, the silicone rubber washer was punching through intermittently at the point of stress. I.F.

**Samtron SC428PSL**

"Screen pincushioning" was the complaint with this one. Actually the scan was excessive – the "pincushioning" was an incidental effect (loss of EW control). D407, the lower of the two EW modulator

diodes, was short-circuit. It's type UF5404. Don't bother trying anything else – it must be a UF type. I.F.

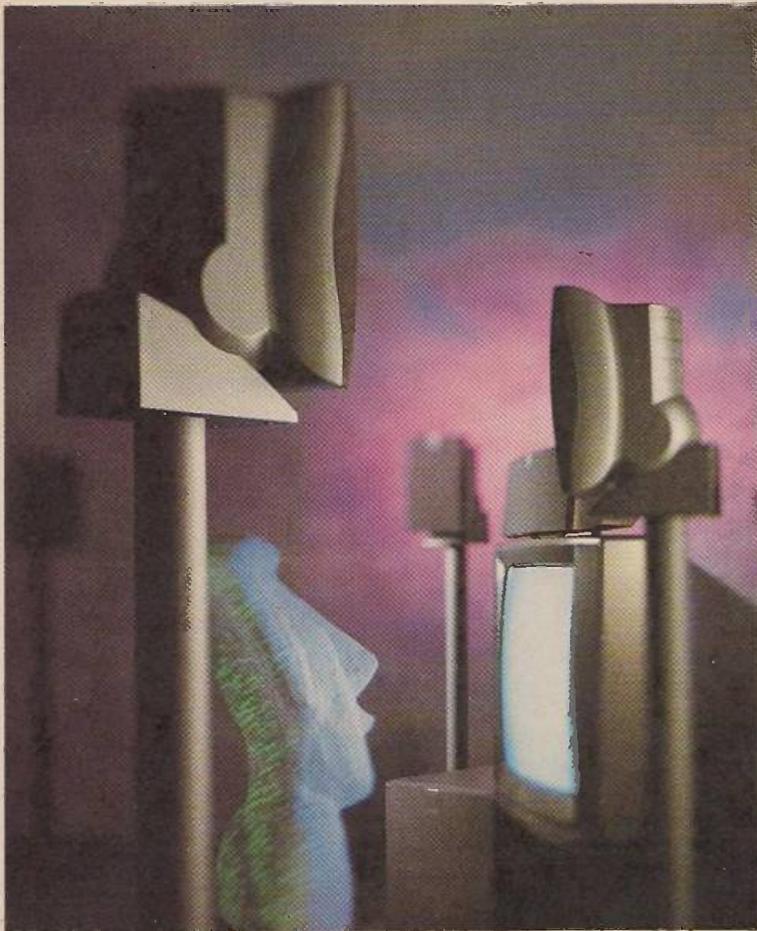
**Samsung CUM4967T**

This monitor had a blown mains fuse. As the STR58041 chopper chip was OK, a long search for the cause began. The degaussing positron didn't rattle, but I cracked it open to make sure! I'd drawn out most of the power supply circuit while working on a previous repair, so I decided to lift each diode in turn to get the number for my diagram, at the same time checking the diodes and going over the soldering.

While refitting D609, which is next to VR601, I impaled my finger on a substantial solder sliver that jutted sideways from one of VR601's lugs. It's my guess that this must have made contact with one of D609's leads. This would have shorted VR601, reducing the regulated voltage to a minimum, but if the contact had been intermittent the failure would not have been so surprising.

The monitor was given a three-day soak test. I.F.

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110</td><td>16.99</td><td>LA4511</td><td>2.99</td><td>LA4512</td><td>2.99</td><td>STR422</td><td>6.99</td><td>TA8586</td><td>3.99</td></tr> <tr><td>STR3876</td><td>16.99</td><td>LA4513</td><td>2.99</td><td>LA4514</td><td>2.99</td><td>STR423</td><td>6.99</td><td>TA8587</td><td>3.99</td></tr> <tr><td>TX3837</td><td>16.99</td><td>LA4515</td><td>2.99</td><td>LA4516</td><td>2.99</td><td>STR424</td><td>6.99</td><td>TA8588</td><td>3.99</td></tr> <tr><td>JVC C21E1E</td><td>16.99</td><td>LA4517</td><td>2.99</td><td>LA4518</td><td>2.99</td><td>STR425</td><td>6.99</td><td>TA8589</td><td>3.99</td></tr> <tr><td>LOEWE ART 1</td><td>16.99</td><td>LA4519</td><td>2.99</td><td>LA4520</td><td>2.99</td><td>STR426</td><td>6.99</td><td>TA8590</td><td>3.99</td></tr> <tr><td>INSTRUMENTS, REPAIR KITS, BOOKS &amp; CABLES TO CHOOSE FROM</td><td></td><td>LA4521</td><td>2.99</td><td>LA4522</td><td>2.99</td><td>STR427</td><td>6.99</td><td>TA8591</td><td>3.99</td></tr> <tr><td>ADD £1.50 P/P + 17.5% VAT</td><td></td><td>LA4523</td><td>2.99</td><td>LA4524</td><td>2.99</td><td>STR428</td><td>6.99</td><td>TA8592</td><td>3.99</td></tr> <tr><td>ALL GOODS DESPATCHED SAME DAY</td><td></td><td>LA4525</td><td>2.99</td><td>LA4526</td><td>2.99</td><td>STR429</td><td>6.99</td><td>TA8593</td><td>3.99</td></tr> <tr><td>PRICES SUBJECT TO CHANGE WITHOUT NOTICE VISA ACCESS ACCEPTED.</td><td></td><td>LA4527</td><td>2.99</td><td>LA4528</td><td>2.99</td><td>STR430</td><td>6.99</td><td>TA8594</td><td>3.99</td></tr> <tr><td>MIN ORDER £5.00</td><td></td><td>LA4529</td><td>2.99</td><td>LA4530</td><td>2.99</td><td>STR431</td><td>6.99</td><td>TA8595</td><td>3.99</td></tr> </table>	AKAI CT2569E	16.99	NEI 1451R	16.99	AN5512	1.99	TD115530	6.99	TA7270	2.50	CT2832E	16.99	NIKKAI BABY 10	16.99	AN5515	1.99	TD115140	6.99	TA7271	2.50	AKURA CX10	16.99	NT14	16.99	AN5521	1.99	TD115570	3.99	TA7279	3.99	SEKO 16328NX	19.99	NT20	16.99	BA2910	12.99	TD15580	3.99	TA7281	2.76	16228NX	19.99	PANASONIC TLF14567	20.00	BA3818	12.99	TD2005	1.70	TA7287	3.99	BUSH 2114T	16.99	TLF14568	20.00	BA5408	4.99	TD2030	1.20	TA7288	4.29	3114T	16.99	TLF14585	20.00	BA5410	3.60	TD2040	1.70	TA7299	3.99	DECCA D18552	16.99	TLF14586	20.00	BA5412	3.50	TD2052	3.50	TA8214	3.50	DT9476	16.99	TLF14587	20.00	BA6109	1.80	TD2578A	2.99	TA8215	3.80	DV9499	16.99	TLF14588	20.00	BA6122	3.99	TD2579A	3.25	TA8216	4.25	TN9422	16.99	TLF14592	22.00	BA6209	4.99	TD2653A	2.60	TA8217	2.99	FERGUSON TX8586	16.99	TLF15506	22.00	BA6222	1.99	M54545L	3.40	TA8218	7.60	TX90	16.99	TLF15534	28.00	BA6229	2.99	M54549L	4.60	TA8220	5.00	TX100	16.99	PHILIPS 2A23A	16.99	BA6238	1.99	MC1306T3	3.99	TA8221	5.99	51P7	16.99	CTXES	16.99	BA6239	2.99	MC1309T3	3.99	TA8227P	3.99	59K7	16.99	GR1AX	18.99	BA8247	1.99	PAL003A	20.00	TA8427K	3.99	66M3	16.99	GR22AA	22.00	CNX62A	1.99	STK3029B	14.99	TA8558AN	12.99	AS1P	16.99	CP90	16.99	CNX82A	1.99	STK465	11.00	TA8560	3.25	FINLUX 2482	19.99	CP110	22.00	CNX83	1.99	STK3082	11.00	TA8561A	3.50	AS1P	16.99	SAMSUNG SAISHO	16.99	CNY75	1.99	STK4121	11.00	TA8562A	3.99	GOLDSTAR CBT2162E	19.99	CT149TXA	16.99	HA1423	2.25	STK4131	8.50	TA8565	2.99	CIT9508	16.99	SANYO CT142RX	16.99	HA13001	1.99	STK4132	11.00	TA8566	3.99	GOODMANS CTY14R	16.99	SAMSUNG CB814F	16.99	HA13118	2.99	STK4141	6.50	TA8568	3.99	CIT2180	16.99	CT5412G	16.99	HA13119	2.99	STK4142	7.00	TA8569	3.99	TV20RC	16.99	SANYO CBP2146	22.00	HA13128	16.99	STK4151	8.00	TA8570	3.99	GRUNDIG CUC2401	21.50	CTP8265	22.00	HA13130	2.99	STK4152	9.00	TA8571	3.99	CUC3400	21.50	SHARP G141S	31.00	HA13150	14.99	STK4182	8.00	TA8572	3.99	WINNARI CT14	19.99	SONY KV2052UB	16.99	LA4270	3.99	STK4171	8.50	TA8573	3.99	CT20R	16.99	KV2096UB	16.99	LA4280	3.99	STK4172	8.50	TA8574	3.99	TVA1	16.99	KV21XRTU	16.99	LA4282	6.99	STK4182	10.00	TA8575	3.99	HITACHI C2114T	24.99	LA4445	2.60	LA4446	2.99	STK4192	10.00	TA8576	3.99	C2118T	24.99	LA4448	2.25	LA4460	1.90	STK4534	7.00	TA8577	3.99	C21P226	24.99	LA4485	2.99	LA4481	1.60	STK5481	6.00	TA8578	3.99	C2558T	24.99	LA4486	2.99	LA4482	2.25	STK5490	5.50	TA8579	3.99	CPT2036	16.99	LA4488	2.99	LA4483	2.99	STK7226	8.00	TA8580	3.99	CPT2158	16.99	LA4495	3.99	LA4484	2.99	STK7253	6.50	TA8581	3.99	CPT2178	16.99	LA4496	3.99	LA4485	2.99	STK7390	4.80	TA8582	3.99	CPT2478	16.99	LA4498	3.99	LA4486	2.99	STR412	4.80	TA8583	3.99	ITC COMP 80R	16.99	LA4507	2.99	LA4508	2.80	STR417	4.80	TA8584	3.99	CT3425	16.99	LA4509	2.99	LA4510	2.99	STR421	5.99	TA8585	3.99	DIGI 3 110	16.99	LA4511	2.99	LA4512	2.99	STR422	6.99	TA8586	3.99	STR3876	16.99	LA4513	2.99	LA4514	2.99	STR423	6.99	TA8587	3.99	TX3837	16.99	LA4515	2.99	LA4516	2.99	STR424	6.99	TA8588	3.99	JVC C21E1E	16.99	LA4517	2.99	LA4518	2.99	STR425	6.99	TA8589	3.99	LOEWE ART 1	16.99	LA4519	2.99	LA4520	2.99	STR426	6.99	TA8590	3.99	INSTRUMENTS, REPAIR KITS, BOOKS & CABLES TO CHOOSE FROM		LA4521	2.99	LA4522	2.99	STR427	6.99	TA8591	3.99	ADD £1.50 P/P + 17.5% VAT		LA4523	2.99	LA4524	2.99	STR428	6.99	TA8592	3.99	ALL GOODS DESPATCHED SAME DAY		LA4525	2.99	LA4526	2.99	STR429	6.99	TA8593	3.99	PRICES SUBJECT TO CHANGE WITHOUT NOTICE VISA ACCESS ACCEPTED.		LA4527	2.99	LA4528	2.99	STR430	6.99	TA8594	3.99	MIN ORDER £5.00		LA4529	2.99	LA4530	2.99	STR431	6.99	TA8595	3.99	<table border="1"> <tr><td>AN5512</td><td>1.99</td><td>TD115530</td><td>6.99</td><td>TA7270</td><td>2.50</td></tr> <tr><td>AN5515</td><td>1.99</td><td>TD115140</td><td>6.99</td><td>TA7271</td><td>2.50</td></tr> <tr><td>AN5521</td><td>1.99</td><td>TD115570</td><td>3.99</td><td>TA7279</td><td>3.99</td></tr> <tr><td>BA2910</td><td>12.99</td><td>TD15580</td><td>3.99</td><td>TA7281</td><td>2.76</td></tr> <tr><td>BA3818</td><td>12.99</td><td>TD2005</td><td>1.70</td><td>TA7287</td><td>3.99</td></tr> <tr><td>BA5408</td><td>4.99</td><td>TD2030</td><td>1.20</td><td>TA7288</td><td>4.29</td></tr> <tr><td>BA5410</td><td>3.60</td><td>TD2040</td><td>1.70</td><td>TA7299</td><td>3.99</td></tr> <tr><td>BA5412</td><td>3.50</td><td>TD2052</td><td>3.50</td><td>TA8214</td><td>3.50</td></tr> <tr><td>BA6109</td><td>1.80</td><td>TD2578A</td><td>2.99</td><td>TA8215</td><td>3.80</td></tr> <tr><td>BA6122</td><td>3.99</td><td>TD2579A</td><td>3.25</td><td>TA8216</td><td>4.25</td></tr> <tr><td>BA6209</td><td>4.99</td><td>TD2653A</td><td>2.60</td><td>TA8217</td><td>2.99</td></tr> <tr><td>BA6222</td><td>1.99</td><td>M54545L</td><td>3.40</td><td>TA8218</td><td>7.60</td></tr> <tr><td>BA6229</td><td>2.99</td><td>M54549L</td><td>4.60</td><td>TA8220</td><td>5.00</td></tr> <tr><td>BA6238</td><td>1.99</td><td>M54548L</td><td>3.99</td><td>TA8221</td><td>5.99</td></tr> <tr><td>BA6239</td><td>2.99</td><td>MC1306T3</td><td>3.99</td><td>TA8227P</td><td>3.99</td></tr> <tr><td>BA8247</td><td>1.99</td><td>MC1309T3</td><td>3.99</td><td>TA8427K</td><td>3.99</td></tr> <tr><td>CNX62A</td><td>1.99</td><td>PAL003A</td><td>20.00</td><td>TA8558AN</td><td>12.99</td></tr> <tr><td>CNX82A</td><td>1.99</td><td>STK3029B</td><td>14.99</td><td>TA8560</td><td>3.25</td></tr> <tr><td>CNX83</td><td>1.99</td><td>STK465</td><td>11.00</td><td>TA8561A</td><td>3.50</td></tr> <tr><td>CNY75</td><td>1.99</td><td>STK4121</td><td>11.00</td><td>TA8562A</td><td>3.99</td></tr> <tr><td>HA1423</td><td>2.25</td><td>STK4131</td><td>8.50</td><td>TA8565</td><td>2.99</td></tr> <tr><td>HA13001</td><td>1.99</td><td>STK4132</td><td>11.00</td><td>TA8566</td><td>3.99</td></tr> <tr><td>HA13118</td><td>2.99</td><td>STK4141</td><td>6.50</td><td>TA8568</td><td>3.99</td></tr> <tr><td>HA13119</td><td>2.99</td><td>STK4142</td><td>7.00</td><td>TA8569</td><td>3.99</td></tr> <tr><td>HA13128</td><td>16.99</td><td>STK4151</td><td>8.00</td><td>TA8570</td><td>3.99</td></tr> <tr><td>HA13130</td><td>2.99</td><td>STK4152</td><td>9.00</td><td>TA8571</td><td>3.99</td></tr> <tr><td>HA13150</td><td>14.99</td><td>STK4182</td><td>8.00</td><td>TA8572</td><td>3.99</td></tr> <tr><td>LA4270</td><td>3.99</td><td>STK4171</td><td>8.50</td><td>TA8573</td><td>3.99</td></tr> <tr><td>LA4280</td><td>3.99</td><td>STK4172</td><td>8.50</td><td>TA8574</td><td>3.99</td></tr> <tr><td>LA4282</td><td>6.99</td><td>STK4182</td><td>10.00</td><td>TA8575</td><td>3.99</td></tr> <tr><td>LA4445</td><td>2.60</td><td>STK4192</td><td>10.00</td><td>TA8576</td><td>3.99</td></tr> <tr><td>LA4446</td><td>2.99</td><td>STK4534</td><td>7.00</td><td>TA8577</td><td>3.99</td></tr> <tr><td>LA4460</td><td>1.90</td><td>STK5481</td><td>6.00</td><td>TA8578</td><td>3.99</td></tr> <tr><td>LA4481</td><td>1.60</td><td>STK5490</td><td>5.50</td><td>TA8579</td><td>3.99</td></tr> <tr><td>LA4482</td><td>2.25</td><td>STK7226</td><td>8.00</td><td>TA8580</td><td>3.99</td></tr> <tr><td>LA4483</td><td>2.99</td><td>STK7253</td><td>6.50</td><td>TA8581</td><td>3.99</td></tr> <tr><td>LA4484</td><td>2.99</td><td>STK7390</td><td>4.80</td><td>TA8582</td><td>3.99</td></tr> <tr><td>LA4485</td><td>2.99</td><td>STR412</td><td>4.80</td><td>TA8583</td><td>3.99</td></tr> <tr><td>LA4486</td><td>2.99</td><td>STR417</td><td>4.80</td><td>TA8584</td><td>3.99</td></tr> <tr><td>LA4488</td><td>2.99</td><td>STR421</td><td>5.99</td><td>TA8585</td><td>3.99</td></tr> <tr><td>LA4495</td><td>3.99</td><td>STR422</td><td>6.99</td><td>TA8586</td><td>3.99</td></tr> <tr><td>LA4496</td><td>3.99</td><td>STR423</td><td>6.99</td><td>TA8587</td><td>3.99</td></tr> <tr><td>LA4498</td><td>3.99</td><td>STR424</td><td>6.99</td><td>TA8588</td><td>3.99</td></tr> <tr><td>LA4507</td><td>2.99</td><td>STR425</td><td>6.99</td><td>TA8589</td><td>3.99</td></tr> <tr><td>LA4508</td><td>2.80</td><td>STR426</td><td>6.99</td><td>TA8590</td><td>3.99</td></tr> <tr><td>LA4509</td><td>2.99</td><td>STR427</td><td>6.99</td><td>TA8591</td><td>3.99</td></tr> <tr><td>LA4510</td><td>2.99</td><td>STR428</td><td>6.99</td><td>TA8592</td><td>3.99</td></tr> <tr><td>LA4511</td><td>2.99</td><td>STR429</td><td>6.99</td><td>TA8593</td><td>3.99</td></tr> <tr><td>LA4512</td><td>2.99</td><td>STR430</td><td>6.99</td><td>TA8594</td><td>3.99</td></tr> <tr><td>LA4513</td><td>2.99</td><td>STR431</td><td>6.99</td><td>TA8595</td><td>3.99</td></tr> <tr><td>LA4514</td><td>2.99</td><td>STR432</td><td>6.99</td><td>TA8596</td><td>3.99</td></tr> <tr><td>LA4515</td><td>2.60</td><td>STR433</td><td>6.99</td><td>TA8597</td><td>3.99</td></tr> <tr><td>LA4516</td><td>2.99</td><td>STR434</td><td>6.99</td><td>TA8598</td><td>3.99</td></tr> <tr><td>LA4517</td><td>2.99</td><td>STR435</td><td>6.99</td><td>TA8599</td><td>3.99</td></tr> <tr><td>LA4518</td><td>2.99</td><td>STR436</td><td>6.99</td><td>TA8600</td><td>3.99</td></tr> <tr><td>LA4519</td><td>2.99</td><td>STR437</td><td>6.99</td><td>TA8601</td><td>3.99</td></tr> <tr><td>LA4520</td><td>2.99</td><td>STR438</td><td>6.99</td><td>TA8602</td><td>3.99</td></tr> <tr><td>LA4521</td><td>2.99</td><td>STR439</td><td>6.99</td><td>TA8603</td><td>3.99</td></tr> <tr><td>LA4522</td><td>2.99</td><td>STR440</td><td>6.99</td><td>TA8604</td><td>3.99</td></tr> <tr><td>LA4523</td><td>2.99</td><td>STR441</td><td>6.99</td><td>TA8605</td><td>3.99</td></tr> <tr><td>LA4524</td><td>2.99</td><td>STR442</td><td>6.99</td><td>TA8606</td><td>3.99</td></tr> <tr><td>LA4525</td><td>2.99</td><td>STR443</td><td>6.99</td><td>TA8607</td><td>3.99</td></tr> <tr><td>LA4526</td><td>2.99</td><td>STR444</td><td>6.99</td><td>TA8608</td><td>3.99</td></tr> <tr><td>LA4527</td><td>2.99</td><td>STR445</td><td>6.99</td><td>TA8609</td><td>3.99</td></tr> <tr><td>LA4528</td><td>2.99</td><td>STR446</td><td>6.99</td><td>TA8610</td><td>3.99</td></tr> <tr><td>LA4529</td><td>2.99</td><td>STR447</td><td>6.99</td><td>TA8611</td><td>3.99</td></tr> <tr><td>LA4530</td><td>2.99</td><td>STR448</td><td>6.99</td><td>TA8612</td><td>3.99</td></tr> </table>	AN5512	1.99	TD115530	6.99	TA7270	2.50	AN5515	1.99	TD115140	6.99	TA7271	2.50	AN5521	1.99	TD115570	3.99	TA7279	3.99	BA2910	12.99	TD15580	3.99	TA7281	2.76	BA3818	12.99	TD2005	1.70	TA7287	3.99	BA5408	4.99	TD2030	1.20	TA7288	4.29	BA5410	3.60	TD2040	1.70	TA7299	3.99	BA5412	3.50	TD2052	3.50	TA8214	3.50	BA6109	1.80	TD2578A	2.99	TA8215	3.80	BA6122	3.99	TD2579A	3.25	TA8216	4.25	BA6209	4.99	TD2653A	2.60	TA8217	2.99	BA6222	1.99	M54545L	3.40	TA8218	7.60	BA6229	2.99	M54549L	4.60	TA8220	5.00	BA6238	1.99	M54548L	3.99	TA8221	5.99	BA6239	2.99	MC1306T3	3.99	TA8227P	3.99	BA8247	1.99	MC1309T3	3.99	TA8427K	3.99	CNX62A	1.99	PAL003A	20.00	TA8558AN	12.99	CNX82A	1.99	STK3029B	14.99	TA8560	3.25	CNX83	1.99	STK465	11.00	TA8561A	3.50	CNY75	1.99	STK4121	11.00	TA8562A	3.99	HA1423	2.25	STK4131	8.50	TA8565	2.99	HA13001	1.99	STK4132	11.00	TA8566	3.99	HA13118	2.99	STK4141	6.50	TA8568	3.99	HA13119	2.99	STK4142	7.00	TA8569	3.99	HA13128	16.99	STK4151	8.00	TA8570	3.99	HA13130	2.99	STK4152	9.00	TA8571	3.99	HA13150	14.99	STK4182	8.00	TA8572	3.99	LA4270	3.99	STK4171	8.50	TA8573	3.99	LA4280	3.99	STK4172	8.50	TA8574	3.99	LA4282	6.99	STK4182	10.00	TA8575	3.99	LA4445	2.60	STK4192	10.00	TA8576	3.99	LA4446	2.99	STK4534	7.00	TA8577	3.99	LA4460	1.90	STK5481	6.00	TA8578	3.99	LA4481	1.60	STK5490	5.50	TA8579	3.99	LA4482	2.25	STK7226	8.00	TA8580	3.99	LA4483	2.99	STK7253	6.50	TA8581	3.99	LA4484	2.99	STK7390	4.80	TA8582	3.99	LA4485	2.99	STR412	4.80	TA8583	3.99	LA4486	2.99	STR417	4.80	TA8584	3.99	LA4488	2.99	STR421	5.99	TA8585	3.99	LA4495	3.99	STR422	6.99	TA8586	3.99	LA4496	3.99	STR423	6.99	TA8587	3.99	LA4498	3.99	STR424	6.99	TA8588	3.99	LA4507	2.99	STR425	6.99	TA8589	3.99	LA4508	2.80	STR426	6.99	TA8590	3.99	LA4509	2.99	STR427	6.99	TA8591	3.99	LA4510	2.99	STR428	6.99	TA8592	3.99	LA4511	2.99	STR429	6.99	TA8593	3.99	LA4512	2.99	STR430	6.99	TA8594	3.99	LA4513	2.99	STR431	6.99	TA8595	3.99	LA4514	2.99	STR432	6.99	TA8596	3.99	LA4515	2.60	STR433	6.99	TA8597	3.99	LA4516	2.99	STR434	6.99	TA8598	3.99	LA4517	2.99	STR435	6.99	TA8599	3.99	LA4518	2.99	STR436	6.99	TA8600	3.99	LA4519	2.99	STR437	6.99	TA8601	3.99	LA4520	2.99	STR438	6.99	TA8602	3.99	LA4521	2.99	STR439	6.99	TA8603	3.99	LA4522	2.99	STR440	6.99	TA8604	3.99	LA4523	2.99	STR441	6.99	TA8605	3.99	LA4524	2.99	STR442	6.99	TA8606	3.99	LA4525	2.99	STR443	6.99	TA8607	3.99	LA4526	2.99	STR444	6.99	TA8608	3.99	LA4527	2.99	STR445	6.99	TA8609	3.99	LA4528	2.99	STR446	6.99	TA8610	3.99	LA4529	2.99	STR447	6.99	TA8611	3.99	LA4530	2.99	STR448	6.99	TA8612	3.99	<table border="1"> <tr><td>TA7270</td><td>2.50</td><td>TA8221</td><td>5.99</td></tr> <tr><td>TA7271</td><td>2.50</td><td>TA8227P</td><td>3.99</td></tr> <tr><td>TA7279</td><td>3.99</td><td>TA8427K</td><td>3.99</td></tr> <tr><td>TA7281</td><td>2.76</td><td>TA8558AN</td><td>12.99</td></tr> <tr><td>TA7287</td><td>3.99</td><td>TA8560</td><td>3.25</td></tr> <tr><td>TA7288</td><td>4.29</td><td>TA8561A</td><td>3.50</td></tr> <tr><td>TA7299</td><td>3.99</td><td>TA8562A</td><td>3.99</td></tr> <tr><td>TA8214</td><td>3.50</td><td>TA8565</td><td>2.99</td></tr> <tr><td>TA8215</td><td>3.80</td><td>TA8566</td><td>3.99</td></tr> <tr><td>TA8216</td><td>4.25</td><td>TA8568</td><td>3.99</td></tr> <tr><td>TA8217</td><td>2.99</td><td>TA8569</td><td>3.99</td></tr> <tr><td>TA8218</td><td>7.60</td><td>TA8570</td><td>3.99</td></tr> <tr><td>TA8220</td><td>5.00</td><td>TA8571</td><td>3.99</td></tr> <tr><td>TA8221</td><td>5.99</td><td>TA8572</td><td>3.99</td></tr> <tr><td>TA8227P</td><td>3.99</td><td>TA8573</td><td>3.99</td></tr> <tr><td>TA8427K</td><td>3.99</td><td>TA8574</td><td>3.99</td></tr> <tr><td>TA8558AN</td><td>12.99</td><td>TA8575</td><td>3.99</td></tr> <tr><td>TA8560</td><td>3.25</td><td>TA8576</td><td>3.99</td></tr> <tr><td>TA8561A</td><td>3.50</td><td>TA8577</td><td>3.99</td></tr> <tr><td>TA8562A</td><td>3.99</td><td>TA8578</td><td>3.99</td></tr> <tr><td>TA8565</td><td>2.99</td><td>TA8579</td><td>3.99</td></tr> <tr><td>TA8566</td><td>3.99</td><td>TA8580</td><td>3.99</td></tr> <tr><td>TA8568</td><td>3.99</td><td>TA8581</td><td>3.99</td></tr> <tr><td>TA8569</td><td>3.99</td><td>TA8582</td><td>3.99</td></tr> <tr><td>TA8570</td><td>3.99</td></tr></table>	TA7270	2.50	TA8221	5.99	TA7271	2.50	TA8227P	3.99	TA7279	3.99	TA8427K	3.99	TA7281	2.76	TA8558AN	12.99	TA7287	3.99	TA8560	3.25	TA7288	4.29	TA8561A	3.50	TA7299	3.99	TA8562A	3.99	TA8214	3.50	TA8565	2.99	TA8215	3.80	TA8566	3.99	TA8216	4.25	TA8568	3.99	TA8217	2.99	TA8569	3.99	TA8218	7.60	TA8570	3.99	TA8220	5.00	TA8571	3.99	TA8221	5.99	TA8572	3.99	TA8227P	3.99	TA8573	3.99	TA8427K	3.99	TA8574	3.99	TA8558AN	12.99	TA8575	3.99	TA8560	3.25	TA8576	3.99	TA8561A	3.50	TA8577	3.99	TA8562A	3.99	TA8578	3.99	TA8565	2.99	TA8579	3.99	TA8566	3.99	TA8580	3.99	TA8568	3.99	TA8581	3.99	TA8569	3.99	TA8582	3.99	TA8570	3.99
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CIT2180	16.99	CT5412G	16.99	HA13119	2.99	STK4142	7.00	TA8569	3.99																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
TV20RC	16.99	SANYO CBP2146	22.00	HA13128	16.99	STK4151	8.00	TA8570	3.99																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
GRUNDIG CUC2401	21.50	CTP8265	22.00	HA13130	2.99	STK4152	9.00	TA8571	3.99																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
CUC3400	21.50	SHARP G141S	31.00	HA13150	14.99	STK4182	8.00	TA8572	3.99																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
WINNARI CT14	19.99	SONY KV2052UB	16.99	LA4270	3.99	STK4171	8.50	TA8573	3.99																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
CT20R	16.99	KV2096UB	16.99	LA4280	3.99	STK4172	8.50	TA8574	3.99																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
TVA1	16.99	KV21XRTU	16.99	LA4282	6.99	STK4182	10.00	TA8575	3.99																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
HITACHI C2114T	24.99	LA4445	2.60	LA4446	2.99	STK4192	10.00	TA8576	3.99																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
C2118T	24.99	LA4448	2.25	LA4460	1.90	STK4534	7.00	TA8577	3.99																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
C21P226	24.99	LA4485	2.99	LA4481	1.60	STK5481	6.00	TA8578	3.99																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
C2558T	24.99	LA4486	2.99	LA4482	2.25	STK5490	5.50	TA8579	3.99																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
CPT2036	16.99	LA4488	2.99	LA4483	2.99	STK7226	8.00	TA8580	3.99																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
CPT2158	16.99	LA4495	3.99	LA4484	2.99	STK7253	6.50	TA8581	3.99																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
CPT2178	16.99	LA4496	3.99	LA4485	2.99	STK7390	4.80	TA8582	3.99																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
CPT2478	16.99	LA4498	3.99	LA4486	2.99	STR412	4.80	TA8583	3.99																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
ITC COMP 80R	16.99	LA4507	2.99	LA4508	2.80	STR417	4.80	TA8584	3.99																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
CT3425	16.99	LA4509	2.99	LA4510	2.99	STR421	5.99	TA8585	3.99																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
DIGI 3 110	16.99	LA4511	2.99	LA4512	2.99	STR422	6.99	TA8586	3.99																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
STR3876	16.99	LA4513	2.99	LA4514	2.99	STR423	6.99	TA8587	3.99																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
TX3837	16.99	LA4515	2.99	LA4516	2.99	STR424	6.99	TA8588	3.99																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
JVC C21E1E	16.99	LA4517	2.99	LA4518	2.99	STR425	6.99	TA8589	3.99																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
LOEWE ART 1	16.99	LA4519	2.99	LA4520	2.99	STR426	6.99	TA8590	3.99																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
INSTRUMENTS, REPAIR KITS, BOOKS & CABLES TO CHOOSE FROM		LA4521	2.99	LA4522	2.99	STR427	6.99	TA8591	3.99																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
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ALL GOODS DESPATCHED SAME DAY		LA4525	2.99	LA4526	2.99	STR429	6.99	TA8593	3.99																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
PRICES SUBJECT TO CHANGE WITHOUT NOTICE VISA ACCESS ACCEPTED.		LA4527	2.99	LA4528	2.99	STR430	6.99	TA8594	3.99																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
MIN ORDER £5.00		LA4529	2.99	LA4530	2.99	STR431	6.99	TA8595	3.99																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
AN5512	1.99	TD115530	6.99	TA7270	2.50																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
AN5515	1.99	TD115140	6.99	TA7271	2.50																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
AN5521	1.99	TD115570	3.99	TA7279	3.99																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
BA2910	12.99	TD15580	3.99	TA7281	2.76																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
BA3818	12.99	TD2005	1.70	TA7287	3.99																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
BA5408	4.99	TD2030	1.20	TA7288	4.29																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
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BA6122	3.99	TD2579A	3.25	TA8216	4.25																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
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BA6222	1.99	M54545L	3.40	TA8218	7.60																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
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BA6238	1.99	M54548L	3.99	TA8221	5.99																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
BA6239	2.99	MC1306T3	3.99	TA8227P	3.99																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
BA8247	1.99	MC1309T3	3.99	TA8427K	3.99																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
CNX62A	1.99	PAL003A	20.00	TA8558AN	12.99																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
CNX82A	1.99	STK3029B	14.99	TA8560	3.25																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
CNX83	1.99	STK465	11.00	TA8561A	3.50																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
CNY75	1.99	STK4121	11.00	TA8562A	3.99																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
HA1423	2.25	STK4131	8.50	TA8565	2.99																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
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HA13118	2.99	STK4141	6.50	TA8568	3.99																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
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LA4445	2.60	STK4192	10.00	TA8576	3.99																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
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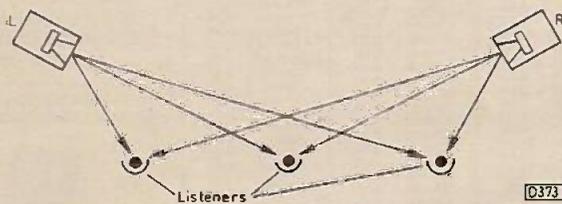
Nicam transmissions have made it possible to add the full Dolby Pro-Logic system to TV, making home cinema sound possible. This has led to a profusion of TV speaker arrangements. **Alan J. Roberts** surveys the current scene

# TV Sound Systems

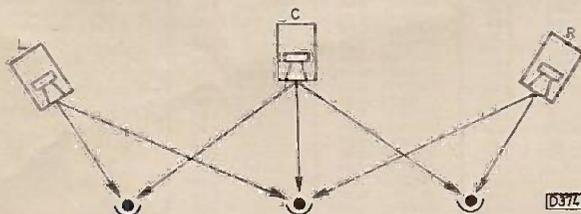
Over the years all sorts of electronic tricks have been used by manufacturers to improve picture quality. Black-level clamping and flywheel sync were early advances. Then automatic contrast control came with some sets: the contrast was varied to adjust for changes in ambient light level. How many of you can remember the photocell fitted in some Pye 405-line sets? Personally I can't remember whether the system actually worked. Now of course you can get 100Hz

scanning, scan-velocity modulation, digital noise reduction and other improvements with top-of-the-range models.

It is only fairly recently in the history of TV that manufacturers have made a real effort with audio quality. It started with Nicam stereo sound which, in the late Eighties, made true hi-fi TV sound possible. Now, with Dolby Pro-Logic, home cinema sound is a reality. It's all a far cry from 2W of mono sound from a 4in. loudspeaker driven by a class A output pentode. This article explains some more recently adopted techniques.



**Fig. 1:** A listener in the centre hears the full sound. Those to the left or right hear a greater proportion of the relevant channel, producing the 'hole-in-the-middle' effect.



**Fig. 2:** Adding an independent centre channel enables listeners at the left and right to hear correctly balanced sound, with voices emanating from screen centre.

## Stereo

The most basic improvement is ordinary stereo. In the UK, and a number of other countries, we can enjoy digital sound quality brought to us via the Nicam system. The results can be very impressive when stereo outputs from a TV set or a Nicam VCR are fed to a good hi-fi system. With most TV sets the problem is that cabinet size imposes restrictions: the internal speakers are too small and too close together to give good results at normal viewing distances.

One trick that has been in use for many years is Spatial Stereo. By adding a proportion of the left channel to the right channel and vice versa, with a phase shift, you get an apparent increase in the distance between the speakers. There is usually a trade-off however, in the bass response and a general sound 'thinness'. This is not too much of a problem when the internal speakers are on the small side and have a limited frequency response.

If the TV set has external speaker connections, normal hi-fi speakers can be linked up and placed farther apart. This gives a worthwhile improvement to the overall

sound, limited by the fact that basic TV sets usually have low output powers.

Some TV receivers have a 'surround sound' provision. By connecting an extra pair of speakers to the 'rear' outputs, passive surround sound can be obtained with stereo material. This is not proper Surround sound, as the effect is achieved by feeding out-of-phase information, with delay, to the rear speakers. The results with a well-balanced system can be extremely good however.

One problem with widely-spaced speakers is the 'hole-in-the-middle' effect. Even with correctly-phased speakers, a listener sitting more to one side will not be able to resolve the centre image properly. Fig. 1 shows why. A centre channel is required to overcome this deficiency.

**Three Channels**

The addition of a centre channel enables a properly-defined centre image to be provided. In its simplest form, this centre channel can be generated by adding left and right information. But it's far better to provide an independent third channel. Speech (dialogue) can then be properly centralised, and can be clearly heard by a listener sitting towards the left or right, see Fig. 2.

**Dolby Pro-Logic Sound**

The Dolby Pro-Logic system includes a true centre channel and a separate rear channel. Although two speakers are used for the rear (surround) sound, they are usually connected in series, comprising a single channel. Fig. 3 shows the sound distribution with a typical system.

Thus the Dolby Pro-Logic system has four audio channels: left, right, centre and rear (surround). The two extra channels, centre and surround, are encoded within the left and right stereo channels and are decoded by a Dolby Pro-Logic processor. George Cole's excellent article in the September 1997 issue explains in detail how the Dolby systems work. Readers can refer back rather than going over the same ground here. What we will do is to take a look at typical sound systems used in stereo TV sets.

**Speaker Arrangements**

The simplest arrangement is, obviously, to have two speakers at the front or side of the TV set. Except in the most basic models, a widely used approach is to have two front-facing, full-range speakers in bass-reflex enclosures within the cabinet, at each side. Reasonably good fidelity is possible with this arrangement, depending on the size of the speakers used. Side-facing speakers can improve the stereo image, but this restricts the position of the TV set as the sides of the cabinet must be kept well clear: building the set into a wall cabinet would not be possible unless the set is provided with external speaker sockets.

Many setmakers now provide a rear subwoofer speaker, which is set into the rear of the cabinet facing upwards. This is usually a fairly powerful speaker that's mounted in an acoustically-designed chamber which forms part of the set's rear cover. It's fed with only the low bass signals, and is normally driven by a separate output amplifier. As it is fed with left and right signals, only mid-range speakers need be fitted at the front (or side) of the set to provide mid- and high-frequency reproduction and stereo separation. The theory behind this is that bass tones are far less directional than mid- and high-frequency ones, so having all the bass coming from a single, central source makes no difference to the overall stereo effect. Furthermore an upwards-facing

speaker provides an omni-directional effect, so the bass response is less affected by positioning. Fig. 4 shows the basic idea.

This practice of having a large sub-woofer at the rear with mid-range speakers and tweeters at the front means that the audio output power can be increased significantly. Some top-range models handle 70W or more per channel without extension speakers.

Fig. 5 shows a slightly more elaborate arrangement. This features surround sound, with two series-connected rear speakers driven by their own output amplifier. There is also provision to connect external left and right speakers. When these are used they are fed with full-range sound - the high-pass filters in the left and right channels are simply shorted out. In addition the sub-woofer is disconnected. The rear (surround) sound remains as before.

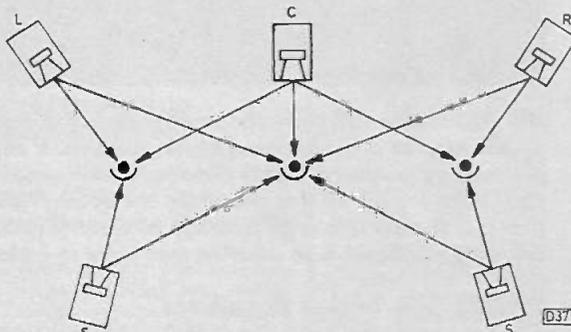


Fig. 3: With Dolby Pro-Logic the listener receives left, right, centre and rear (surround) sound.

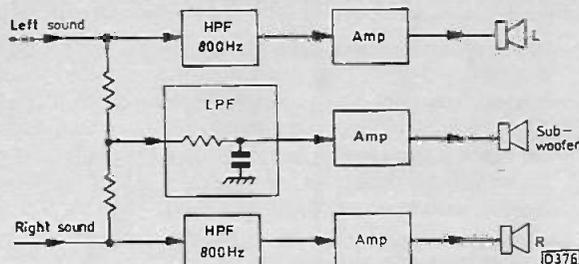


Fig. 4: Use of a sub-woofer speaker fed via a low-pass filter.

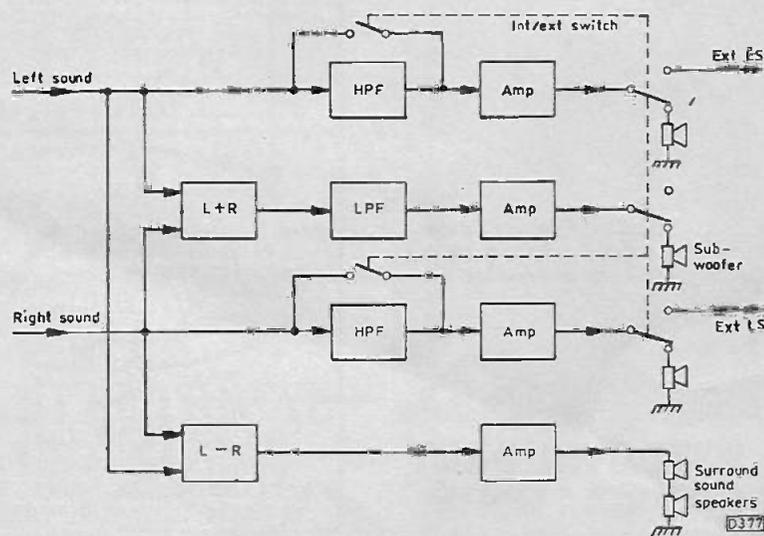


Fig. 5: A more elaborate arrangement with surround sound and provision for the use of external left and right speakers.

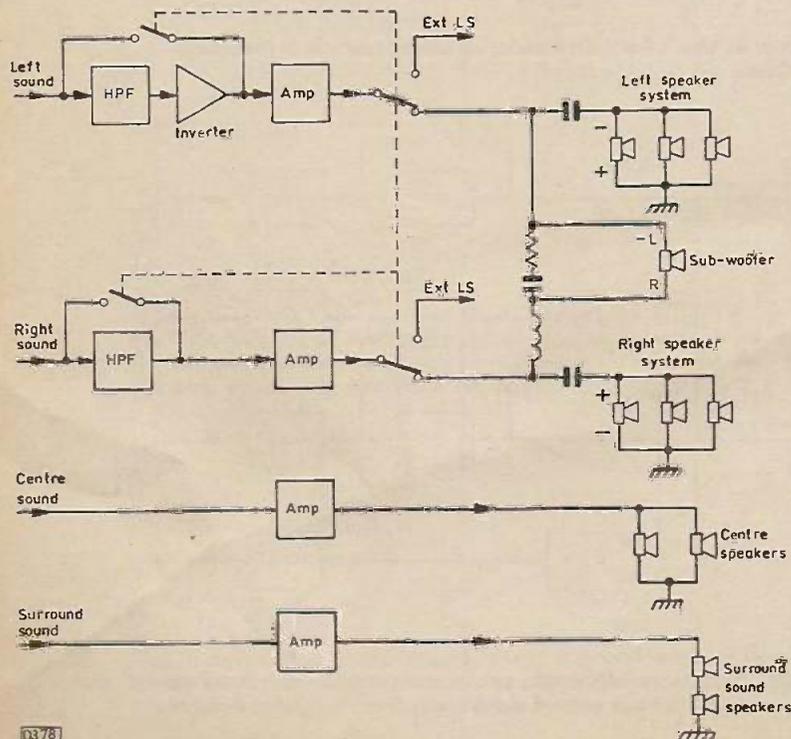


**KEF claims that its Home Theatre system produces a uniform sound stage without the usual 'sweet-spot' localisation of other speaker arrangements. It says that, unlike conventional systems, its Uni-Q technology creates a highly detailed sound stage over an exceptionally wide area - and, with identical Uni-Q drivers for all five channels, the same high-quality sound is heard throughout the room. KEF says that it is compatible with virtually all quality receivers and hi-fi systems. The compact, discreetly stylish cabinets are flexible to position and easy to install.**

**Philips GFL Series Receivers**

The final arrangement, shown in Fig. 6, is a full Dolby Pro-Logic set-up. This is a simplified representation of the circuitry used in the Philips GFL series of TV sets, which incorporate Pro-Logic sound. Four separate amplifiers are used, for left, right, centre and surround. Note however that the sub-woofer is driven by the left and right amplifiers. You will see that an inverter is present in the left audio channel. This is present because if two in-phase signals were to be fed to the sub-woofer they would cancel out and there would be no sound output from it. For the same basic reason the left- and right-channel speakers have to be connected out-of-phase relative to each other

**Fig. 6: The full Dolby Pro-Logic set-up used in Philips GFL series TV receivers.**



to produce in-phase sound for the listener.

When external speakers are connected, once again the full-range sound is fed to them. The left-channel inverter is bypassed so that ordinary hi-fi speakers will operate normally. The TV set then drives the centre and surround sound speakers.

There are a number of options within the sound set-up menu of GFL series sets. These enable the viewer (listener?) to customise the sound to his own preferences. It's possible for example to connect an external stereo amplifier to the left and right output sockets then adjust the TV set to produce a normal or wide centre output. In the normal mode, centre sound is fed to the set's centre speaker and bass sound to its side speakers: in the wide mode, centre sound is fed to the set's centre, left and right speakers. Alternatively the centre sound can be fed to the left and right speakers: this is the phantom mode, which is the preferred one when using an external stereo amplifier for the left and right sound.

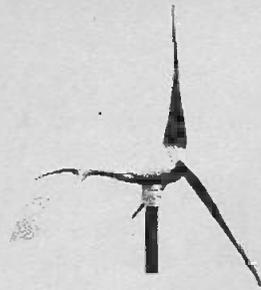
Further possibilities are Dolby Three and Hall Surround. The first one is useful where surround speakers are not fitted or the surround channel carries no information: only the left, right and centre channels are used. The Hall mode is designed to produce a surround-sound effect with non-Dolby material: the centre channel is off, the left and right channels provide full-range left and right audio, and a separate L-R signal is generated for the surround speakers - the delay between the front and rear speakers is set at 120ms.

**In Conclusion**

So there you have it: from the days when TV sound was AM mono, then FM mono then digital stereo to full-blown Dolby Pro-Logic, which enables us to enjoy the full home cinema experience if we want to. In less than ten years TV sound has come a long way, mainly as a result of the introduction of digital techniques (Nicom).

What of the future? When hang-on-the-wall TV sets that use flat plasma displays become cheap enough for mass production, virtually any screen size may be possible. Then we may be able to experience true home cinema.

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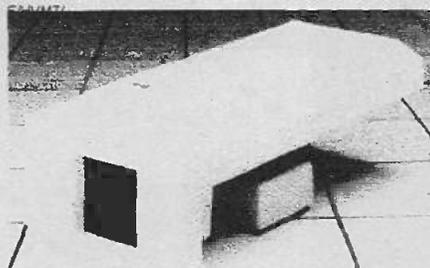
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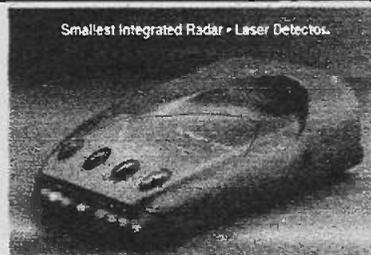
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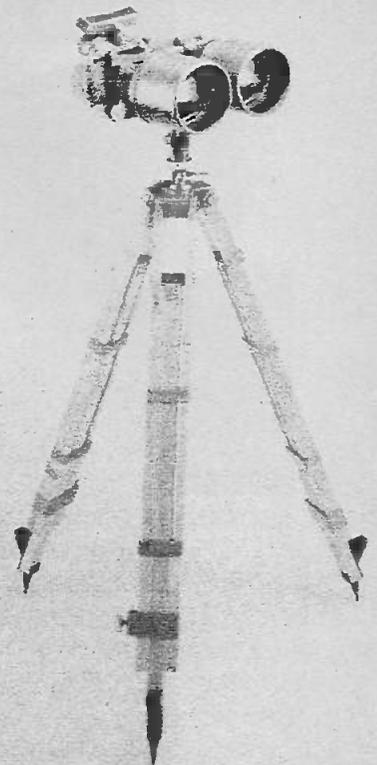
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TZS4 Nightsight £199 ref BAR61



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

### TV Faults

A Ferguson T10R mains-battery portable came in for repair twice with the 8A fuse FD702 on the DC-DC converter board blown. I subsequently discovered that Ferguson has available a 'protection module' which can be added. It seems that the cause of the problem can be excessive converter board current consumption when the receiver is used with a partially discharged battery. The protection module ensures that the receiver will not switch out of standby when the battery voltage falls below safe working limits, and that the converter doesn't discharge the 12V battery beyond these safe working limits. The module's part no. is 20666690. Fitting instructions come with it.

In another case recently a Bush 1452T was brought in because of loss of field hold. On investigation I found that the field hold control VR304 had risen in value from 30k $\Omega$  to 60k $\Omega$ . I replaced it with a 22k $\Omega$  preset which provides a better range.

*M. Della Verita,  
Langley Park, Co. Durham.*

### Channel 5 and Cable TV

I have read with interest the recent letters (August and October) on Channel 5 and cable TV modulators – especially as I live in the same area as Mike Harris and have also experienced interference problems.

A Nynex technician told me that ch. 69 and any channel below 40

# Letters

cannot be used for the cable service. Instead, he altered the modulator in the cable TV box to ch. 44. This cleared the interference to Channel 5 and the image-frequency patterning on BBC-1. The cable input is also much improved, but isn't perfect because of weak reception from a local ch. 44 relay station. This results in slight Venetian bars.

The +5 and +9 spacings are also occupied by weak signals, but the signal-to-noise ratio of the wanted-to-unwanted carriers appears to assist with spurious signal rejection. A filter would further improve matters.

This is just a foretaste of the problems that will have to be resolved when terrestrial digital TV starts. The broadcasters will be responsible for maintaining same-quality analogue TV reception by carrying out a vast programme of retuning and aerial alterations. It's a patently absurd situation, since the government has under consideration analogue transmitter switch off within five years. It would cost no more to provide every viewer with a free digital set-top box!

*Peter Litter,  
Stockport, Cheshire.*

### S-M Aluminium Electrolytics

The October camcorder page contained a reference to leaky surface-mounted aluminium electrolytic capacitors, C945 and C946, in the Sharp Model VLC690H. I recently had the same problem with one of these camcorders. It wouldn't initialise properly because the excessive load caused by the electrolyte leakage had led to the failure of the chopper transistor Q940. After replacing these items and C947, which was also leaky, the machine powered up normally. But the viewfinder image had severe patterning when the machine attempted to focus, and the focusing was very laboured and erratic. Further investigation revealed that several similar electrolytics on the SIP/autofocus board were leaky. They could be identified by the soldered joint appearing to be crystallised, more usually at the negative pad, or the presence of liquid just beneath the plastic bases.

The more closely I looked, the more of these leaky electrolytics I found. Certain values were more badly affected than others. I repeated the exercise on all the PCBs, and found a total of 35 leaky electrolytics. The worst affected value was 47 $\mu$ F, 6.3V. All fifteen of these were faulty. Others were eight faulty 10 $\mu$ F, 16V electrolytics, four faulty 1 $\mu$ F, 50V electrolytics, three faulty 10 $\mu$ F, 35V electrolytics, two each 47 $\mu$ F, 16V and 22 $\mu$ F, 35V electrolytics and one 22 $\mu$ F, 16V electrolytic. By no means all of these are directly connected to the supply rails, so I can't believe that the power supply fault could have been responsible for their failure. I have never seen such a catalogue of unrelated failures before.

The camcorder is only about five years old and is otherwise in immaculate condition. I wonder how long it will be before the other capacitors of this type suffer the same fate? I don't relish the idea of replacing all the other surface-mounted electrolytics in the machine. Any thoughts on how to tackle the problem would be appreciated.

*Arthur Coppock, B.Sc.,  
Stockport, Cheshire.*

### Internet Group

In the March 1997 letters page I asked if anyone would like to contact me on the internet to exchange information, gossip, etc. I was subsequently contacted by a couple of dozen people who were interested in chatting about the TV trade in general. We have gradually built up a group of about forty members who regularly communicate. Many of the group members have web sites that offer help and information for the trade.

The general opinion is that we get tremendous benefit from the group, as we can often help each other by providing information on fault diagnosis, spares sources and news – to name just a few things. We would now like to enlarge our group.

We are not, strictly speaking, a newsgroup, just a bunch of electronics-orientated people from Britain and around the world

(including Australia, Spain and South Africa) who like to keep in touch. If anyone is interested, please send me an e-mail and I will be happy to include you in our group.  
**Eddie Branch**  
 e-mail address:  
 BranchTV@Clara.net

### Low-ESR Electrolytics

The use of low-ESR electrolytic capacitors was mentioned in Jack Armstrong's Satellite Workshop column in the November issue. Readers might like to know that Farnell Components of Leeds (01132 636 311) has available an extensive range of specialist electrolytics. Capacitors with effective series resistances as low as 0.018Ω and ones with temperature ratings up to 125°C can be supplied, thus ensuring ultra long life and reliability.  
**Michael Dranfield**,  
 Buxton, Derbyshire.

### Sony KVX2902U

The symptom description in my fault report (November) on one of these sets (BE3B chassis) may not have been wholly clear. The set would not respond to local or remote control commands when a locked picture was being displayed. Otherwise it was OK, so we were able to note down the EVR settings. The cure was a new microcontroller chip.

**Richard Flowerday**,  
 Harborne, Birmingham.

### Satellite TV Polarisation Checker

Many thanks to Michael Dranfield for his satellite TV polarisation checker design which was featured in the June 1997 issue. I have found this very useful but added a 100Ω, 10W resistor across the F connector to load the satellite receiver's power supply. Beware – this resistor will run hot!

**Pete Haylor**, Billesley Satellite,  
 Billesley, Birmingham.

### Minimum Order Charges

In a letter in the October issue L. Jones discussed minimum handling charges for spares and components dispatched by spares distributors, and mentioned that one distributor appears to ask for a larger order at certain times in order to qualify for carriage-free delivery when its viewdata ordering system is being used.

At CHS we offer carriage-free delivery of all orders over £10 (excluding VAT) that are received via our CHESS viewdata system.

Any order under £10 received via CHESS has a £2 handling charge added to help cover costs.

As with most distributors, we apply handling charges on a sliding scale on all orders received by telephone, fax or post. Our charge levels are £3.99 on orders under £10, £2.99 on orders between £10 and £20 and 99 pence on orders between £20 and £30. Orders above £30 are dispatched carriage free.

If we are out of stock of an item, the back order will be dispatched carriage free when it becomes available from our suppliers.

So it pays to place your small orders by the CHESS viewdata system. We offer this low carriage-charge facility to all our customers.

**Freddie Whipp**,  
 General Sales Manager,  
 Charles Hyde and Son Ltd.,  
 Prospect House, Barnby Road,  
 Pocklington, York YO4 2DP.

### 35 Years in the Trade

It's a mystery to me how anyone can run a successful business charging the prices quoted in your What a Life! feature. In my opinion the TV trade has been busy cutting its own throat over the past twenty years. My business provides a first-class service: but we charge well for it and we, not the customer, run the business.

Those who advertise free estimates etc. cannot be very confident of their ability to trade. We give nothing away yet our very large workshop, 2,000 square feet, is always full.

Nevertheless we always enjoy the What a Life! articles. With reference to Vic Rummery of Bodmin – best of luck to him – if we sell an article and for some reason the customer asks for his money back we reply that the money we have taken is ours, the goods are his, otherwise the customer is in effect only lending us the money!

No other business is so chaotically run as the TV game. I say run it fair to make a good living. We are skilled people and deserve it.  
**E.R. Webb**, KTV Electronics,  
 Camborne, Cornwall.

### Electrical Safety

I read with interest C.N. Cory's observations on two-wire mains cables (Letters, November 1997). As I understand it, for equipment to carry the double-insulated concentric-squares symbol there must be at least two insulating materials between mains voltages and the 'outside world'. Clearly this rule is

not being enforced.

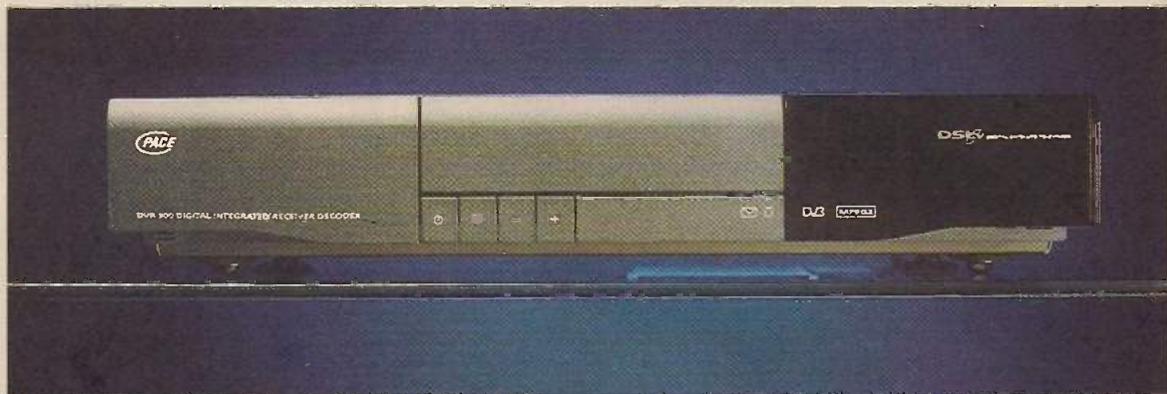
A poor example of double insulation I came across recently was a Kenwood DP990D CD player that required a new laser. The mains supply is present at a pair of pins that protrude vertically from a PCB at the rear of the unit, just millimetres below the non-earthed metal lid. If the lid had been bent downwards by an excessively heavy unit on top, or because of mishandling, the whole hi-fi system to which it was connected would have become live. Because of the price of a replacement laser, the unit had to be written off. The world became a safer place.

A problem can occur with equipment that has a live power supply and a floating main circuit, with a chopper transformer or line output transformer used to provide isolation. To prevent the floating side of the circuit floating off to a dangerous potential, the manufacturer uses a high-value resistor and a low-value capacitor to bridge the isolation barrier. The set's sockets therefore float at 110V, sometimes with a surprising current capability.

Two cases of this sort have caught me out. One was a 14in. Boots colour set that produced a big spark when the aerial input was connected to an earthed aerial amplifier. The set didn't like running in this way either – there was a thin hum bar on the picture. This was not a faulty set: they all do it. I actually own one of these sets, but I run it from an isolation transformer! Personally I don't consider this set to be safe, and I would not sell one.

The other surprise I had was when I was up a ladder in the pouring rain connecting a dual-LNB feed for a friend. When I connected the second LNB cable my eyes lit up and I got a belt. Both satellite receivers were switched off, but one of them was connected via a scart cable to a cheap TV set that was in standby. Amused I was not.

It's important that we are all aware of the possibility of voltages being present at the sockets of some equipment, and of how dangerous this can be when the equipment is connected to a non-earthed metal object such as a hi-fi system. The current should not be enough to be a serious threat, but a shock could blow you off a ladder or make you drop something – not to mention what members of the public might feel about getting a shock from something that you have installed.  
**Colin McCormick**,  
 Plymouth, Devon.



# Introduction to Digital TV

What will you be looking for when faulty digital TV receivers start to appear on the bench? It's early days so far, but **J. LeJeune** is able to provide some preliminary guidance

In the absence of any UK digital satellite receiver models – in fact the receiver specification has only recently been confirmed – this article is simply an introduction to the black art of servicing Pace digital satellite receivers. The receivers seen so far have a family likeness: they look like the familiar analogue Models PRD900 and MSS200. But once the covers have been removed the inquisitive engineer is in for a shock – even with the mains supply disconnected!

## The Pace PCB

The printed circuit board looks substantial. This is not surprising, as it consists of four layers of copper print on fibreglass substrates. The top layer carries mainly surface-mounted ICs. The second layer provides screening, to prevent crosstalk between the top layer and those beneath it. The third layer provides interconnections. The bottom, or underside, layer carries more surface-mounted discrete components, with connections to wire-ended, top-mounted components such as electrolytic capacitors and power semiconductor devices.

In terms of worry factor, the only layers that are likely to provide grounds for suicide are the buried ones. And as one of these is simply a screening plate, the one area that could cause the heart to beat a little faster is likely to be the third, interconnection layer. By now you will have realised that it can be investigated with the aid of a continuity tester. But don't use an old-fashioned buzzer: the back-EMF generated can cause a lot of damage to the 3-3V logic chips.

I have already seen some Dutch receivers with interconnection-layer faults. Problems of this sort are rectified simply by adding a jumper wire to make the required connection. Interconnection-layer failures are

most likely to be caused by contamination during board manufacture: small quantities of the etchant used can be trapped when the four individual boards are fused together. In service, the board heats up. This activates the etchant, which eats its way through the copper track.

## The Power Supply

The Pace digital satellite receiver uses a chopper power supply based on the now familiar TOP202 device. The circuit seems to be quite reliable, though the reservoir capacitor for the mains rectifier seems to have caused a few problems.

As power supplies are, for obvious reasons, less reliable than the rest of a piece of equipment, my guess is that most of the receivers that will eventually come into the workshop will have simple power supply failures rather than logic or other faults.

## Servicing Requirements

To deal with anything other than DC faults your test equipment armoury will need to have suitable weapons, specifically a 60MHz oscilloscope, a frequency counter and a good digital multimeter. Without these items, and good eyesight, faults in the processing sections of the receiver are going to create problems.

There's a likelihood that a PC test program will be made available. It will interrogate the receiver via an RS232 port – this is a standard interface between a PC and a peripheral device, with a 25-pin D-type connector – and then provide an indication as to where the cause of the fault lies. Such a system would be invaluable for speeding up fault diagnosis.

UK receivers are likely to incorporate a fast modem as part of the specification, to provide interactive use.

Some means of testing this will also be necessary.

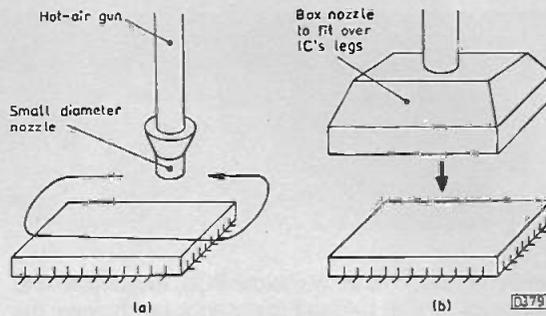
One very important clock signal is the 27MHz one (see Fig. 2), which is linked to the transport stream demultiplexer and is synchronised by data in the transmission. High accuracy is a basic requirement here. Even a small inaccuracy will result in loss of the picture and sound.

**Repair**

Once the faulty component has been located, repair has to be undertaken. The devices used in the DVR500 and DVR501 models supplied to the Netherlands are mostly of the surface-mounted type. Thus those who have serviced camcorders and subminiature audio equipment will have a head start when it comes to digital receiver repair.

Those who are new to surface-mounted devices are in for some surprises – mainly in terms of the cost of the desoldering/resoldering equipment required. Basic tools should include a strong magnifying glass, tweezers, a good bench light, a hot-air soldering tool with suitable nozzles to cater for the ICs used in the receivers being serviced, and a fine low-wattage soldering iron. You will need antistatic bench mats – and a steady hand.

If you are to carry out servicing on any scale, a proprietary surface-mounted component soldering/desoldering station is an almost essential investment. Some stainless steel probes that can be modified to produce a variety of hooks and spikes are worthwhile. For the sake of your eyes, don't attempt to service digital equipment in a broom cupboard lit by a fly-blown 40W bulb. Good lighting is a primary necessity. A thorough visual



**Fig. 1: Desoldering a surface-mounted IC. Start, as shown at (a), by using a small-diameter hot-air gun nozzle and a circular motion to warm the chip. Then, (b), fit a rectangular nozzle to direct heat to the IC's legs. Hold the nozzle about 2mm above the device.**

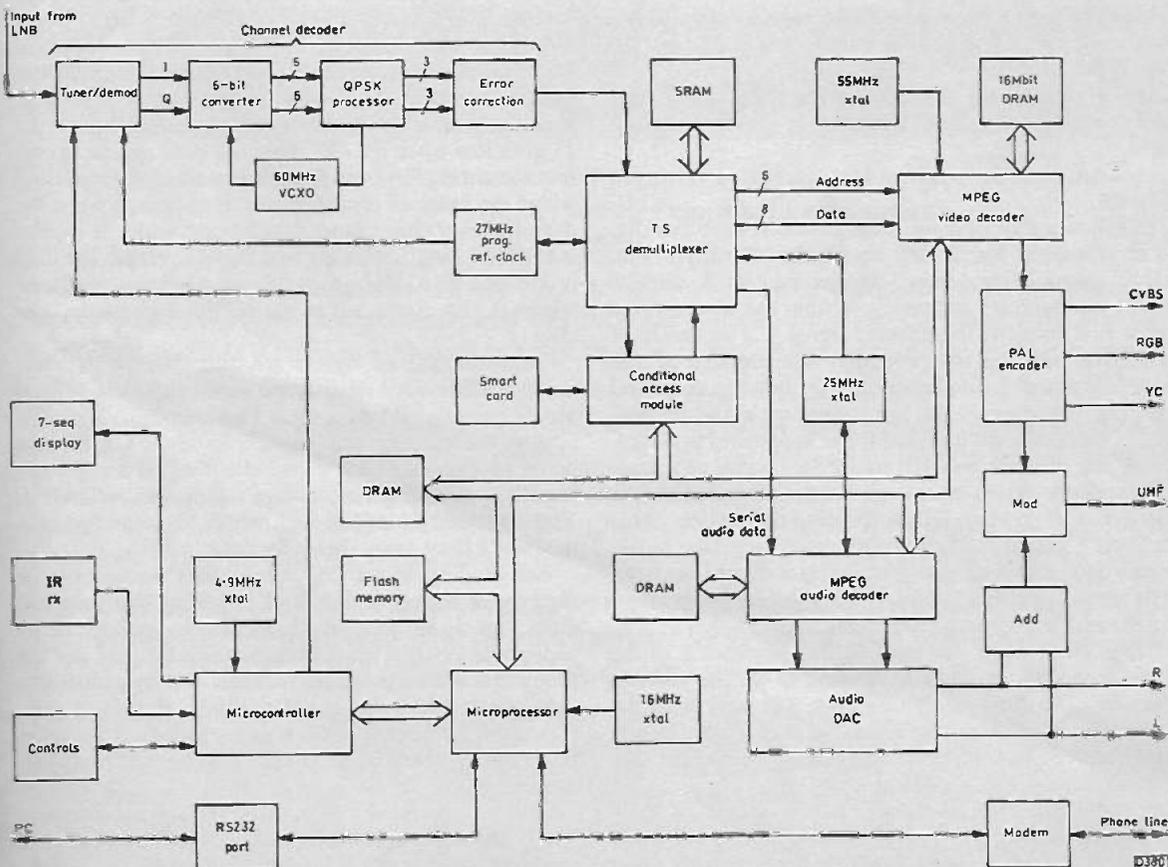
inspection can sometimes save an hour's probing with test equipment.

**IC Replacement**

Once you have located the faulty component, and you are absolutely certain that it is the IC with over 100 legs, begin by warming it with a small hot-air soldering tool. Use a circular motion to heat its body – see Fig. 1. Then fit a rectangular nozzle to the hot-air tool to direct the heat to the IC's legs. Hold the nozzle about 2mm above the legs: the solder will soon melt. When bright beads appear between the IC's legs, use the tweezers to grab one corner and lift the device off the board. It all sounds quite easy, and is after some practice.

Remove the excess solder and burnt flux from the vacant copper pads. Solderwick and the hot-air tool will soon complete the first part of this operation, then use a solvent to remove the burnt flux and leave the contact area clean, ready for the replacement chip.

Check the replacement chip for possibly misaligned legs, and if necessary straighten out any irregularities



**Fig. 2: Simplified block diagram of a typical digital satellite TV receiver.**

Rear view of the Pace DVR500 digital satellite receiver.



before you solder the device to the PCB. Check also that the legs are tarnish free and bright looking. Prepare the PCB's solder pads by painting a thin strip of solder paste along them, on all four sides where the IC is to be mounted. Note that solder paste does not have an indefinite shelf life – keeping it stored in a refrigerator at between 3-8°C will help to prolong its life. Soldering the IC to the PCB should be a one-step operation, so make sure that the solder paste is OK by testing it on a scrap board.

Place the IC on the solder pads accurately, and make sure that it doesn't move. A level surface is best, but this is not mandatory. Fit a small nozzle to the hot-air tool and begin to circulate the hot-air stream steadily over the IC's legs at a height of about 5-6mm (a quarter of an inch). Lower the height of the nozzle gradually. Take care not to dwell on one spot for more than a couple of seconds, as this would burn the PCB material and cause electrical leakage. Do not go nearer to the IC's legs than 2-3mm.

At some point the solder paste will melt, forming bright solder around the IC's legs. Remove the heat at this stage. Allow the work to cool naturally: this will avoid heat-stress trouble, dry-joints and IC damage. Once the repair has cooled, check it for solder bridges. These can be removed by careful use of a fine-tipped soldering iron or reapplication of the hot-air gun and the use of solderwick.

Go carefully at all times, and remember that the age-old golden rule of good soldering is absolute cleanliness.

### Clues

The following general outline is based on the block diagram shown in Fig. 2. The signal from the LNB, with QPSK modulation, enters the receiver at a satellite (first) intermediate frequency. Within the receiver, the tuner first converts the selected signal to a second IF of 480MHz, which is synchronously demodulated to provide separated I (in-phase) and Q (quadrature-phase) outputs. These are passed to a converter chip which produces outputs in 6-bit digital form. It operates at a sampling rate of some 60MHz, under the control of a crystal oscillator which is voltage-controlled by an output from the following QPSK processing section. This delivers 3-bit data to the forward error correction block. Some quite elaborate data processing is carried out here. The output consists of the MPEG-2 data packets we mentioned in previous instalments.

Three chips carry out most of this processing in the Pace receivers, in what is referred to as the channel decoder. The form of this decoder will vary with the transmission medium – satellite, cable or terrestrial off-air. The end result however will always be an MPEG-2 data stream.

In the event of a no-signal fault, indicated in these Pace receivers by flashing of the two bottom segments of the front panel display and the on-screen message "searching for default frequency", check the Manual Tuning Data menus before delving into the electronics. The data should be set to correspond with the service

you want to receive, i.e.:

**LNB:** Local oscillator frequency; polarisation; LNB power on.

**Tuner:** Tuner frequency; symbol rate; FEC (forward error correction) size.

These parameters must be set correctly for the receiver to lock to the incoming signal. If the parameters cannot be set, use a scope to check for activity on the bus lines from the microcontroller chip to the channel decoder chips when the remote-control handset is being operated. Also check that the remote-control receiver is OK.

To be more specific than this is impossible at present, because the only receivers seen in the UK have been brought in by Dutch or Belgian viewers for temporary use here. UK models promise to be different. But successful operation depends on good communication between the chips used in the channel decoder. A 60MHz scope can be used to check the clock and data signals.

The MPEG-2 data that emerges from the forward error correction chip in the channel decoder in the Pace Models DGT400, DVR500 and DVR501 is fed to a very large chip called the transport stream demultiplexer. This 160-pin monster has a useful pin which indicates whether the incoming data is good enough to process or is still so full of errors that it cannot be deciphered: pin 11 goes low when the FEC chip has been unable to correct the errors. Pin 14 is also very useful for diagnosing where the cause of problems lies. It goes high when the demultiplexer chip cannot synchronise with the incoming MPEG data, indicating that this is corrupt. The chip is clocked at 25MHz (pin 58) by a crystal oscillator which is also connected to the MPEG-2 audio decoder chip.

The demultiplexed signals are then checked to determine whether they need to be sent to the conditional access module. When a clear (unscrambled) signal is present the receivers will work without the CA module being plugged in. With a scrambled signal and no CA module, you will get a message telling you to insert it. You also need a viewing card, which fits in a slot in the receiver's front panel, behind a door.

Fault finding in the MPEG decoder section of the receiver is largely a matter of checking that data and clock signals are present. Good video with poor or no audio indicates that the demultiplexer is OK and that the problem is within the audio sections. But remember that the 25MHz clock for the demultiplexer chip is controlled by the MPEG audio processor chip. If the latter fails there will thus be no activity – no sound and no picture.

As usual, checks for activity on the interrupt request (IRQ) and data strobe (DSTRB) lines can be helpful in establishing where the cause of a fault lies.

### Start-up

At power up the 68306 microprocessor chip used in

these Pace sets runs the software contained in the flash memory. Assuming that all is OK and that no corrupt data is present, it instructs the NEC microcontroller chip to operate the front-panel display. Faults such as dry-joints around the flash memory or corrupted data within it, or dry-joints around the microprocessor chip, are likely to result in the receiver being stuck in the standby mode. The power supply will be operational – so beware of the nasty high voltages that will be present here.

In these receivers, as in their analogue counterparts, standby is a matter of switching off the modulator and muting the vision and sound at the rear sockets. The power supply itself is a sort of combination of the MSS100 series chopper circuit with the sensing circuit used in the MSS1000 to provide feedback for regulation.

### Processing Power

Digital technology takes radio and television broadcasting into the computer age. The processing power within a digital satellite TV receiver is equivalent to that in many a desk-top computer, fast processing being a primary requirement.

Exactly which processing blocks will be contained in which chips will depend on developments in IC technology. With later developments of the original Model DVR500, like the Pace DSR200 free-to-air receiver, the audio and video MPEG processors are integrated and there is no external 55MHz clock. It appears that the 25MHz audio clock is used, possibly doubled to 50MHz within the processor.

The introduction of a Pace tuner for the company's digital models extended the frequency range – there was a problem in that the original Philips tuners covered only 950-2,050MHz. Tuner failures were common with early receivers, but later ones with second-generation Philips tuners or the Pace tuner seem to behave better in this respect.

Teething troubles are to be expected with early production receivers, and the delay in the start of digital broadcasting in the UK may be all to the good – though you could argue that early troubles provide experience for service engineers.

### In Conclusion

Training in digital broadcasting techniques, particularly in receiver servicing, is likely to be a hot topic in the coming months. With some notable exceptions, the training provided by technical colleges has rapidly diminished over the last few years. Training provided by receiver manufacturers such as Pace has been available to the trade, and more is expected as the actual launch of services gets nearer.

The arrival of digital broadcasting represents an opportunity for engineers to promote their services. Many less capable engineers will probably opt out, and there will be a great deal of ignorance and confusion amongst viewers and the public in general when the transmissions start. Answering their questions, giving them reassurance and repairing their equipment when faults arise will provide your business with a much-needed boost.

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# What a Life!

**Donald Bullock gets some lessons on common camcorder problems from son Steven. So this month it's a load of camcorders**

"We haven't been getting any camcorders in lately" Steven said the other day. "Perhaps they've all been put away for the winter."

"Good thing too" I replied. "I scarcely know anything about them, and can't generate much curiosity."

## **A Handycam**

As we spoke, Cyril Sidgeworth popped in with a Sony Handycam, Model CCDF330E.

"Liney picture" he squeaked. "Picture all liney. Sort of made of lines, like. Liney, you might say."

"OK, OK" I said, waving him out. As Steven plugged it in, I asked "what's the cause of that then?"

"Dud parents I suppose" he replied.

I looked at him. "The camera" I said.

"Oh. Loose guide poles on the tape arms I expect. Usually is."

He's got long, thin fingers, like Greeneyes. Not short stubby ones like me. So he had it open in no time. Sure enough the guide poles were loose. Each pole is secured by a tiny screw. But there was still a problem when he'd tightened them.

For the first two minutes after switching on the control pulses seemed to be weak and, with a standard play recording, the tape speed kept switching between long play and standard play. After the two minutes however the camcorder worked perfectly. It continued to do so whenever we tried it for the rest of the day. We decided to put it aside until next day.

## **And another**

This was as well, since Pete Porter bowled in at this point with a bagful of shopping.

"Can you mend this, Mr Buglock?" he asked, peering at his bag of shopping. I noticed an old screwdriver poking out of his top jacket pocket.

"No. Who would try? How is a chap supposed to mend a bag of shopping?"

He pulled out a pound of sausages, a box of eggs and a bag of pork chops and laid them out on our counter. Steven rucked his hair like Stan Laurel as I stood in indignant disbelief, like Ollie. Then out came a Sanyo VMPS120P camcorder.

"E's about a year old. Yest'dy he jammed up. All by hisself. I never touched 'im, 'onest. Cross me 'eart and wish to die."

He then departed, leaving his sausages. Steven displayed his expertise by rapidly opening up the camcorder. The tape carriage had been forced so brutally that it was quite unrepairable.

While I was wondering about it Steven was on the phone to Chas Hyde and Son.

"So the part number is 11923XO and the price £20.40 altogether. That's cheap. Will you post it today?"

It arrived next morning, as we knew it would from this excellent firm. Steven had the camcorder working perfectly almost as soon as the postman had left.

When Porter returned I told him about the mangled tape carriage.

"Must 'ave been the missus" he said.

## **Sunshine's Viewcam**

Our next caller was Sunshine Honeychild. She bounced in as though she'd just jumped from a carnival float and was carrying a Sharp Viewcam, Model VLC73H.

"What's up with it?" I asked. "It's the laziest camera in town, man. Done do nuthin'. Nuthin' at all."

Steven tried it and found that it wouldn't eject the tape in it. There was no rewind or fast forward either. Once again his fingers flew into action and the camcorder was soon opened up. He examined it carefully.

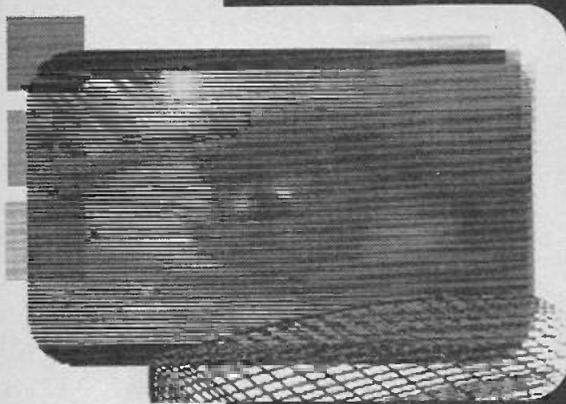
"I reckoned it might have been the mode switch" he said, "but it isn't. The easiest approach with these is to remove all the casing parts first. Then it's a simple matter to separate the single PCB from the bottom of the deck."

When he'd done this he soon found the cause of the trouble. Several membrane leads connect the chassis and the panel. Three of the retaining clamps had never been clicked into place, so the conductors were only loosely connected. When they had been pushed home properly and the clamps had been secured the camcorder came to life, with excellent results.

## **Dickie Downsize**

Dickie Downsize is a preacher of sorts and a general walking disaster. Not only does he do silly things, he tries to cover up his fool-





Reports from  
**Philip Blundell, AMIEEIE**  
**Nick Beer**  
**Robert Wainwright**  
**John Edwards**  
**Edward Branch**  
**David Smith**  
**Andrew Tebbutt**  
**Terry Lamoon**  
**Keith Evans**  
**Michael Maurice and**  
**Chris Watton**

### **Grundig ST55-725FT (CUC7350 Chassis)**

This new set was brought back with an unusual problem a week after being delivered. Only one function was affected – the OK message that comes on when a setting is memorised had changed to E. The correct values were being stored.

On Grundig's suggestion new microcontroller and EEPROM chips were fitted, but the E remained. In previous Grundig chassis, special functions were called up by holding down one of the front control buttons then using the mains switch to power the set. After a few minutes of trial and error I found that switching on with the programme-down button held down cleared the 'fault'. P.B.

### **Ferguson B49F (TX90E Chassis)**

If there is no tuning, check the 33V supply at pin 4 of the tuner unit. If this is low or missing, check RH06 (12k $\Omega$ ) which is by the tuner and RH04 (27k $\Omega$ ) which is by the line output transformer. P.B.

### **Toshiba 2100TBT**

This set had two faults: the picture pulsed for the first few minutes and the set wouldn't tune or store a station. The reason for the pulsating picture was that the power supply didn't run cleanly from cold. Replacing C824, C829 and C830

# TV Fault Finding

soon cured that. The tuning fault was a bit more obscure.

The exact symptoms were as follows: when a channel was selected the picture came up then the tuning slowly drifted off. This happened with all stations. Suspecting an AFC problem, I started by checking the voltages at transistor QA06. There was no voltage at its base, though there was at pin 5 of the IF module. RA75 (1k $\Omega$ ) was open-circuit. P.B.

### **Sharp DV6635H (BCTV-A Chassis)**

When this set had been on for a few minutes the picture would gradually go dark then disappear. Checks in the video section showed that the luminance was being lost in the TDA4681 video processor chip IC400. The problem was not being caused by the chip itself: the sandcastle pulse at pin 14 was the trouble – it was misshapen. The field section of the pulse is derived from the TDA8350Q field output chip IC500, where the pulse at pin 2 changed when the picture went dark. A new TDA8350Q chip restored normal operation. P.B.

### **Panasonic TC100G**

This aged but nice portable TV/monitor was dead when powered from the mains supply. It was OK with a DC supply. There was a buzz, but the DC conditions on the primary side of the power supply were haywire. The outputs on the secondary side were, even when unloaded, at just over fifty per cent of the correct levels. R816 (330k $\Omega$ ) in the trigger amplifier stage was open-circuit. N.B.

### **Samsung C15322T**

This set produced no sound though the output stage was clearly working. In addition the sweep tuning didn't stop. There was obviously a link between these two symptoms.

A check showed that the microcontroller chip's ident pin didn't toggle when a station was found. The associated pull-up resistor R709 went open-circuit on load, though it seemed to be fine when checked with a meter. N.B.

### **Harwood HTV4914**

An intermittently snowy picture has been the problem with a couple of these sets I've had in. The impression you get is that there is a tuner problem or a faulty socket. The rather interesting cause however is an invisible break in the print just after the tuner's IF pin. N.B.

### **Bush 2052T**

After curing the usual excessive HT fault you may find that the sound is muted. Your reaction would be to replace the microcontroller chip IC601. When this is ordered however you will find that an equivalent which won't work properly is supplied. Once Alba has sorted out this problem you may still have the fault. Check the voltage at pin 13 of IC601. If there is no voltage here, check the 1N4148 diode D304 in the network connected to pin 30 of IC301. It may be short-circuit. It seems that a number of engineers are waiting for microcontroller chips that are not needed. R.W.

### **Philips CTX-S Chassis**

This set would occasionally go off. Purely by accident and good fortune, whilst I was prodding around in the power supply area looking for dry-joints the HT preset R3325 fell apart. A replacement solved the problem. J.E.

### **Amstrad CTV250**

This set would intermittently switch off, as if it had been unplugged. After a long time it might or might not go into the standby mode by itself. When it did, use of the remote control unit to select a chan-

nel would result in normal operation until the fault returned. To save room and time while waiting for the fault to put in an appearance I took the back off, hoping to spot something obvious. There were countless dry-joints, some just developing, in the power supply and line output stages. A blanket resoldering job followed by a two-day soak test proved that all was now OK. J.E.

### **Dynatron 279062EK/05Z (Philips 2A Chassis)**

This set was dead. Its power supply was trying to produce the HT voltage but couldn't because the BU508V line output transistor was short-circuit. A replacement died immediately when the set was switched on. Fortunately it didn't take us long to discover that one of the tuning capacitors in the EW diode modulator circuit, C2609 (9-1nF, 1-5kV), had a burn hole in its case. When checked it was found to be open-circuit. After replacing both components and resoldering a few suspect joints in the line output stage there were no further problems. J.E.

### **Hitachi CPT2064**

There was no remote control operation. Although the customer blamed the remote control unit and ordered a replacement, the cause of the fault was in the set itself. The M58485P chip IC3003 had failed. J.E.

### **Pye 37KV1212/05B**

After a short while the sound would be accompanied by crackle and popping noises. Tapping anywhere on the mother board would instigate the fault. In particular the TDA7052 audio output chip seemed to be very sensitive to slight taps. It had already been resoldered, but removing it, cleaning the print and refitting it cured the noises. J.E.

### **Hitachi CPT2250**

The verticals were ragged and there was severe line tearing. The cause of the trouble was C809 (1 $\mu$ F, 250V) which was open-circuit. J.E.

### **Alba CTV601/Bush 2009**

Field collapse was the problem with one of these sets, also a noiseless raster and no sound. A new AN5521 field output chip brought the raster back – for a couple of minutes! I then did what I should have done first and checked the HT voltage. It was high at 150V instead of 112V. Replacing the

chopper drive coupling capacitor C909 (47 $\mu$ F, 25V) brought it back down to the correct level, but the field output chip had succumbed to the high voltages. The 12V supply was also missing, which is why there was no sound or vision. R422 (5-2 $\Omega$ , 3W) and ZD402 (12V) had failed. Once these three items had been replaced the set was pronounced fit. E.B.

### **Hitachi CPT2236 (NP83CQ Chassis)**

The customer complained that the picture "bounced intermittently". This was so, but it was more that the top inch of the picture came and went, leaving a gap at the top of the screen – the linearity was not affected. I scoped the field input at pin 1 of IC601 and found that a large line pulse was present on the waveform when the fault occurred. After much checking and changing of capacitors in the field timebase I found that C613 (100nF) was the culprit. It's connected across the field scan coils. E.B.

### **Fidelity ZX5000 Chassis**

This set was dead with no 120V HT output from the power supply. When I disconnected R57 to unload it the BUT56A chopper transistor TR1 failed. As I've had similar problems before with this type of power supply I replaced the 4-7 $\mu$ F chopper transistor base coupling capacitor C5. I also replaced the 10nF, 1-5kV line output stage tuning capacitor C28 as one of its legs was burnt, though it measured OK. Further checks brought me to the 100 $\mu$ F HT reservoir capacitor C18, which was open-circuit. After fitting replacements I started the set up via a variac. When the AC input reached 120V the set sprang to life and the HT remained constant at 120V as the input voltage was increased to 240V. E.B.

### **Panasonic Alpha 1 Chassis**

This set was half dead! The channel numbers and the standby LED were alight, but there was no sound or raster. Various checks in the line output stage failed to reveal anything amiss, so I disconnected the scan coil plug. The standby LED then went out with the channel numbers still alight. So in went a new TLF15506F line output transformer. This brought the set back to life. D.S.

### **Granada C16BZ4**

This set produced a yellow picture

because R271 (56k $\Omega$ ) in the blue channel was open-circuit. It's advisable to replace the equivalent resistors in the other channels as well. D.S.

### **JVC C14ET1EK**

This set produced a picture that was swamped with a red cast. Checks on the tube base panel showed that Q502 was short-circuit collector-to-emitter. A.T.

### **Ferguson TX90 Chassis**

There was reduced height with slight top foldover. Having had experience with these sets I looked for dry-joints around the field output transistors, but there weren't any. Voltage checks then showed that TR105 had only 0.5V at its base instead of 1V. The cause of the fault was in the DC feedback circuit, where R194 had risen in value from 270k $\Omega$  to around 500k $\Omega$ . Note that the value of this resistor varies with screen size. A.T.

### **Goodmans 1450T**

This set had a blank raster, as if someone had switched it to the AV mode. The cause of the problem was cracked print along the rear edge of the board, removing the supply to ZD102. I've also had one of these sets that wouldn't tune because of cracked print in the same area. A.T.

### **Thomson/Ferguson TX805 Chassis**

Failure of the M52038SP multi-function chip IL01 in one of these sets produced the blank raster symptom (no video). A replacement restored normal operation. The set was actually badged as the Goodmans 1410. A.T.

### **Sharp 59CS05H**

If you get one of these large-screen sets and it looks as if the CRT is faulty, with poor focus, check whether R618 has risen in value. It should be 2-2k $\Omega$ . T.L.

### **Sony KVM2140**

The complaint with one of these sets was that it would intermittently crack, with a picture flash. It was left on soak test and after a while it started to produce the symptoms. When I removed the back and inspected the PCB closely I saw that the line output transformer's earth pin was dry-jointed. A clean up and resoldering cleared the fault. T.L.

### **Sony KV25F1**

This large TV set would lose its

picture and sound intermittently though the on-screen display remained. It was a difficult problem to deal with because the fault wouldn't show on test in the workshop, only in the customer's home – occasionally. I eventually checked with a friend who is familiar with the chassis. He recommended a Sony sync circuit modification which consists of changing R117 to 2k $\Omega$  (1-208-789-11) and C201 to 0.1 $\mu$ F (1-164-004-11), then replacing IC3 with the type supplied under part no. 8-759-447-61. The IC differs depending on model number, so check this.

The set concerned now seems to be behaving itself. The modification provides improved sync performance under weak signal conditions. T.L.

#### Ferguson ICC9 Chassis

If continual tripping is the trouble with one of these sets, try replacing the BC327-40 transistor TL65 in the line drive circuit. T.L.

#### Ferguson T10R

The complaint with this little 10in. set was a line down the middle of the screen, which is rather unusual nowadays. But the customer was quite right. I removed the back, powered the set up again and tapped the main PCB gently. A loud arcing noise came from the scan coils. The wire from the line output stage to the coils was just hanging on the tag – it appeared never to have been soldered. I cleaned the connections, made a good physical wrapped connection and resoldered it. This cured the problem. T.L.

#### Matsui 1436

Fluctuating brightness was the complaint with this portable. I'd had the problem before, and just touched the sub-brightness preset VR303. This settled the picture. A new 10k $\Omega$  preset cured the problem. T.L.

#### Sony KVM14TU

This portable came in with a darkish picture that flared slightly. You could have thought, mistakenly, that the CRT was faulty. The things to check are the first anode supply diode D852 and the feed resistor R852. Replacing them should restore a good picture. You may find that the resistor is somewhat burnt. T.L.

#### Ferguson ICC9 Chassis

If the problem with one of these sets is a bright white screen, check

the 10 $\Omega$  safety resistors RB06 and RB07 on the CRT base panel. T.L.

#### Hitachi G6P Chassis

Most of the picture was blanked except for an uneven area about three inches wide at the left-hand side of the screen. What remained of the picture in this area suffered from line pulling and unlocked colour, and was also expanded in size. When the back cover was removed it was evident that something was cooking. Close inspection of the components around the line output transformer revealed that tuning capacitor C782 was in some distress. A replacement put things right. K.E.

#### Grundig CUC70KT

Herringbone patterning and a negative picture, but only on some channels, was the complaint with this old set. The problem cleared when the set had warmed up. I eventually found that replacing the 47 $\mu$ F and 220 $\mu$ F electrolytics next to the IC in the IF can restored normal operation. K.E.

#### Hitachi NP83CQ Mk 2 Chassis

The picture was bright on the right-hand side of the screen, fading to very dark on the left-hand side. The condition improved as the set warmed up. This sort of thing usually means that the reservoir capacitor in supply for the RGB output stages, derived from the line output stage, is faulty. A quick burst of freezer on C715 (4.7 $\mu$ F) proved the point. K.E.

#### GoldStar CIT9508

After a few minutes the picture would fade and disappear. We've often had this fault with Ferguson sets, but never before with a GoldStar one. As with the Ferguson sets, the cause of the problem was loss of the CRT heater supply. Dry-joints at connector P451 on the main panel were to blame. K.E.

#### Panasonic U4W Chassis

This set would occasionally refuse to come out of standby. The cause turned out to be the reservoir capacitor for the error sensing circuit in the power supply, C808. The correct value is 47 $\mu$ F (25V). When it was measured with a capacitance meter the reading was only 19 $\mu$ F. A new capacitor cured the fault. M.M.

#### B and O MX1000

This set was dead, with the line

output and chopper transistors both short-circuit. A previous engineer had replaced the chopper transistor, which had failed again immediately. The cure for this is to replace all the driver transistors in the power supply as well as the chopper transistor itself. The cause of the line output transistor failure was probably the dry-joint we found at the tuning capacitor. M.M.

#### Mitsubishi CT15M2TX (Euro 7 Chassis)

There were two faults with one of these sets. First, it wouldn't come out of standby. The STR54041 chopper chip was responsible for this. The second fault occurred when the set had warmed up: line and field sync were lost. The cause was on the text board, where the MAB8461-W115 microcontroller chip IC7704 responded to heating and cooling. A replacement restored normal operation. M.M.

#### Sony KVX2562U

There were lots of lines and the height and linearity were doing odd things. Scope checks showed that a sort of 500Hz ripple was present on the field output sawtooth waveform. It was also present at the input to the field output chip. The culprit was the CXD2018Q multi-function chip. Replacing this 48-pin flatpack device, which lives on board M, cured the fault. M.M.

#### Philips CP110 Chassis

After a few seconds the display would go out and there was no response from either the front panel buttons or the remote control unit. The culprit was the 1N4148 diode D6733, which is located beside the microcontroller chip. It was leaky. M.M.

#### Decca DYS9893C

This set was 'dead' except for the channel indicator LED. Checks showed that the power supply was working, and that HT was present at the collector of the line output transistor. There was no supply at the line driver transformer's primary winding however. This supply comes via a plug-in PCB that carries the scart socket and the switching circuitry. The PCB connector had a dry-joint at its end pin (they aren't marked). Resoldering brought the set back to life. M.M.

#### Samsung CI3312Z (P585C Chassis)

This portable produced no sound unless it was connected to a hi-fi

system via the scart socket. Sound switching is carried out by the CD4066BCN chip IC601. The 2SC1815 transistor Q601 controls this and appeared to be faulty. A replacement cured the fault. M.M.

**Philips CP90 Chassis with Fastext**

The picture was OK when this set was first switched on. Then, after a few minutes, small black dots akin to satellite TV sparklies began to appear. After a few more minutes these dots turned into small rectangles and the picture became dark. The cause of the trouble was a faulty SAA5243P/E text processor chip. A new chip produced a good picture without dots. C.W.

**Finlux 1000 Series**

This set was dead with RU14 (10kΩ) burning up. The cause was a short in the chopper transformer, which is the same type as in the 3000 series chassis. C.W.

**Amstrad TVR2**

When this set had warmed up the verticals became ragged. Checks in the power supply were fruitless, as no undue ripple could be found.

What I did discover was that freezing the line driver transistor cleared the fault. But a replacement made no difference. So why was the transistor running away with itself? Checks on nearby components revealed that CC1409 (1nF, 2kV) was open-circuit. Normal operation was restored when this item had been replaced. C.W.

**Toshiba 2539DB**

There was only a low whine from one of the background speakers. Everything else was OK. The culprit was the TA8211AH chip IC501. C.W.

**Finlux 5100**

Although the EHT came up when this set was switched on there was no sound or picture. When the tube's first anode voltage was increased there was illumination on the screen. Checks showed that the S5V and S12V supplies were missing, the culprit being the BC557 transistor TA18. It was leaky. C.W.

**Sanyo CBP2565/2566 (E3-A25 Chassis)**

The complaint with one of these sets was flaring and a dim picture.

Apparently another firm had condemned the tube. In fact the HT was low. After a few checks we found that the thick-film error voltage sensing unit A701 was suspect – it's a small, four-pin module. As the circuit is shown in

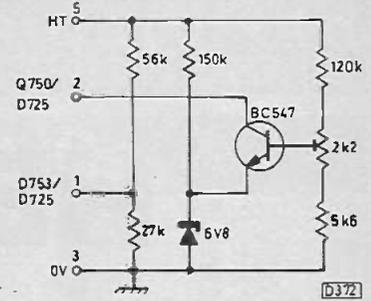


Fig. 1: The error voltage sensing circuit used in the Sanyo E3-A25 chassis.

the manual, individual parts could be tested. The silicon devices were OK, but the resistors were up the wall. Unfortunately when we tried to order a replacement we were told that the unit is no longer available. Rather than scrap the set we decided to make a replacement on a small piece of Veroboard, with a potentiometer for HT adjustment. Fig. 1 shows the circuit. C.W.

**Matsui 1466**

Failure to start up, though the channel indicator is alight, has become quite a common problem with these sets. The start-up resistors R502 and R503 (both 330kΩ) in the power supply tend to go open-circuit. It's best to replace them both. C.W.

BA157=0.10	LA7835=2.35	STK5335=3.25	TCA955=4.10	2N6539=0.35	2SD761=0.55
BYD33D=0.15	LA7850=2.25	STK5337=4.65	TDA1013A=2.99	2SA747=4.95	2SD810=0.55
BYD33M=25	LB1645=2.00	STK5488=4.75	TDA1060=3.25	2SA794=0.60	2SD836=0.75
BYW95C=28	LM384=1.25	STK6962=2.50	TDA1082=2.75	2SA861=0.70	2SD838K=P.O.A.
BYX10=15	M293B1=15.00	STK7217=5.25	TDA1175=2.10	2SA893=0.50	2SD1047=2.25
BYX98=3.25	M710B1=6.10	STK7308=3.50	TDA1235=3.40	2SA949=0.80	2SD1271=0.75
OA91=0.12	M51365=3.99	STK7404=6.40	TDA1517=2.50	2SA1006=1.18	2SD1308=0.90
RGP15K=30	M54519=4.99	STK8250=5.00	TDA1557Q=4.50	2SA1062=1.00	2SD1403=2.85
AN320K=7.50	M58658P=6.99	STK73410=2.85	TDA1558Q=3.65	2SA1124=0.78	2SD1453=4.40
AN5011=2.29	MC1377P=4.25	SKT73410/2=3.50	TDA1670=5.00	2SA1180=2.25	2SD1497=2.50
AN5138=4.30	MDA2060=3.50	STR450=16.50	TDA1904=0.80	2SA1302=3.00	2SD1651=1.80
AN5265=0.95	MDA2061=7.99	STR451=19.50	TDA2004=1.90	2SB524=0.65	2SD1889=3.15
AN5512=1.35	NE544N=4.50	STR1195=7.99	TDA2148=3.25	2SB618=3.05	2SD2125=4.15
AN5521=1.35	PA3029N=24.99	STR4090=11.15	TDA2541Q=3.10	2SB648=0.50	2SK193=0.30
AN5620=2.50	SA11251=6.99	STR11006=3.50	TDA2577=P.O.A.	2SB817=2.25	2SK176=8.00
AN5790=2.40	SA1293=3.5.15	STR16006=3.99	TDA2578A=2.25	2SB883=1.40	AF200=0.80
AN6250=2.99	SA3004P=3.15	STR30115=2.75	TDA2653A=2.40	2SB1156=0.79	BC303=0.20
AN6652=1.00	SA3027P=5.05	STR30125=5.99	TDA3030B=5.50	2SC372=0.30	BC877=0.50
AN6878=2.50	SA55000=4.15	STR44115=5.99	TDA4503=3.00	2SC461=0.10	BC880=0.40
AN7110=1.00	SA5230=12.50	STR50092=5.50	TDA6200=10.50	2SC536=0.20	BD142=1.50
AN7169=2.00	SA7000=8.99	STR50103A=3.85	TDA8214B=3.45	2SC741=3.00	BD226=0.30
APU2400T=9.45	SAB3021=3.99	STR50115=4.50	TDA8372=7.25	2SC840=3.15	BD677=0.50
BA340=1.40	SAB3035P=5.45	STR50213=4.50	TDA8380=2.50	2SC901A=3.50	BD791=0.60
BA536=1.50	SAB3210=2.99	STR53041=4.50	TDA8405=8.00	2SC1123=0.45	BDT64C=2.10
BA3920L=2.50	SAJ210=3.15	STR54041=3.50	TDA8732=5.95	2SC1185=2.25	BDT65C=2.10
BA5102A=1.10	SDA2516=3.00	STR56041=4.50	TEA2018A=1.50	2SC1317=0.15	BDX670=1.67
BA5406=1.80	SDA3002=11.15	STR58041=3.00	TEA1039=1.75	2SC1675=1.85	BF337=0.30
BA6209=1.00	SDA5243=10.15	STR80145=5.50	TEA2031A=1.80	2SC1756=0.35	BF479=0.30
BA6247=2.00	SL1454=18.95	STRD1816=3.99	TEA2164=3.25	2SC1819=0.78	BF760=0.40
BA7766=2.80	STA451C=3.95	STRD6001=5.15	TEA2260=2.99	2SC1904=3.10	BF872=0.25
CNX36=90	STK032=8.75	STRD6108=7.00	TEA5170=1.40	2SC2200=2.50	BFR96=1.00
CNX62A=0.75	STK0049=4.00	TA7119=1.30	TEA8172=1.99	2SC2271=0.55	BFX89=2.50
CNX82A=0.80	STK0060=7.99	TA7210=8.95	TMS3741=5.50	2SC2440=0.30	BU502=1.25
HA1350=2.00	STK435=3.50	TA7230=1.00	TPU2732=19.99	2SC2580=2.35	BU508A=0.80
HA1457=8.99	STK439=3.99	TA7245=2.00	U2829B=1.70	2SC2671=1.20	BU2525=4.10
HA11223=1.35	STK1040=6.35	TA7256=3.99	UAA1008=3.00	2SC2706=3.50	BUT13=2.25
HA11244=2.99	STK2029=4.75	TA7722=8.99	UAA4009=7.00	2SC2753=0.40	BUW41B=0.80
HA11713=1.00	STK2240=6.50	TA7280=1.90	UC3844=1.50	2SC2898=2.50	BUX80=1.80
HA11715=2.10	STK3042/2=4.75	TA7281=2.00	VCU2133=13.00	2SC3156=4.00	BUX98A=4.50
HA12411=5.75	STK3082=5.25	TA7302=2.25	VPU2203=12.50	2SC3178=2.25	MJ15024=6.50
HA17741=4.99	STK4017=3.85	TA7318=4.90	XR2207=4.85	2SC3212=3.50	MJ13009=2.00
IRF840=2.50	STK4042=7.99	TA7328=1.50	UPC1018=1.10	2SC3279=1.15	S2055AF=1.85
KIA6283=2.50	STK4112/2=9.25	TA7604=3.50	UPC1163=1.15	2SC3306=2.50	T1P41C=0.35
L4964=4.99	STK4131/2=6.50	TA7680=2.00	UPC1185=6.00	2SC3358=0.60	TIP42C=0.40
LA3300=1.30	STK4141/2=5.50	TA7698=4.75	UPC1212=1.70	2SC3459=2.10	TIP40=0.85
LA3350=1.99	STK4151/2=6.80	TA8200=3.50	UPC1278M=2.20	2SC3679=3.50	TIP147=0.98
LA4182=1.65	STK4161/2=5.15	TA8215=3.00	UPC1536=5.25	2SC3795=2.50	TIP2955=1.10
LA4422=1.25	STK4191/2=6.85	TA8221=5.75	15/80H=2.50	2SC3973B=2.75	TIP3055=0.95
LA4446=2.90	STK4272=5.99	TA8618=1.80	15/85H=2.50	2SD200=1.80	TIP761=1.89
LA4500=2.00	STK4352=4.85	TA8694=4.99	BTA25=3.99	2SD350=4.10	TIPL=7.63
LA4700=4.40	STK4773=8.20	TBA520=0.95	24004=1.20	2SD371=2.99	7808=0.38
LA7279=1.50	STK5315=4.75	TBA2800=2.50	2N3055H=0.55	2SD551=6.99	7809=0.38
LA7830=1.99	STK5326=4.99	TCA2705=2.99	2N6130=0.40	2SD621L=4.00	7818=0.38

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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:** Service manual or circuit diagram for the Ion Obelisk 3x/2.03 Hi-Fi amplifier. Or does anyone have an address for Ion Systems Ltd.? The one on the back of the unit is no longer valid. Failing that can anyone tell me the values of R24/24a on the power amplifier board? Dave Rhodes, 175 Flixton Road, Urmston, Manchester M41 5ED. 0161 747 7543.

**For disposal:** Tektronix 2235 100MHz, double-beam scope with delay sweep and probes. Recent calibration certificate. Reasonable offer to S. Morris, 23 Spencer Street, Ringstead, Northants NN14 4BX. 01933 625 877.

**Wanted:** Manual or circuit diagram (photocopy OK) for the Marconi Universal LCR bridge type TF868B. Bill Mansell, 8 Cochrane Close, Thatcham, Berks RG19 4QX. 01635 861 134.

**Wanted:** Timer cover flap for the Panasonic NV7000B VCR or a scrap machine; tuner cover flap for the NV333/366. D. Lee, 16 Devonshire Place, Cloughton, Birkenhead, Merseyside L43 ITU16.

**Wanted:** UHF valve tuners (not transistor ones!). Any models, e.g. Cyldon, Ekco, Mullard etc., accepted. Phone J. Dean-Smith on 01984 624 373 or write to 7 Allenslade, Langley Marsh, Wiveliscombe, Nr. Taunton, Somerset TA4 2UE.

**Wanted:** Users' or service manual for the Technics direct-drive turntable system type SL5. Photocopy OK. Malcolm George, 42 Butt Lane, Manuden, Nr Bishops Stortford, Herts CM23 1DL. 01379 813 727.

**Wanted:** Service manual - purchase, loan or photocopy - for the Blaupunkt car radio-cassette type Peugeot PF3(C)R. N. Plumb, 58 Howell Road, Exeter EX4 4EY. 01392 277 444.

**Wanted:** LOPT for the Mitsubishi

Model CT1905BM, new or second-hand. Part no. is 334BD79010. Martin Abbott, Flat 7, The Highlands, Ludlow Road, Leominster, Herefordshire HR6 0DH. 01568 614 725.

**For disposal:** Collector has various issues of *Practical Wireless/Television* dating from 1947 to 1969 available. Please send stamped, addressed envelope for list. David Tilley, 6 Lime Road, Tiverton EX16 6JA.

**Wanted:** Does anyone know of a source of spares and service information for the Soundwave Model CTV1405R? A. Robertson, 261 Warrington Road, Abram, Wigan WN2 5RQ. 01942 865 621.

**Wanted:** TDA3300B and TDA3030B chips. Good price paid. R. Gifford, 4 Gypsy Lane, Needham Market, Suffolk IP6 8DY. 01449 723 009.

**Wanted:** Luminance/chroma board for the Saisho VXL12X/Matsui VX765 VCR and a front membrane switch control panel for the Ferguson TV Model 51K3. Mike Haslam, 477 Warrington Road, Abram, Wigan, Lancs WN2 5XY. 01942 865 766.

**Wanted:** Servo pack PCB for the Panasonic NVFS100B VCR; also any instructions/suggestions in connection with a jammed cassette holder. Eric Chapman, 42 Rochester Drive, Lincoln LN6 0XJ. 01522 688 307.

**Wanted:** A 10in. colour TV set in exchange for a 17in. Ferguson 8000 chassis set and a 22in. Ultra 8800 chassis set, both working and with manuals. G. Mechan, 15 Queensway Close, Mark, Highbridge, Somerset TA9 4PH. 01278 641 339.

**For disposal:** Two brand new Mullard A56-510 boxed 'G11' tubes, also approximately five boxed new panels. Cheap if collected. Michael Dranfield, 6 Caledale Close, Buxton, Derbyshire SK17 9RH. 01298 73 492.

**Wanted:** Retired engineer requires anything to do with valve radios or pre-Sixties radio and TV servicing. Am willing travel anywhere in the country. S. Taylor, 11 Charnborough Road, Coalville LE67 4SF.

**Wanted:** CX523110P memory chip for the Sony YE2 chassis, or working remote control/memory board with this chip included. D. Jackson, 55 Firth Road, Penyfan, Llanelli SA15 1PN. 01554 759 868.

**Wanted:** HT4207-3A hybrid module for the Hitachi VT11E VCR. A second-hand module or scrap Y/chroma PCB would do. Julian Salt, High Barn House, 11 Timber Hill, Sewstern, Grantham, Lincs NG33 5RH.

**Wanted:** February 1988, August 1989 and March 1991 issues of *Television*. P. Cox, 14 Hillside Avenue, Blaenavon, Gwent. 01495 790 538.

**For disposal:** A number of TV, radio and audio valves, all boxed and unused. For list send SAE or fax Mike Brett, 31 Eastfield Avenue, Warford, Herts WD2 4HH, 01923 224 951.

**Wanted:** Scan coils for the Mitsubishi Model CT2525TX (CRT type A59JJZ). Salvaged set will do fine. Also STK043 or equivalent. Have for disposal to enthusiast seven *Radio and TV Servicing* volumes between 1960 and 1971. Mike Weston, 67 Prince of Wales Road, Dorchester, Dorset DT1 1PS. 01305 267 154.

**Wanted:** Any old 5in. colour TV sets, Sony, JVC etc. John Power, 78A Dawlish Drive, Coventry CV3 5NA.

**Wanted:** LOPT for the Hinari Model CT15. Andie Wilkes, 34 Tideswell Road, Great Barr, Birmingham B42 2DT. 01926 404 935 day, 0121 605 0702 evenings.

**More Helps on page 199**

# TRANSISTORS/LINEAR ICs

Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price		
BC107	8p	BD434	30p	BU126	65p	BUV48AF	326p	MJ4502	300p	4N35	50p	LINEAR ICs		AN6340	600p	BA335	55p	BA7004	200p
BC108	8p	BD435	31p	BU128	69p	BUV48C	250p	MJ1012	300p			AN203	210p	AN6342	200p	BA338	80p	BA7007	200p
BC109	8p	BD436	32p	BU130	72p	BUV50	425p	MJ11015	250p			AN210	165p	AN6344	440p	BA340	75p	BA7021	180p
BC140	10p	BD437	28p	BU137	150p	BUV61	1000p	MJ11016	300p	RECTIFIER DIODES		AN217P	95p	AN6346	400p	BA343	60p	BA7022	350p
BC142	20p	BD438	30p	BU170	100p	BUV70	200p	MJ15003	250p	BY127	8p	AN2140	170p	AN6348	400p	BA346	175p	BA7025L	100p
BC143	20p	BD440	40p	BU204	65p	BUV90	175p	MJ15004	300p	BY164	40p	AN2252	160p	AN6350	350p	BA401	60p	BA7026	475p
BC147	8p	BD441	40p	BU208	70p	BUV93	375p	MJ15007	250p	BY179	35p	AN2278	140p	AN6352	450p	BA422	50p	BA7212S	200p
BC148	8p	BD533	50p	BU206	100p	BUW11A	225p	MJ15015	250p	BY184	32p	AN2282	140p	AN6355	450p	BA511	145p	BA7252S	150p
BC159	8p	BD534	38p	BU207	160p	BUW12A	150p	MJ15016	350p	BY206	11p	AN2274	250p	AN6356	300p	BA514	160p	BA7604N	100p
BC160	30p	BD535	38p	BU208	70p	BUW12F	250p	MJ15023	400p	BY207	20p	AN2278	140p	AN6359	600p	BA516	150p	BA7751L	150p
BC171	10p	BD536	38p	BU208A	70p	BUW13A	200p	MJ15024	400p	BY227	19p	AN2278	140p	AN6360	320p	BA518	160p	BA7752	280p
BC172	10p	BD537	40p	BU208AT	70p	BUW32A	500p	MJ15025	700p	BY228	28p	AN2278	140p	AN6362	400p	BA521	100p	BA7755	150p
BC177	14p	BD538	40p	BU208B	200p	BUW48	500p	MJE340	25p	BY238	15p	AN301	330p	AN6363	375p	BA524	240p	BA7757AS	155p
BC178	14p	BD543	50p	BU208D	130p	BUW48	500p	MJE350	80p	BY239	18p	AN302	650p	AN6367NK	400p	BA526	180p	BA8504	350p
BC179	14p	BD545	50p	BU209	90p	BUW48	500p	MJE350	80p	BY239	18p	AN303	250p	AN6368	275p	BA527	95p	BA15218	60p
BC182	7p	BD547	50p	BU225	120p	BUW81A	200p	MJE350	80p	BY239-1200	150p	AN303	250p	AN6371	350p	BA528	350p	CA1140E	28p
BC182L	7p	BD548	50p	BU225	120p	BUW81A	200p	MJE2955T	65p	BY240	20p	AN303	250p	AN6377	400p	BA532	100p	CA1140E	28p
BC183	7p	BD575	40p	BU312	90p	BUW84	75p	MJE3055T	65p	BYT11	25p	AN304	360p	AN6385	50p	BA546	120p	CX141	750p
BC183L	7p	BD576	40p	BU325	55p	BUW85	85p	MJE13004	100p	BYT13-1000	30p	AN316	350p	AN6387	400p	BA546	120p	CX145	725p
BC184	7p	BD577	38p	BU326A	75p	BUX10	150p	MJE13005	60p	BYV96E	36p	AN337	600p	AN6390	400p	BA546	120p	CX150B	325p
BC184L	7p	BD578	38p	BU326A	75p	BUX11	200p	MJE13007	100p	BYV96E	36p	AN337	600p	AN6391	400p	BA546	120p	CX175	325p
BC212	7p	BD673	40p	BU408	60p	BUX12	150p	MJE13009	100p	BYV96E	36p	AN337	600p	AN6392	400p	BA546	120p	CX187	825p
BC212L	7p	BD674	40p	BU408	60p	BUX12	150p	MJE13009	100p	BYV96E	36p	AN337	600p	AN6393	400p	BA546	120p	CX187	825p
BC213	7p	BD681	45p	BU407D	75p	BUX20	350p	MJE15028	200p	BYX10	15p	AN337	600p	AN6394	400p	BA546	120p	CX187	825p
BC213L	7p	BD682	45p	BU408	60p	BUX21	450p	MJE15029	200p	BYX10	15p	AN337	600p	AN6395	400p	BA546	120p	CX187	825p
BC214	7p	BD705	40p	BU408	60p	BUX22	450p	MJE15030	250p	BYX10	15p	AN337	600p	AN6396	400p	BA546	120p	CX187	825p
BC214L	7p	BD706	40p	BU408	60p	BUX23	220p	MJE15034	125p	BYX10	15p	AN337	600p	AN6397	400p	BA546	120p	CX187	825p
BC237	7p	BD709	50p	BU412	175p	BUX39	450p	MJE18004	175p	BYX10	15p	AN337	600p	AN6398	400p	BA546	120p	CX187	825p
BC238	7p	BD711	50p	BU413	175p	BUX40	210p	MJE18004	175p	BYX10	15p	AN337	600p	AN6399	400p	BA546	120p	CX187	825p
BC239	7p	BD736	50p	BU414B	225p	BUX41	200p	OC28	350p	BYX10	15p	AN337	600p	AN6400	400p	BA546	120p	CX187	825p
BC301	20p	BD826	50p	BU415A	170p	BUX42	200p	OC29	350p	BYX10	15p	AN337	600p	AN6401	400p	BA546	120p	CX187	825p
BC302	20p	BD827	50p	BU428A	70p	BUX47A	150p	OC35	350p	BYX10	15p	AN337	600p	AN6402	400p	BA546	120p	CX187	825p
BC303	20p	BD828	50p	BU433	120p	BUX48A	150p	OC36	250p	BYX10	15p	AN337	600p	AN6403	400p	BA546	120p	CX187	825p
BC303	20p	BD829	50p	BU500	225p	BUX55	800p	S2000A3	175p	BYX10	15p	AN337	600p	AN6404	400p	BA546	120p	CX187	825p
BC304	25p	BD899	50p	BU500D	225p	BUX80	180p	S2000AF	130p	BYX10	15p	AN337	600p	AN6405	400p	BA546	120p	CX187	825p
BC327	7p	BD977	50p	BU506	90p	BUX81	200p	S2055AF	175p	BYX10	15p	AN337	600p	AN6406	400p	BA546	120p	CX187	825p
BC328	7p	BDX33	100p	BU506DF	100p	BUX84	50p	S2530A	100p	BYX10	15p	AN337	600p	AN6407	400p	BA546	120p	CX187	825p
BC337	7p	BDX37	100p	BU506DF	100p	BUX85	50p	S2530A	100p	BYX10	15p	AN337	600p	AN6408	400p	BA546	120p	CX187	825p
BC338	7p	BDX44	100p	BU506	90p	BUX86	50p	S2530A	100p	BYX10	15p	AN337	600p	AN6409	400p	BA546	120p	CX187	825p
BC441	28p	BDX47	60p	BU506D	70p	BUX87	60p	S2530A	100p	BYX10	15p	AN337	600p	AN6410	400p	BA546	120p	CX187	825p
BC446	8p	BDX55	75p	BU506DF	100p	BUX87	60p	S2530A	100p	BYX10	15p	AN337	600p	AN6411	400p	BA546	120p	CX187	825p
BC477	18p	BDX62	150p	BU508A	70p	BUZ71	75p	TIP29A	22p	BYX10	15p	AN337	600p	AN6412	400p	BA546	120p	CX187	825p
BC516	22p	BDX63C	175p	BU508AF	95p	BUZ71AF	100p	TIP30	25p	BYX10	15p	AN337	600p	AN6413	400p	BA546	120p	CX187	825p
BC537	25p	BDX64C	175p	BU508AFPH	80p	BUZ72A	100p	TIP30C	25p	BYX10	15p	AN337	600p	AN6414	400p	BA546	120p	CX187	825p
BC546	8p	BDX65	80p	BU508D	75p	BUZ72AF	100p	TIP31A	22p	BYX10	15p	AN337	600p	AN6415	400p	BA546	120p	CX187	825p
BC547	8p	BDX66C	80p	BU508D	75p	BUZ72AF	100p	TIP31C	22p	BYX10	15p	AN337	600p	AN6416	400p	BA546	120p	CX187	825p
BC548	8p	BDX67C	275p	BU508D	75p	BUZ73AF	60p	TIP32	24p	BYX10	15p	AN337	600p	AN6417	400p	BA546	120p	CX187	825p
BC549	8p	BDX71	70p	BU508V	110p	BUZ76A	110p	TIP32A	21p	BYX10	15p	AN337	600p	AN6418	400p	BA546	120p	CX187	825p
BC550	8p	BDX77	175p	BU508VF	100p	BUZ80	135p	TIP32C	28p	BYX10	15p	AN337	600p	AN6419	400p	BA546	120p	CX187	825p
BC556	8p	BDX87C	175p	BU526	75p	BUZ80AF	200p	TIP32C	28p	BYX10	15p	AN337	600p	AN6420	400p	BA546	120p	CX187	825p
BC557	8p	BDX88C	150p	BU526	75p	BUZ80AF	200p	TIP33C	60p	BYX10	15p	AN337	600p	AN6421	400p	BA546	120p	CX187	825p
BC558	8p	BDX92A	55p	BU546	120p	BUZ90A	180p	TIP34C	65p	BYX10	15p	AN337	600p	AN6422	400p	BA546	120p	CX187	825p
BC559	8p	BDW93	50p	BU603	125p	BUZ91A	260p	TIP34C	60p	BYX10	15p	AN337	600p	AN6423	400p	BA546	120p	CX187	825p
BC560	8p	BDW94	50p	BU603D	225p	BY448	20p	TIP35C	65p	BYX10	15p	AN337	600p	AN6424	400p	BA546	120p	CX187	825p
BC573	20p	BDY29	225p	BU608D	120p	BYT11	25p	TIP36	65p	BYX10	15p	AN337	600p	AN6425	400p	BA546	120p	CX187	825p
BC578	20p	BDY29	225p	BU608D	120p	BYT11	25p	TIP36	65p	BYX10	15p	AN337	600p	AN6426	400p	BA546	120p	CX187	825p
BC580	20p	BDY58	500p	BU705	120p	IRF130	45p	TIP40A	20p	BYX10	15p	AN337	600p	AN6427	400p	BA546	120p	CX187	825p
BC583	20p	BDY90	125p	BU706DF	175p	IRF140	55p	TIP42A	20p	BYX10	15p	AN337	600p	AN6428	400p	BA546	120p	CX187	825p
BCY34	200p	BDY92	100p	BU706F	150p	IRF230	55p	TIP42A	22p	BYX10	15p	AN337	600p	AN6429	400p	BA546	120p	CX187	825p
BCV70	16p	BF137	35p	BU724A	100p	IRF260	425p	TIP42A	22p	BYX10	15p	AN337	600p	AN6430	400p	BA546	120p	CX187	825p
BCV72	16p	BF167	30p	BU724A	100p	IRF350	375p	TIP44	40p	BYX10	15p	AN337	600p	AN6431	400p	BA546	120p	CX187	825p
BD115	30p	BF183	20p	BU806	70p	IRF350	375p	TIP46	40p	BYX10	15p	AN337	600p	AN6432	400p	BA546	120p	CX187	825p
BD124P	50p	BF195	7p	BU807F	76p	IRF350	375p	TIP51	80p	BYX10	15p	AN337	600p	AN6433	400p	BA546	120p	CX187	825p
BD131	26p	BF199	8p	BU808DF	210p	IRF350	375p	TIP52	80p	BYX10	15p	AN337	600p	AN6434	400p	BA546	120p	CX187	825p
BD132	26p	BF201	8p	BU808DF	210p	IRF350	375p	TIP52	80p	BYX10	15p	AN337	600p	AN6435	400p	BA546	120p	CX187	825p
BD133	50p	BF225	30p	BU824	60p	IRF510	110p	TIP102	70p	BYX10	15p	AN337	600p	AN6436</					

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# LINEAR ICs

Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price				
HA13001	110p	LA2800	35p	LA7096	200p	LF353	48p	MC3302	50p	SAB3029	62.5p	STK3102 II	53p	STK6478	38p	STR16006	50p	TA7281	200p
HA13002	200p	LA3120	200p	LA7113	275p	LF355	70p	MC3401	45p	SAB3035	27.5p	STK3106	250p	STK6479	30p	STR17006	50p	TA7282	180p
HA13006	400p	LA3150	200p	LA7116	125p	LF357	60p	MC3423P	100p	SAB3036	72.5p	STK3122 III	72.5p	STK6481	47p	STR20005	45p	TA7210	200p
HA13007	300p	LA3160	120p	LA7123	1300p	LF398	300p	MC3488AP	200p	SAB3037	70p	STK3152 II	90p	STK6482	28.5p	STR20012	45p	TA7283	400p
HA13108	280p	LA3161	80p	LA7215	60p	LH2426S	600p	MC3493AP	300p	SAB3042	82.5p	STK3155	500p	STK6483	44p	STR20015	45p	TA7284	200p
HA13117	175p	LA3210	65p	LA7212	150p	LM301	25p	MM1220T	600p	SAB3064	130p	STK4017	400p	STK6486	45p	STR30110	330p	TA7284P	400p
HA13118	140p	LA3226	60p	LA7214	150p	LM311	25p	MM1226	450p	SAB3209	22.5p	STK4019	480p	STK6487	52.5p	STR30115	275p	TA7288	220p
HA13119	140p	LA3246	75p	LA7220	125p	LM319	15p	MM1228	600p	SAB3210	25p	STK4021	380p	STK6488	48p	STR30120	400p	TA7292P	32.5p
HA13127	350p	LA3300	140p	LA7222	110p	LM324	30p	MM1276	1300p	SAB8456	12.5p	STK4024 II	550p	STK6490	45p	STR30123	450p	TA7294P	450p
HA13128	400p	LA3301	110p	LA7224	150p	LM335Z	12p	MM1280	600p	SAB8048	75p	STK4025	530p	STK6532	45p	STR30125	550p	TA7299	200p
HA13130	450p	LA3380	100p	LA7225	280p	LM338	25p	MM3208	500p	SAB8052AP	70p	STK4028	480p	STK6533	40p	STR30130	250p	TA7299	200p
HA13135	500p	LA3365	70p	LA7292	275p	LM348	50p	MM3005	2000p	SDA2003	45p	STK4028 II	550p	STK6575	45p	STR40090	350p	TA7302P	75p
HA13139	600p	LA3370	70p	LA7294	200p	LM358	45p	MM3011	4000p	SDA2004	32.5p	STK4032	510p	STK6570	45p	STR40115	600p	TA7303	70p
HA13150A	1150p	LA3373	70p	LA7295	160p	LM380	80p	MM3101	110p	SDA2005	70p	STK4034 X	92.5p	STK6316	50p	STR41090	330p	TA7307	100p
HA13151	875p	LA3375	300p	LA7297	120p	LM381	150p	MM3102	110p	SDA2007	300p	STK4036	470p	STK6324B	500p	STR43111	950p	TA7310	100p
HA13203	400p	LA3376	80p	LA7305A	350p	LM382	130p	MM3207	375p	SDA2008	400p	STK4038	680p	STK6327	1200p	STR44115	475p	TA7312	200p
HA13206W	400p	LA3380	30p	LA7308	70p	LM386	18p	MM3208	950p	SDA2112	45p	STK4040 II	85p	STK6328A	500p	STR45115	550p	TA7312	120p
HA13408	450p	LA3390	25p	LA7311	200p	LM387	70p	MM6308	350p	SDA2120	200p	STK4042 II	800p	STK6431	85p	STR50020	350p	TA7313	70p
HA13412	600p	LA3400	25p	LA7320	120p	LM389N	105p	MM6163A	70p	SDA2131	22.5p	STK4044	800p	STK6607	400p	STR50092	550p	TA7314	175p
HA13426	600p	LA3401	90p	LA7323	32.5p	LM393	45p	MTA001M	600p	SDA2208	45p	STK4046	95p	STK6722	72.5p	STR50103A	260p	TA7317	120p
HA13432	400p	LA3410	150p	LA7330	350p	LM431	50p	NE555	20p	SDA4212	77.5p	STK4048	1280p	STK6732	1000p	STR50113	500p	TA7320P	100p
HA13441	450p	LA3430	135p	LA7331	250p	LM471	45p	NE556	80p	SDA4214	72.5p	STK4050 II	1600p	STK6733	600p	STR50115	550p	TA7320P	200p
HA13452	250p	LA3500	30p	LA7332	22.5p	LM473	42.5p	NE558	80p	SDA5243	45p	STK4060	510p	STK6822	500p	STR51041	500p	TA7322	130p
KA2102	100p	LA3605	100p	LA7340	300p	LM741DIL	18p	NE555	110p	SDA5343	145p	STK4065	650p	STK6932	52.5p	STR50213	500p	TA7323	80p
KA2103	150p	LA3607	125p	LA7376	150p	LM741MET	15p	NE567	115p	SDA5640	200p	STK4101	500p	STK6952	27.5p	STR53041	400p	TA7324	75p
KA2131	110p	LA4030	180p	LA7391	550p	LM747	55p	NE571	290p	SDA5642	45p	STK4111	500p	STK6972	480p	STR54041	320p	TA7325	100p
KA2206	150p	LA4031	140p	LA7392	200p	LM7017	200p	NE592	25p	SG5F44	500p	STK4112	500p	STK6981B	600p	STR55041	450p	TA7326	200p
KA2209	200p	LA4032	140p	LA7393	200p	LM1035M	350p	NE592P	140p	SG5F45	500p	STK4121	530p	STK6982	500p	STR55041	450p	TA7328	110p
KA2210	230p	LA4033	160p	LA7395	175p	LM1035N	650p	NE593	100p	SLA4031	75p	STK4122	660p	STK6982H	600p	STR55041	450p	TA7328	110p
KA2212	65p	LA4100	85p	LA7545	160p	LM1203	22.5p	SAA1004	350p	SLA7020M	450p	STK4131	480p	STK7216	420p	STR55041	450p	TA7330P	80p
KA2213	130p	LA4101	80p	LA7550	275p	LM1203AN	22.5p	SAA1005	32.5p	STA301A	200p	STK4132 II	600p	STK7217	500p	STR60001	52.5p	TA7331	100p
KA2214	100p	LA4102	100p	LA7555	450p	LM1875T	330p	SAA1006	300p	STA311M	180p	STK4133 II	750p	STK7225	500p	STR60145	47.5p	TA7335	85p
KA2224	50p	LA4110	120p	LA7620	500p	LM1881N	37.5p	SAA1008	450p	STA401A	220p	STK4141 II	420p	STK7226	600p	STR61145	37.5p	TA7336	180p
KA2244	75p	LA4120	220p	LA7680	67.5p	LM1886	260p	SAA1014	400p	STA403A	270p	STK4142	530p	STK7251	500p	STR6120	42.5p	TA7337	120p
KA2281	100p	LA4178	100p	LA7681	85p	LM1889	300p	SAA1024	250p	STA405A	280p	STK4147 II	1450p	STK7253	450p	STR6208	500p	TA7337P	175p
KA2283	100p	LA4140	60p	LA7710	250p	LM1894N	200p	SAA1025	250p	STA431A	250p	STK4151	680p	STK7308	350p	STRD1406	600p	TA7339P	175p
KA2264	100p	LA4142	65p	LA7800	90p	LM1895N	27.5p	SAA1026	400p	STA432A	220p	STK4152	650p	STK7309	400p	STRD1706	360p	TA7341	250p
KA2284	75p	LA4145	65p	LA7801	100p	LM2901N	35p	SAA1027	400p	STA434A	270p	STK4161	650p	STK7310	470p	STRD1806	380p	TA7342P	70p
KA2309	175p	LA4160	100p	LA7802	300p	LM2902N	40p	SAA1029	160p	STA435A	270p	STK4162	560p	STK7348	400p	STRD1816	360p	TA7343	120p
KA2401	150p	LA4162	110p	LA7806	260p	LM2903N	40p	SAA1042	32.5p	STA441C	220p	STK4164 II	1175p	STK7356	42.5p	STRD1836	300p	TA7347P	120p
KA2411	225p	LA4178	100p	LA7808	250p	LM3900	40p	SAA1043P	67.5p	STA451C	280p	STK4171	900p	STK7358	44p	STRD3035	300p	TA7348P	120p
KA2912	125p	LA4180	150p	LA7820	100p	LM3909	40p	SAA1044	400p	STA456C	240p	STK4172 II	680p	STK7402	560p	STRD4412	500p	TA7349P	65p
KA2913A	175p	LA4182	180p	LA7823	200p	LM3911M	200p	SAA1056	300p	STA471	210p	STK4181	680p	STK7404	400p	STRD4420	550p	TA7354P	65p
KA2914A	200p	LA4190	300p	LA7824	130p	LM3914	160p	SAA1057	37.5p	STA901M	280p	STK4182 II	750p	STK7406	65p	STRD4512	400p	TA7357	340p
KA22427	100p	LA4192	140p	LA7830	90p	LM3915	160p	SAA1058	22.5p	STK0025	420p	STK4191	700p	STK7408	67.5p	STRD5441	47.5p	TA7358	85p
KA62120H	400p	LA4200	90p	LA7831	85p	LM3916	270p	SAA1059	270p	STK0029	360p	STK4197	700p	STK7412	600p	STRD5541	47.5p	TA7358	85p
KA6210AH	400p	LA4201	120p	LA7832	130p	LM3933	320p	SAA1061	250p	STK0038	600p	STK4211	1000p	STK7458	1250p	STRD6008	575p	TA7359P	90p
KA6281H	250p	LA4260	230p	LA7835	150p	LM8560	17.5p	SAA1062	250p	STK0040	520p	STK4211 V	800p	STK7554	600p	STRD6009E	400p	TA7361	125p
KA6283K	160p	LA4261	300p	LA7837	150p	LM13600	150p	SAA1063	250p	STK0049	510p	STK4221	1200p	STK7561	650p	STRD618	450p	TA7362	150p
KA6299H	210p	LA4265	12.5p	LA7838	200p	LM13700	12.5p	SAA1064	27.5p	STK0050	440p	STK4231 II	700p	STK7562	1000p	STRD6602	47.5p	TA7364P	175p
KA7227CP	200p	LA4270	300p	LA7850	22.5p	LM18293	500p	SAA1067	550p	STK0059	620p	STK4241	1050p	STK7563	1000p	STRD6601	650p	TA7366P	65p
KA7313	45p	LA4282	350p	LA7851	300p	LM4022P	600p	SAA1073	32.5p	STK0060	620p	STK4241 V	1250p	STK7573	400p	STRD6602	47.5p	TA7366P	65p
LA1491	300p	LA4280	140p	LA7910	150p	M49481	700p	SAA1075	350p	STK0070	1100p	STK4272	500p	STK7576	1500p	STRM6546	900p	TA7373P	150p
LA155V	250p	LA422	100p	LA7913	90p	M5265P	200p	SAA1086	17.5p	STK0080	580p	STK4273	550p	STK7703	500p	STRM6549	900p	TA7373P	150p
L200	200p	LA4425A	200p	LA7930	350p	M50115P	320p	SAA1089	32.5p	STK011	330p	STK4301	500p	ST					

# LINEARIC/ JAPANESE TRANSISTORS

Part	Price	Part	Price	Part	Price	Part	Price	Part	Price										
TAB164P	100p	TD41180	120p	TD42750	400p	TD44661	225p	TD4A391	675p	UPC1004C	130p	2SA771	90p	2SA1177	25p	2SB561	30p	2SC738	15p
TAB189P	350p	TD41185A	190p	TD42780	600p	TD44670	475p	TD4A395	360p	UPC1009	960p	2SA773	50p	2SA1179	20p	2SB562	20p	2SC739	150p
TAB200AH	150p	TD41190	80p	TD42791	275p	TD44680	350p	TD4A405	500p	UPC1018	550p	2SA775	100p	2SA1184	120p	2SB563	20p	2SC740	150p
TAB200AH	200p	TD41200	50p	TD4282M	60p	TD44700A	750p	TD4A416	625p	UPC1023	60p	2SA781	150p	2SA1185	200p	2SB566	50p	2SC763	85p
TAB205	220p	TD41235	300p	TD42824	85p	TD44714C	350p	TD4A417	550p	UPC1024H	75p	2SA786	25p	2SA1186	500p	2SB568	30p	2SC790	50p
TAB207K	175p	TD41236	240p	TD42840	200p	TD44716C	450p	TD4A421	300p	UPC1025	230p	2SA794	50p	2SA1198	40p	2SB569	50p	2SC792	380p
TAB210	260p	TD41251	150p	TD43047	100p	TD44718A	250p	TD4A425	500p	UPC1026	95p	2SA798	30p	2SA1201	40p	2SB561	60p	2SC805	220p
TAB211AH	200p	TD41270	100p	TD43048	70p	TD44832	400p	TD4A432	700p	UPC1028	250p	2SA812	25p	2SA1202	25p	2SB562	25p	2SC818	20p
TAB214H	200p	TD41302	200p	TD43082	200p	TD44800	300p	TD4A433	600p	UPC1031H	150p	2SA814	60p	2SA1204	225p	2SB563	40p	2SC829	15p
TAB215	300p	TD41405	50p	TD43083	200p	TD44810	250p	TD4A440	300p	UPC1032	60p	2SA816	70p	2SA1206	60p	2SB564	45p	2SC839	20p
TAB216H	300p	TD41410	220p	TD43190	100p	TD44814A	300p	TD4A442	200p	UPC1033C	110p	2SA817	20p	2SA1207	25p	2SB563	40p	2SC867	100p
TAB217P	120p	TD41412	35p	TD43301B	400p	TD44850	475p	TD4A443	350p	UPC1043C	125p	2SA825	20p	2SA1208	70p	2SB641	12p	2SC870	90p
TAB220AH	600p	TD41508	275p	TD43310	120p	TD44851	325p	TD4A444	200p	UPC1159H	200p	2SA826	20p	2SA1209	100p	2SB642	12p	2SC871	175p
TAB221AH	600p	TD41505	75p	TD43433	150p	TD44852	320p	TD4A451	320p	UPC1161	110p	2SA837	200p	2SA1210	120p	2SB643	45p	2SC900B	30p
TAB225H	475p	TD41510	170p	TD43420	200p	TD44850	200p	TD4A452	200p	UPC1167	125p	2SA839	110p	2SA1215	60p	2SB649	35p	2SC930	15p
TAB225L	475p	TD41512	140p	TD43501	300p	TD44866	275p	TD4A453	350p	UPC1170	150p	2SA841	20p	2SA1216	550p	2SB673	100p	2SC934	300p
TAB227	250p	TD41514A	325p	TD43502	360p	TD44881	200p	TD4A461	950p	UPC1173	200p	2SA844	20p	2SA1217	100p	2SB676	85p	2SC931	15p
TAB229K	200p	TD41515A	200p	TD43504	300p	TD44935	300p	TD4A490	225p	UPC1178C	120p	2SA847	25p	2SA1220	75p	2SB688	90p	2SC944	140p
TAB240P	200p	TD41516Q	350p	TD43505	275p	TD44936	300p	TD4A491	225p	UPC1181	110p	2SA848	25p	2SA1221	75p	2SB689	90p	2SC945	140p
TAB410K	200p	TD41596	200p	TD43508	260p	TD44942	200p	TD4A492	275p	UPC150C	200p	2SA851	45p	2SA1222	50p	2SB693	200p	2SC950	40p
TAB410P	200p	TD41519	200p	TD43507	450p	TD44944	175p	TD4A493	600p	UPC185H2	400p	2SA872	25p	2SA1226	25p	2SB707	200p	2SC959	225p
TAB432	200p	TD41519A	200p	TD43510	200p	TD44950	150p	TD4A498	700p	UPC186	80p	2SA872A	50p	2SA1227	250p	2SB716	200p	2SC980	40p
TAB605N	350p	TD41520	275p	TD43520	250p	TD45030A	100p	TD4A499	100p	UPC187	150p	2SA879	30p	2SA1232	180p	2SB718	100p	2SC982	25p
TAB606N	350p	TD41521	210p	TD43530	200p	TD45031	100p	TD4A500	100p	UPC188	150p	2SA879	30p	2SA1233	180p	2SB718	100p	2SC982	25p
TAB607P	200p	TD41521A	200p	TD43530T	200p	TD45032	100p	TD4A501	100p	UPC191	300p	2SA885	35p	2SA1234	180p	2SB718	100p	2SC982	25p
TAB611AN	250p	TD41524	200p	TD43541	175p	TD45331T	150p	TD4A740	625p	UPC193	140p	2SA886	45p	2SA1239	30p	2SB734	35p	2SC1001	950p
TAB615N	480p	TD41526	225p	TD43560	260p	TD45332T	150p	TD4A741	550p	UPC198H	200p	2SA887	20p	2SA1240	45p	2SB737	20p	2SC1008	20p
TAB628N	350p	TD41534	2000p	TD43561	300p	TD45500	400p	TD4A808T	325p	UPC1210	150p	2SA893	15p	2SA1242	80p	2SB739	22p	2SC1010	225p
TAB631	500p	TD41540	420p	TD43561A	300p	TD45600	480p	TD4A809T	350p	UPC1215	125p	2SA896	25p	2SA1244	120p	2SB750	60p	2SC1010	225p
TAB632N	550p	TD41540Q	350p	TD43566	280p	TD45600	850p	TD4A810T	350p	UPC1216	125p	2SA897	25p	2SA1244	120p	2SB750	60p	2SC1010	225p
TAB634N	550p	TD41542	250p	TD43567	280p	TD45820	370p	TD4A813	225p	UPC1238	120p	2SA913	100p	2SA1256	30p	2SB774	50p	2SC1051	850p
TAB644	375p	TD41543	200p	TD43563	350p	TD45832	125p	TD4A800	225p	UPC1241H	150p	2SA914	90p	2SA1257	30p	2SB775	50p	2SC1051	250p
TAB653N	1500p	TD41552Q	350p	TD43564	325p	TD45708	275p	TD4A903	130p	UPC1228AH	45p	2SA907	650p	2SA1249	100p	2SB764	30p	2SC1046	250p
TAB659AN	100p	TD41553Q	325p	TD43565	220p	TD45709	375p	TD4A900	750p	UPC1230	200p	2SA909	500p	2SA1252	100p	2SB765	30p	2SC1047	200p
TAB690N	700p	TD41585Q	375p	TD43566	280p	TD45709	375p	TD4A900	750p	UPC1231	200p	2SA909	500p	2SA1252	100p	2SB765	30p	2SC1047	200p
TAB691N	700p	TD41597	150p	TD43567	280p	TD45820	370p	TD4A913	225p	UPC1238	120p	2SA913	100p	2SA1256	30p	2SB774	50p	2SC1051	850p
TAB701AN	275p	TD41598	200p	TD43568	350p	TD45832	125p	TD4A900	225p	UPC1241H	150p	2SA914	90p	2SA1257	30p	2SB775	50p	2SC1051	250p
TAB718N	550p	TD41560Q	675p	TD43570	375p	TD45850	175p	TD4A921	200p	UPC1242H	150p	2SA915	30p	2SA1258	70p	2SB776	110p	2SC1089	175p
TAB720	525p	TD41571	300p	TD43580	300p	TD45930	225p	TD4A922	150p	UPC1245	130p	2SA916	30p	2SA1261	150p	2SB788	35p	2SC1070	60p
TAB739P	450p	TD41572	175p	TD43586	760p	TD46100Q	120p	TD4A925	150p	UPC1270H	350p	2SA921	20p	2SA1261	150p	2SB788	35p	2SC1070	60p
TAB739P	450p	TD41572	175p	TD43586	760p	TD46100Q	120p	TD4A925	150p	UPC1270H	350p	2SA921	20p	2SA1261	150p	2SB788	35p	2SC1070	60p
TAB739P	450p	TD41572	175p	TD43586	760p	TD46100Q	120p	TD4A925	150p	UPC1270H	350p	2SA921	20p	2SA1261	150p	2SB788	35p	2SC1070	60p
TAB739P	450p	TD41572	175p	TD43586	760p	TD46100Q	120p	TD4A925	150p	UPC1270H	350p	2SA921	20p	2SA1261	150p	2SB788	35p	2SC1070	60p
TAB739P	450p	TD41572	175p	TD43586	760p	TD46100Q	120p	TD4A925	150p	UPC1270H	350p	2SA921	20p	2SA1261	150p	2SB788	35p	2SC1070	60p
TAB739P	450p	TD41572	175p	TD43586	760p	TD46100Q	120p	TD4A925	150p	UPC1270H	350p	2SA921	20p	2SA1261	150p	2SB788	35p	2SC1070	60p
TAB739P	450p	TD41572	175p	TD43586	760p	TD46100Q	120p	TD4A925	150p	UPC1270H	350p	2SA921	20p	2SA1261	150p	2SB788	35p	2SC1070	60p
TAB739P	450p	TD41572	175p	TD43586	760p	TD46100Q	120p	TD4A925	150p	UPC1270H	350p	2SA921	20p	2SA1261	150p	2SB788	35p	2SC1070	60p
TAB739P	450p	TD41572	175p	TD43586	760p	TD46100Q	120p	TD4A925	150p	UPC1270H	350p	2SA921	20p	2SA1261	150p	2SB788	35p	2SC1070	60p
TAB739P	450p	TD41572	175p	TD43586	760p	TD46100Q	120p	TD4A925	150p	UPC1270H	350p	2SA921	20p	2SA1261	150p	2SB788	35p	2SC1070	60p
TAB739P	450p	TD41572	175p	TD43586	760p	TD46100Q	120p	TD4A925	150p	UPC1270H	350p	2SA921	20p	2SA1261	150p	2SB788	35p	2SC1070	60p
TAB739P	450p	TD41572	175p	TD43586	760p	TD46100Q	120p	TD4A925	150p	UPC1270H	350p	2SA921	20p	2SA1261	150p	2SB788	35p	2SC1070	60p
TAB739P	450p	TD41572	175p	TD43586	760p	TD46100Q	120p	TD4A925	150p	UPC1270H	350p	2SA921	20p	2SA1261	150p	2SB788	35p	2SC1070	60p
TAB739P	450p	TD41572	175p	TD43586	760p	TD46100Q	120p	TD4A925	150p	UPC1270H	350p	2SA921	20p	2SA1261	150p	2SB788	35p	2SC1070	60p
TAB739P	450p	TD41572	175p	TD43586	760p	TD46100Q	120p	TD4A925	150p	UPC1270H	350p	2SA921	20p	2SA1261	150p	2SB788	35p	2SC1070	60p
TAB739P	450p	TD41572	175p	TD43586	760p	TD46100Q	120p	TD4A925	150p	UPC1270H	350p	2SA921	20p	2SA1261	150p	2SB788	35p	2SC1070	60p
TAB739P	450p	TD41572	175p	TD43586	760p	TD46100Q	120p	TD4A925	150p	UPC1270H	350p	2SA921	20p	2SA1261	150p	2SB788	35p	2SC1070	60p
TAB739P	450p	TD41572	175p	TD43586	760p	TD46100Q	120p	TD4A925	150p	UPC1270H	350p	2SA921	20p	2SA1261	150p	2SB788	35p	2SC1070	60p
TAB739P	450p	TD41572	175p	TD43586	760p	TD46100Q	120p	TD4A925	150p	UPC1270H	350p	2SA921	20p	2SA1261	150p	2SB788	35p	2SC1070	60p
TAB739P	450p	TD41572	175p	TD43586	760p	TD46100Q	120p	TD4A925	150p	UPC1270H	350p	2SA921	20p	2SA1261	150p	2SB788	35p	2SC1070	60p
TAB739P	450p	TD41572	175p	TD43586	760p	TD46100Q	120p	TD4A925	150p	UPC1270H	350p	2SA921	20p	2SA1261	150p	2SB788	35p	2SC1070	60p
TAB739P	450p	TD41572	175p	TD43586	760p	TD46100Q	120p	TD4A925	150p	UPC1270H	350p	2SA921	20p	2SA1261	150p	2SB788	35p		









# VIDEO SERVICE KITS

<b>AMSTRAD</b> VCR700 Contents BELT SET, PINCH ROLLER, REEL IDLER, VIDEO LAMP Order Code: SK41	£5.50	<b>HITACHI</b> VT11/VT33 Contents BELT SET, PINCH ROLLER, TENSION BAND, IDLER TYRES Order Code: SK08	£5.00	<b>NV600/NV588</b> Contents BELT SET, PINCH ROLLER, PLAY IDLER, FF/REW IDLER, TENSION BAND Order Code: SK25	£12.00	Economy Kit Contents BELT SET, PINCH ROLLER, PLAY IDLER TYRE, FF/REW IDLER TYRE Order Code: SK26	£6.00				
<b>FERGUSON &amp; JVC</b> 3V42/43 HRD455/HRD725 Contents BELT SET, PINCH ROLLER, CLUTCH MECHANISM, TENSION BAND Order Code: SK37	£16.00	Economy Kit Contents BELT SET, PINCH ROLLER, SUPPLY CLUTCH, TAKE UP CLUTCH Order Code: SK38	£9.00	<b>NV730/NV770</b> Contents SLOT IN BELT, LOADING BELT, PINCH ROLLER, IDLER UNIT, TENSION BAND Order Code: SK19	£5.50	Economy Kit Contents SLOT IN BELT, LOADING BELT, PINCH ROLLER, IDLER TYRE Order Code: SK20	£3.00				
3V58/59/64/65 HRD170/180/210/230/300/320/370/400/430/530/700/750 HRS5000 Contents BELT SET, PINCH ROLLER, IDLER ARM, TENSION BAND Order Code: SK44	£7.00	VT52/61/62/63/64/65/65/66/640 Contents BELT SET, PINCH ROLLER, FF/REW ARM, CLUTCH PLATE, TENSION BAND Order Code: SK49	£14.00	Economy Kit Contents BELT SET, PINCH ROLLER, FF/REW IDLER Order Code: SK50	£3.00	<b>NV370/NV380/480/630/780/830/850/AG2100PK/AG2200PK</b> Contents BELT SET, PINCH ROLLER, IDLER TENSION BAND Order Code: SK21	£5.00	Economy Kit Contents BELT SET, PINCH ROLLER, IDLER TYRE Order Code: SK22	£2.75		
3V29/3V30 HR7200/7300/7350 Contents BELT SET, PINCH ROLLER, TENSION BAND, IDLER TYRES Order Code: SK05	£5.00	VT400/405/410/13/14/15/18/420/25/26/28/430/31/35/48/450/496/510/520/25/26/330/35/36/540/545/46/48/570/75/575/580/85/88 Contents TIMING BELT, PINCH ROLLER, FF/REW ARM, CLUTCH BASE, TENSION BAND Order Code: SK52	£9.75	<b>NV771/NV788</b> Contents BELT SET, PINCH ROLLER, IDLER UNIT, TENSION BAND Order Code: SK17	£6.00	Economy Kit Contents BELT SET, PINCH ROLLER, IDLER TYRE Order Code: SK18	£4.00				
3V35/36, 38/39/49 HRD110/111/120/225 Contents BELT SET, PINCH ROLLER, TENSION BAND, IDLER TYRES Order Code: SK04	£5.00	VT100/110/111/113/115/118/120/125/128/130/135/138/145/150/175/220/225/250/255/258/260/VT130 Contents BELT SET, PINCH ROLLER, FF/REW ARM, CLUTCH PLATE, TENSION BAND Order Code: SK51	£14.00	<b>SHARP</b> VC381 Contents BELT SET, PINCH ROLLER, REEL IDLER, TENSION BAND, VIDEO LAMP Order Code: SK47	£8.00	Economy Kit Contents BELT SET, PINCH ROLLER, REEL IDLER TYRE Order Code: SK48	£3.25				
3V31/3V42 HR7600/7610/7850/7855 Contents BELT SET, T/U REEL TABLE TYRE, PINCH ROLLER, REEL IDLER, T/U CLUTCH, T/U IDLER, TENSION BAND, VIDEO LAMP Order Code: SK33	£11.00	<b>PANASONIC</b> NV2000/NV2010/NV7000/NV7200/NV7800 Contents BELT SET, PINCH ROLLER, TENSION BAND, IDLER TYRES Order Code: SK03	£5.00	Economy Kit Contents BELT SET, PINCH ROLLER, TENSION BAND, IDLER TYRES Order Code: SK02	£5.00	<b>VC500/VC571/VC581/VC582/VC583/VC584/VC5F3</b> Contents BELT SET, PINCH ROLLER, REEL IDLER, TENSION BAND Order Code: SK50	£9.50	Economy Kit Contents BELT SET, PINCH ROLLER, REEL IDLER Order Code: SK61	£5.00		
3V35/38/39/49 HRD110/111/120/121/225 Contents BELT SET, T/U REEL TABLE TYRE, SUPPLY REEL TABLE TYRE, PINCH ROLLER, T/U CLUTCH, T/U IDLER REEL IDLER, TENSION BAND Order Code: SK35	£10.00	NV300/NV330/NV333/NV340/NV366 Contents BELT SET, PINCH ROLLER, TENSION BAND, IDLER TYRE Order Code: SK01	£5.00	<b>NV2000/NV2010</b> Contents BELT SET, PINCH ROLLER, FF IDLER, PLAY IDLER, TENSION BAND, VIDEO LAMP Order Code: SK13	£6.00	Economy Kit Contents BELT SET, PINCH ROLLER, IDLER TYRE, PULLEY TYRE Order Code: SK14	£3.50	<b>VC781/VC7810/VC7822/VC785/VC786/VC793/VC800/VC8100/VC8102/VC8104/VC8212</b> Contents BELT SET, PINCH ROLLER, REEL DRIVE UNIT, TENSION BAND Order Code: SK64	£13.50	Economy Kit Contents BELT SET, PINCH ROLLER, REEL DRIVE UNIT TYRE Order Code: SK65	£3.75
3V29/3V30 HRD7200/7300/7350 Contents BELT SET, T/U REEL TABLE TYRE, SUPPLY REEL TABLE TYRE, PINCH ROLLER, REEL IDLER, T/U CLUTCH, T/U IDLER, TENSION BAND, VIDEO LAMP Order Code: SK31	£10.00	NV7000/NV7200/NV7800 Contents BELT SET, PINCH ROLLER, IDLER UNIT, PLAY IDLER, TENSION BAND Order Code: SK11	£8.50	Economy Kit Contents BELT SET, PINCH ROLLER, IDLER TYRE, CLUTCH TYRE Order Code: SK12	£3.25	<b>VC681/VC682/VC684/VC685/VC686/VC689/VC692/VC700</b> Contents BELT SET, PINCH ROLLER, REEL DRIVE UNIT, TENSION BAND Order Code: SK62	£13.50	Economy Kit Contents BELT SET, PINCH ROLLER, REEL DRIVE UNIT TYRE Order Code: SK63	£5.00		
3V44/45/48/53/54/55/57 HRP50/HRD140/150/156/160 HRD250/257/565/566/755 Contents BELT SET, PINCH ROLLER, CLUTCH MECHANISM, TENSION BAND Order Code: SK39	£15.00	NV300/NV330/NV333/NV340/NV366 Contents BELT SET, PINCH ROLLER, IDLER UNIT, PLAY IDLER, TENSION BAND Order Code: SK15	£7.00	Economy Kit Contents BELT SET, PINCH ROLLER, IDLER TYRE, PLAY IDLER Order Code: SK16	£3.25						
<b>FISHER</b> FVHP905/906/907/908/910/911/916/918 Contents BELT SET, PINCH ROLLER, IDLER, GEAR IDLER UNIT, TENSION BAND Order Code: SK57	£13.00	NVG7/NVG9/NVG10/NVG11/NVG12/NVG14/NVG15/NVG16/NVG18/NVG30/NVG120/NVG130/NVG400/NVH85 (PX/AC/AG1810 (P/K)) Contents LOADING BELT, CAPSTAN BELT, PINCH ROLLER, IDLER TENSION BAND Order Code: SK27	£5.00	Economy Kit Contents LOADING BELT, CAPSTAN BELT, PINCH ROLLER, IDLER TYRE Order Code: SK28	£3.00						
FVHP615/618/620/622/710/711/715/716/720/721/722/725/730/830/840 Contents BELT SET, PINCH ROLLER, IDLER, GEAR IDLER UNIT, TENSION BAND Order Code: SK68	£11.00	NV332 Contents BELT SET, PINCH ROLLER, PLAY IDLER, FF/REW IDLER, TENSION BAND, FF/REW TYRE Order Code: SK29	£12.00	Economy Kit Contents BELT SET, PINCH ROLLER, PLAY IDLER TYRE, FF/REW IDLER TYRE Order Code: SK30	£5.10						
NV230/250/260/280/430/450/460/470/650/810/890/AG1200PK/AG1500PK Contents BELT SET, PINCH ROLLER, IDLER, TENSION BAND Order Code: SK23	£3.00	NV730 Contents BELT SET, PINCH ROLLER, IDLER TYRE Order Code: SK24	£5.00	Economy Kit Contents BELT SET, PINCH ROLLER, IDLER TYRE Order Code: SK24	£3.25						

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**8 WAY REMOTE**

**See Page 198**

**SPECIAL OFFER !!**

## REPLACEMENT VIDEO CASSETTE HOUSINGS

Name	Models	Code	Price	Name	Models	Code	Price	Name	Models	Code	Price
AKAI	VS35, VS53, VS55, VS56, VS75	CH18	3200p						VCA103, 103GV, 105, 106GV, 254GV, 254GV	CH23	2500p
GRANADA	VHSDF1, VHSYJ2	CH05	1100p						VCS211, 244, 5055, 605, VCB230, VCD806G, 810G, VCT212, 310, 410G, 610	CH24	2500p
GOLDSTAR	GHV1280P, 1291P, 1295P, 9400, 73401, GSE1295P, GSE1891P, 20001Q, 20051Q, VCP4200, 4300, 4301, 4305, VCP4306, 4311, 4315, 4318, 4320, 4321, 4325	CH25	2000p						VR2970	CH02	2800p
	GHV51, 1221, 1232, 1240, 1241, 1242, 1244, 1246, 1248, GHV8000, 6200	CH26	2900p	FERGUSON	FV57H, VR3605, VR3905	CH27	2400p	TELEFUNKEN	V320, 321, 323, 326, 4200, 4300	CH01	2800p
FERGUSON & J.V.C.	3V38, 3V39, 8943, 8944, 8951, 3V35, 3V38, 3V48, HRD 110, 111, 120, 121, 225	CH01	2800p	L.T.T.	VR3916, 3926, 3946, 3948, 3976, 3986, 3995, 3997, 6948	CH02	2800p	THOMSON	V342, 343, 352, 353, 360, 364, 368, 4210, 4230, 4260, 4400, V9500, 6000, 8540	CH02	2800p
	3V42, 3V43, 3V44, 3V45, 3V48, 3V53, 3V54, 3V55, 3V57, 8945, 8947, 8948, HRD 140, 141, 150, 157, 158, 160, 250, HRD257, 455, 565, 566, 725, 755	CH02	2800p		VR3916, 3926, 3946, 3948, 3976, 3986, 3995, 3997, 6948	CH02	2800p	TOSHIBA	V55, V57, V65, V66	CH01	2800p
	8948, 8950, FV108, 12L, 13H, 14T, 20B, 21R, 22L, 26, 395, HRD230, 430, 530	CH03	2800p	NATIONAL PANASONIC	NV730	CH06	4300p				
	3V58, 3V59, 3V64, 3V65, FV11R, 8950, 8951, HRD 170, HRD180, HRD370	CH04	2800p	N.E.C.	N830EG, N831EG, N831EG, N832, N833EG	CH01	2800p				
				PHILIPS	NR85	CH02	2800p				
					CASSETTE LIFT ASSEMBLY (68120366)						
					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, VR6448, 4858B	CH22	2900p				
					VR6448, 4858B	CH23	2500p				
					VR6448, 4858B	CH24	2500p				
				SHARP	VCA100, VCH851, VCH852	CH22	2900p				

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**AMSTRAD MOD KIT**

☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆

FITS :

VCR 4500, 4600, 4700, 5200, TVR 1,2,3

☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆

**PRICE : £2.75 + VAT each**

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MODE SWITCH	
NV2000, 2010, 7000, 7200, 7800 (VSS0048)	
NV230, 260, 430, 810, 870, 2300, 4300 (VSS0110)	<b>£3.50</b>
NV830 (VSS0091)	<b>£2.25</b>
NV300, 333, 340, 366, 688, 777, 778 (VSS0060)	<b>£2.10</b>
NVG21, 25, NVH65, NVD80 (VSS0175A)	<b>£3.75</b>
	<b>£2.00</b>

AUDIO CONTROL HEADS		
<b>AMSTRAD ORIGINAL NO: 150751</b>		
Used on: AMSTRAD TVR1, 2, 3, VCR4600, 4600MKII, 4700, FUNAI VS2, VCR4600, 4800, 5200, 5600, 6600, VIP3000, 5000		
Also fits: FIDELITY, FUNAI, HINARI, PROLINE, SCHNEIDER, TOWADA, UNIVERSUM ORDER CODE: AH01 PRICE: 1350p		
<b>AMSTRAD ORIGINAL NO: 153134</b>		
Used on: AMSTRAD DD8900, 8904, VCR2000, 8000, 8100, 8600, 8602, 8603, VCR8604, 8700, 8704, 8714, 8800, 9005, 8244		
Also fits: ANTECH, BONDSTEC, CASIO, CROWN, FIDELITY, GOLD-HAND, GRANADA, HINARI, MARQUANT, OMEGA, PROFEX, SCHNEIDER, SEG, SENTRA, SHINTOM, TASHIKO, TATUNG, TOWADA, UNIVERSUM ORDER CODE: AH02 PRICE: 1450p		
<b>Replacement Audio Control Video Sound Head for National Panasonic</b>		
PART NUMBER	MODELS	PRICE
VBR0091	NV7 etc	875p
VBR0050	NV300, NV340 etc	875p
VBR0061	NV777 etc	875p
VBR0103A	NV250, NV450 etc	625p
VBR0125		625p

## VIDEO TOOLS

**VIDEO CLEANING STICKS**  
 Price 17p each 15p each pack of 10pcs  
 13p each pack of 25pcs  
**Order Code: SP14**

**VIDEO MAINTENANCE TOOLS**  
 Set of 8 Allen keys packed in a plastic wallet  
**Order code: TOOL 9, Price 125p**  
 Specifically designed for video maintenance

**UNIVERSAL HEAD EXTRACTOR**  
 Hand tool designed for extracting hard to remove heads without damage to either the head or the mounting assembly. Adjustable so as to suit various heads.  
**Order code: TOOL 8, Price 600p**

### 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

**SET OF 8 ALLEN KEYS**  
 0.77mm 0.90mm  
 1.27mm 1.50mm  
 1.60mm 2.00mm  
 2.40mm 3.00mm

**3 REVERSIBLE SCREWDRIVERS**  
**3 REVERSIBLE SCREWDRIVERS**  
**SPRING HOOK**

**CIRCLIP PLIERS**  
**MICRO SCREWDRIVER**

**VCR HEAD EXTRACTOR**  
**Order code: TOOL 10, Price 2900p**

### TRANSPARENT REPAIR/ADJUSTMENT CASSETTE

This transparent videocassette replaces a normal videotape during measurements, adjustments and inspection. The mechanical parts come into sight and become accessible.  
**Order code: TOOL 23, Price 500p**

## BACK UP BATTERIES

**PHILIPS**  
 Part Nos: 138 - 101138, 138 - 10313 1.2v 90mAH  
 Order Code: BB01  
 Part Nos: 138 - 10229, 2.4v 100mAH  
 Order Code: BB02

Price: 75p  
 Price: 135p

**FERGUSON**  
 Part No: 00E6 - 067 - 001 1.2V 100mAH  
 Order Code: BB03  
 Part Nos: 00E6 - 606 - 8001 2.4V 100mAH  
 Order Code: BB04

Price: 90p  
 Price: 150p

## SATELLITES

MAKE & MODEL	CODE	PRICE
PACE PRD800, PRD900	SATPSU1	600p
PACE SS9000, 9200, 9010, 9210, 9220	SATPSU2	550p
AMSTRAD SRD510, SRD520	SATPSU3	600p
AMSTRAD SRD500	SATPSU4	600p
AMSTRAD SRX340, SRX345, SRX350	SATPSU5	600p
PACE D100/150	SATPSU6	650p
CHURCHILL D2MAC	SATPSU7	650p
PACE MSS100	SATPSU8	730p

MAKE & MODEL	CODE	PRICE
PACE MSS200/300 APPOLL	SATPSU9	900p
PACE MSS500/1000	SATPSU10	1230p
FERGUSON SRD4	SATPSU11	650p
ECHOSTAR SR5500	SATPSU12	1600p
ECHOSTAR 6500/7700/8700	SATPSU13	2750p
AMSTRAD SRD600	SATPSU14	2600p
MIMTEC (Surenson)	SATPSU15	700p
AMSTRAD SRD700, SR950, SRX100, 301, 501, 502, 1002, 2001, SRD2000 SAT250	SATPSU16	650p

### SATELLITE TUNERS

PACE PRD800/MSS200 2Ghz (221-2077062)  
**ORDER CODE: TUNER01 PRICE: 1400p + VAT**

PACE PRD900/MSS1000 2Ghz (221-21770112)  
**ORDER CODE: TUNER02 PRICE: 1400p + VAT**

### SWITCH MODE TRANSFORMERS

PACE 9000  
**ORDER CODE: PACE9000 PRICE: 800p**

PRD800/PRD900  
**ORDER CODE: PRD800 PRICE: 550p**

### SATMETER

The Satmeter is a professional portable satellite strength meter designed for the installation and maintenance of satellite TV systems. The Satmeter can be used as stand alone with powering the LNB as well as in loop.  
 Through operation with satellite RX powering the LNB.  
 \* Acoustical signal: On signal strength \*LED indicator: Vert/Hori  
 \* Frequency Range: 900 to 2050 Mhz \*Input impedance: 70 Ohm  
 \* Power amplifier: 18db \*Detection Range: -60 to -10 DBM  
 \* Max. input signal: -10 DBM  
**ORDER CODE: TOOL22 PRICE: 8500p**

## REPLACEMENT TV SWITCHES

### GRUNDIG

PART No: 29703, 29102  
 USED ON:  
 C7500, C8500, C8502, C8712 ... ETC  
 Order Code: SW1 Price: 140p

### PHILIPS

USED ON:  
 K30, K35, K40, KT3, KT4  
 Order Code: SW13 Price: 95p

### SONY

USED ON:  
 KV1612, KB1612, KV1614, KV2052, V2056  
 KV2062, KV2067, KV2212 ... ETC  
 Order Code: SW5 Price: 150p

### SONY

USED ON:  
 KV1400, KV1440, KV2040, KV2060  
 (POWER SWITCH 26mm)  
 Order Code: SW12 Price: 125p

### SONY

USED ON:  
 KV2020  
 (POWER SWITCH 21mm +Remote)  
 Order Code: SW6 Price: 200p

### SONY 2 PIN FUNCTION SWITCH

Order Code: SW9 Price: 35p

# FUSES

CURRENT RATING	TIME LAG (20mm)		QUICK BLOW (20mm)	
	ORDER CODE	PRICE	ORDER CODE	PRICE
100mA	FUSE36	75p	FUSE37	60p
160mA	FUSE01	75p	FUSE17	60p
250mA	FUSE02	75p	FUSE18	60p
315mA	FUSE03	75p	FUSE19	60p
400mA	FUSE04	75p	FUSE20	60p
500mA	FUSE05	75p	FUSE21	60p
630mA	FUSE06	75p	FUSE22	60p
800mA	FUSE07	60p	FUSE23	60p
1A	FUSE08	60p	FUSE24	60p
1.25A	FUSE09	60p	FUSE25	60p
1.6A	FUSE10	60p	FUSE26	60p
2A	FUSE11	50p	FUSE27	60p
2.5A	FUSE12	50p	FUSE28	60p
3.15A	FUSE13	55p	FUSE29	50p
4A	FUSE14	55p	FUSE30	50p
5A	FUSE15	60p	FUSE31	50p
6.3A	FUSE16	60p	FUSE32	50p

## CERAMIC PLUG TOP

CURRENT RATING	ORDER CODE	PRICE
3A	FUSE33	100p
5A	FUSE34	100p
13A	FUSE35	100p

## 32 mm CERAMIC SLOW BLOW

CURRENT RATING	ORDER CODE	PRICE
8A	FUSE44	185p
10A	FUSE45	185p
15A	FUSE46	185p
20A	FUSE47	210p

NB. All fuses are made in the UK and fully meet BS4265 & BS1362 safety standards and should not be compared with cheap imported types

## 20mm CERAMIC TIME LAG

CURRENT RATING	ORDER CODE	PRICE
6.3A	FUSE38	100p
8A	FUSE39	100p
10A	FUSE40	100p
3.15A	FUSE41	85p
4A	FUSE42	85p
5A	FUSE43	85p

## 38mm CERAMIC TIME LAG

CURRENT RATING	ORDER CODE	PRICE
10A	FUSE48	825p

\*\* ALL THE ABOVE PRICES ARE FOR PACKS OF 10 FUSES \*\*

## VOLTAGE TESTER

A terminal screwdriver incorporating continuity & voltage with Euroslot  
**ORDER CODE: TOOL11** **PRICE: 220p**

## SPRING HOOK

Spring Hook, to unlock springs in audio tape recorders & VCRs  
**ORDER CODE: TOOL20** **PRICE: 265p**

## FAULT FINDING / COMPARISON BOOKS

Satellite Fault Finding Guide Issue 1.  
 Listing about 1,000 faults for over a range of 24 different brands.  
 Order Code: BOOK05.  
**Price £8.50 - No VAT.**

**TELEVISION Edition 6**  
 Lists more than 8,450 faults with 460 pages covering 58 different brands  
 Price: 1600p only - no VAT. Order Code: BOOK02

**SEMICONDUCTOR COMPARISONS 1997/8**  
 Listing more than 31,600 Semiconductors with suitable alternative complete with descriptions and base information.  
**Price: £15.50 - No VAT. Order Code: BOOK04**

**Video Recorders Edition 5 1997**  
 Over 300 pages packed with more than 5500 faults for different brands  
**Price £15.00 - No VAT. Order Code: BOOK01**

### Satellite Repair Manual Edition 4

A comprehensive guide to receiver reviewing, featuring stock faults and installation tips.  
**Price £15.00 Only No VAT Postage 100p**  
 Order Code: BOOK03

**SEMICONDUCTOR COMPARISONS 1997**  
 The new 1997 Jaeger Semiconductor with 952 pages packed with information on over 80,000 semiconductors in much greater detail plus marketing data on SMD devices and a separate generic table of all type designations.  
**Price: £40.00 only - No VAT (+ £5 Postage).**  
 Order Code: BOOK06

## SERVICE AIDS

DESCRIPTION	VOLUME	CODE	PRICE
VIDEO HEAD CLEANER	75ML	SP01	125p
SWITCH CLEANER	176ML	SP02	140p
SILICONE GREASE	200ML	SP03	170p
FREEZE IT	170ML	SP04	280p
FREEZE IT	400ML	SP16	570p
FOAM CLEANER	400ML	SP05	155p
ANTI-STATIC	150ML	SP06	155p
AERDKLEANE	135ML	SP07	185p
AERO DUSTER	150ML	SP08	290p
AERO DUSTER	400ML	SP17	550p
PLASTIC SEAL	200ML	SP09	230p
GLASS CLEANER	250ML	SP10	155p
COLDKLENE	250ML	SP13	225p
EXCEL POLISH 80	250ML	SP18	145p
ADHESIVE 120	400ML	SP19	190p
LABEL REMDVER 130	200ML	SP20	240p
REFURB 140	400ML	SP21	240p
TUBE SILICON GREASE	50 GRAMMES	SP11	200p
TUBE SILICON SEALANT WHITE	75ML	SP22	250p
TUBE SILICON SEALANT CLEAR	75ML	SP23	250p
TUBE HEAT SINK COMPOUND	25 GRAMMES	SP12	140p
DRIVE CLEANER	200ML	SP24	130p
SCREEN CLEANER	200ML	SP25	145p
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 2- 5 cans 500p for more than 5 cans**

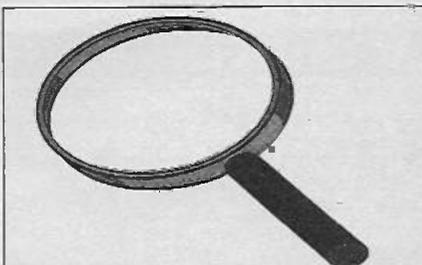
## SOLDERING ACCESSORIES

DESCRIPTION	CODE	PRICE
<b>ANTEX SOLDERING IRONS</b>		
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
<b>SOLDERING STAND &amp; SPONGES</b>		
SOLDERING STAND (MADE BY ANTEX)	S108	350p
SPARE SPONGE	S109	55p
<b>SOLDER</b>		
18 SWG 500 GRAMMES	S110	500p
20 SWG 500 GRAMMES	S111	650p
22 SWG 500 GRAMMES	S112	700p
<b>DESOLDERING AIDS</b>		
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

## I.C. PROTECTORS

ICPF10, ICPF15, ICPF20, ICPF25, ICPF38, ICPF50, ICPF75  
 ICPN5, ICPN10, ICPN15, ICPN20, ICPN25, ICPN 38, ICPN50, ICPN75

**PRICE: 30p EACH ONLY**



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# REPLACEMENT LINE OUTPUT TRANSFORMERS

Part No.	Code	Price	HITACHI	4515 01 19	LOT153 1500p	TLF 14520 F	LOT40 1500p	094-010200.7	LOT59 1400p	1-439-303-31	LOT54 1300p
AKAI			2424593	4515 01 24	LOT137 1600p	TLF 14521 F	LOT39 1850p	094-010210.6	LOT59 1400p	1-439-303-32	LOT94 1300p
45150344	LOT56	1850p	2432101	4515 01 46	LOT136 1600p	TLF 14567 F	LOT39 1850p	094-010270.0	LOT138 1825p	1-439-311-00	LOT55 1550p
101-214017-03	LOT278	1300p	2432461	4515 03 01	LOT169 1500p	TLF 14568 F	LOT40 1500p	094-010380.7	LOT245 1900p	1-439-311-11	LOT95 1550p
101-220005-03A	LOT72	1600p	2432611	4515 03 02	LOT180 1500p	TLF 14584 F	LOT41 2000p	094-010520.8	LOT188 1825p	1-439-311-13	LOT95 1550p
D 050/37	LOT27	1450p	2432851	4515 03 04	LOT169 1500p	TLF 14586 F	LOT42 1800p	094-010577.1	LOT188 1825p	1-439-311-31	LOT95 1550p
D 053/37	LOT207	1550p	2432761	4515 03 05	LOT180 1850p	TLF 15503 F	LOT256 2000p	610.018.6620	LOT189 1850p	1-439-311-32	LOT95 1550p
D 056/37	LOT56	1650p	2432981	4515 03 08	LOT168 1550p	TLF 70012 F	LOT78 1500p	610.018.6637	LOT215 1800p	1-439-331-22	LOT96 1550p
D 059/37	LOT200	1400p	2432982	4515 03 09	LOT178 1500p	TLF 70012A	LOT78 1500p	SHARP	LOT215 1800p	1-439-331-41	LOT98 1550p
D 069/37	LOT56	1550p	2433011	4515 03 10	LOT168 1550p	TLF 70018	LOT78 1500p	RTRNF 1220 CEZZ	LOT215 1800p	1-439-332-00	LOT99 1600p
FCM 2015 AL	LOT78	1500p	2433012	4515 03 13	LOT175 1500p	TLF 70018 F	LOT724 1550p	RTRNF 1783 BMZZ	LOT202 1800p	1-439-332-11	LOT9 1600p
FERGUSON			2433014	4515 03 14	LOT174 1400p	TLF 70161	LOT728 1300p	RTRNF 1786 BMZZ	LOT211 1850p	1-439-332-41	LOT100 1500p
00 D-3-508-001	LOT38	1250p	2433212	4515 03 15	LOT168 1500p	TLF 70162	LOT728 1300p	RTRNF 2002 CEZZ	LOT202 1800p	1-439-332-42	LOT100 1500p
00 D-3-508-002	LOT38	1250p	2433291	4515 03 18	LOT172 1350p	TLF 70162A	LOT728 1300p	RTRNF 2000 BMZZ	LOT214 1600p	1-439-332-52	LOT100 1500p
00 D-3-508-003	LOT276	1400p	2433301	4515 03 19	LOT246 1600p	TLF 70162B	LOT728 1300p	RTRNF 2002 CEZZ	LOT207 1450p	1-439-333-00	LOT270 1550p
00 D-3-515-001 PL1	LOT276	1400p	2433441	4515 03 20	LOT188 1900p	TLF 70162B	LOT728 1300p	RTRNF 2000 BMZZ	LOT214 1600p	1-439-333-11	LOT270 1550p
00 D-4-208-001	LOT79	1800p	2433442	4515 03 22	LOT191 1600p	TLF 70012 B	LOT274 1550p	RTRNF 2003 BMZZ	LOT308 1350p	1-439-333-12	LOT270 1550p
00 D-4-235-002	LOT79	1800p	2433451	4515 03 24	LOT181 1350p	PHILIPS		RTRNF 2004 BMZZ	LOT307 1450p	1-439-333-13	LOT270 1550p
00 D-4-235-002 HTI	LOT81	1350p	2433452	4515 03 25	LOT82 1250p	4822 140 10142	LOT142 1800p	RTRNF 2005 BMZZ	LOT308 1350p	1-439-333-14	LOT268 1400p
00 D-4-235-00201G	LOT81	1350p	2433453	4515 03 26	LOT82 1250p	4822 140 10145	LOT134 1450p	RTRNF 2006 BMZZ	LOT308 1350p	1-439-333-15	LOT268 1400p
00 D-4-280-004 HTI	LOT78	1250p	2433455	4515 03 28	LOT234 1600p	4822 140 10146	LOT112 1700p	RTRNF 2007 BMZZ	LOT307 1450p	1-439-337-21	LOT311 1450p
00 H-6-701-2400	LOT182	1450p	2433521	4515 03 29	LOT85 1600p	4822 140 10151	LOT102 1700p	RTRNF 2023 BMZZ	LOT310 1600p	1-439-416-11	LOT255 1600p
06 D-3-083-001	LOT82	1250p	2433581	4515 03 30	LOT123 1250p	4822 140 10161	LOT103 1250p	SONY		1-439-416-12	LOT255 1600p
06 D-3-083-002	LOT82	1250p	2433721	4515 03 31	LOT83 1400p	4822 140 10171	LOT104 1500p	3753100	LOT275 1500p	1-439-416-21	LOT255 1600p
06 D-3-084-001	LOT23	1400p	2433751	4515 03 34	LOT01 1300p	4822 140 10176	LOT114 1850p	1-439-243-00	LOT281 1600p	1-439-416-23	LOT255 1600p
06 D-3-087-001	LOT23	1400p	2433752	4515 03 35	LOT01 1300p	4822 140 10184	LOT105 1600p	1-439-243-11	LOT81 1600p	1-439-416-41	LOT255 1600p
06 D-3-089-001	LOT84	1450p	2433752	4515 03 38	LOT250 1350p	4822 140 10191	LOT104 1500p	1-439-243-12	LOT81 1600p	1-439-416-51	LOT255 1600p
06 D-3-093-001	LOT204	1600p	2433891	4515 03 40	LOT23 1400p	4822 140 10201	LOT104 1500p	1-439-243-21	LOT229 1700p	1-439-416-52	LOT271 1550p
06 D-3-095-001	LOT87	1000p	2433892	4515 03 41	LOT84 1450p	4822 140 10206	LOT118 1550p	1-439-243-31	LOT229 1700p	1-439-430-21	LOT271 1550p
06 D-333-512 001	LOT204	1600p	2433893	4515 03 43	LOT23 1300p	4822 140 10236	LOT111 1500p	1-439-243-41	LOT229 1700p	154125A	LOT275 1500p
FETX 100 90 DEG	LOT04	1500p	2434002	4515 03 44	LOT200 1400p	4822 140 10246	LOT105 1500p	1-439-244-01	LOT48 1600p	TOSHIBA	
FETX 90 WHITE	LOT06	1850p	2434141	4515 03 46	LOT33 1000p	4822 140 10254	LOT107 1450p	1-439-244-11	LOT48 1600p	37019	LOT131 1450p
FETX 100 100 DEG	LOT34	1500p	2434274	4515 03 51	LOT33 1000p	4822 140 10263	LOT117 1550p	1-439-244-21	LOT48 1600p	37019	LOT131 1450p
GRUNDIG			2434274	4515 03 51	LOT33 1000p	4822 140 10269	LOT210 1350p	1-439-244-31	LOT48 1600p	37019	LOT131 1450p
29201.008.01	LOT153	1750p	2434274	4515 03 75	LOT44 1050p	4822 140 10271	LOT208 1650p	1-439-256-01	LOT45 1650p	37019	LOT131 1450p
29201.014.01	LOT140	1800p	2434453	4516 16 01	LOT44 1050p	4822 140 10274	LOT123 1450p	1-439-256-11	LOT45 1650p	37019	LOT131 1450p
29201.015.01	LOT149	1400p	2434455		LOT234 1500p	4822 140 10282	LOT122 1300p	1-439-256-21	LOT45 1650p	37019	LOT131 1450p
29201.017.01	LOT60	1250p	2434583		LOT296 1400p	4822 140 10283	LOT104 1500p	1-439-256-22	LOT45 1650p	37019	LOT131 1450p
29201.018.01	LOT163	1300p	2435062		LOT296 1400p	4822 140 10294	LOT125 2150p	1-439-276-21	LOT230 1700p	37019	LOT131 1450p
29201.018.02	LOT81	1700p	2435121		LOT287 1000p	4822 140 10306	LOT110 1200p	1-439-280-00	LOT82 1600p	37019	LOT131 1450p
29201.019.01	LOT82	1250p	2435121		LOT251 1450p	4822 140 10325	LOT132 1500p	1-439-280-13	LOT82 1600p	37019	LOT131 1450p
29201.019.02	LOT82	1250p	2435141		LOT88 1450p	4822 140 10326	LOT122 1300p	1-439-280-14	LOT82 1600p	37019	LOT131 1450p
29201.022.01	LOT63	1700p	2435671		LOT89 1600p	4822 140 10328	LOT124 1450p	1-439-280-15	LOT82 1600p	37019	LOT131 1450p
29201.022.02	LOT186	1600p	2436201		LOT109 1200p	4822 140 10349	LOT106 1250p	1-439-280-16	LOT46 1300p	37019	LOT131 1450p
29201.022.03	LOT186	1600p	2436202		LOT109 1200p	4822 140 10353	LOT284 1450p	1-439-280-17	LOT46 1300p	37019	LOT131 1450p
29201.022.04	LOT186	1350p	2436202		LOT109 1200p	4822 140 10356	LOT284 1400p	1-439-280-18	LOT46 1300p	37019	LOT131 1450p
29201.022.04A	LOT186	1350p	2436202		LOT109 1200p	4822 140 10367	LOT286 1400p	1-439-280-19	LOT228 1750p	37019	LOT131 1450p
29201.024.01	LOT85	1500p	2436202		LOT109 1200p	4822 140 10369	LOT108 1200p	1-439-280-20	LOT228 1750p	37019	LOT131 1450p
29201.024.04	LOT164	1400p	2436202		LOT109 1200p	4822 140 10381	LOT128 1300p	1-439-280-21	LOT228 1750p	37019	LOT131 1450p
HINARI			2436202		LOT109 1200p	4822 140 10384	LOT127 1550p	1-439-280-22	LOT47 1400p	37019	LOT131 1450p
154 138 K	LOT24	1500p	2436202		LOT109 1200p	4822 140 10395	LOT116 1600p	1-439-280-23	LOT47 1400p	37019	LOT131 1450p
151 13914 1	LOT24	1500p	2436202		LOT109 1200p	4822 140 10406	LOT173 1150p	1-439-280-24	LOT47 1400p	37019	LOT131 1450p
51 14184 1	LOT24	1500p	2436202		LOT109 1200p	4822 140 10421	LOT109 1200p	1-439-280-25	LOT93 1450p	37019	LOT131 1450p
CF 44 A	LOT24	1500p	2436202		LOT109 1200p	4822 140 10421	LOT103 1250p	1-439-280-26	LOT93 1450p	37019	LOT131 1450p
HM51-1411834-1	LOT24	1500p	2436202		LOT109 1200p	4822 140 10421	LOT103 1250p	1-439-280-27	LOT93 1450p	37019	LOT131 1450p
			2436202		LOT109 1200p	4822 140 10421	LOT103 1250p	1-439-280-28	LOT93 1450p	37019	LOT131 1450p
			2436202		LOT109 1200p	4822 140 10421	LOT103 1250p	1-439-280-29	LOT93 1450p	37019	LOT131 1450p
			2436202		LOT109 1200p	4822 140 10421	LOT103 1250p	1-439-280-30	LOT93 1450p	37019	LOT131 1450p
			2436202		LOT109 1200p	4822 140 10421	LOT103 1250p	1-439-280-31	LOT93 1450p	37019	LOT131 1450p
			2436202		LOT109 1200p	4822 140 10421	LOT103 1250p	1-439-280-32	LOT93 1450p	37019	LOT131 1450p
			2436202		LOT109 1200p	4822 140 10421	LOT103 1250p	1-439-280-33	LOT93 1450p	37019	LOT131 1450p
			2436202		LOT109 1200p	4822 140 10421	LOT103 1250p	1-439-280-34	LOT93 1450p	37019	LOT131 1450p
			2436202		LOT109 1200p	4822 140 10421	LOT103 1250p	1-439-280-35	LOT93 1450p	37019	LOT131 1450p
			2436202		LOT109 1200p	4822 140 10421	LOT103 1250p	1-439-280-36	LOT93 1450p	37019	LOT131 1450p
			2436202		LOT109 1200p	4822 140 10421	LOT103 1250p	1-439-280-37	LOT93 1450p	37019	LOT131 1450p
			2436202		LOT109 1200p	4822 140 10421	LOT103 1250p	1-439-280-38	LOT93 1450p	37019	LOT131 1450p
			2436202		LOT109 1200p	4822 140 10421	LOT103 1250p	1-439-280-39	LOT93 1450p	37019	LOT131 1450p
			2436202		LOT109 1200p	4822 140 10421	LOT103 1250p	1-439-280-40	LOT93 1450p	37019	LOT131 1450p
			2436202		LOT109 1200p	4822 140 10421	LOT103 1250p	1-439-280-41	LOT93 1450p	37019	LOT131 1450p
			2436202		LOT109 1200p	4822 140 10421	LOT103 1250p	1-439-280-42	LOT93 1450p	37019	LOT131 1450p
			2436202		LOT109 1200p	4822 140 10421	LOT103 1250p	1-43			

**Wanted:** Service manual or circuit diagram for the Packard-Bell PB8539VG monitor. Frank James, 6 Pinewood Close, East Preston, Littlehampton, West Sussex BN16 1HF. 01903 775 929.

**Wanted:** Any information (manual, circuit etc., photocopies OK) for the Thomson TC01P videocamera and TVK01PG portable VCR, the Connexions CX2460R satellite receiver and the JVC DC7 portable stereo disc centre. A.J. Spayne, Apartado 167, Carcavelos 2775, Portugal. 00 351 1 4573341.

**Wanted:** SP8629 100:1 frequency divider chip. Don Jannece, 54 Wyatts Green Lane, Brentwood, Essex CM15 0PX. 01277 822 380.

**Wanted:** Carry handle, mains unit and lid or case to complete Uher 4000 Report L restoration. Scrap unit may do. Jim Holloway, 10 Garnett House, St. George's Road, Brighton, Sussex BN2 1EU.

**Wanted:** Circuit diagram (photocopy OK) for the Seleco Model 21SM427. R. Flitcroft, 69 Cartmel Court, Blackley, Manchester M9 7HT.

**Wanted:** TDA2571AQ chip for a portable Philips TV set. Douglas Terry, Quinta da Avenida, Algarve, Portugal. Phone/fax 00 351 82 688111.

**Wanted:** LOPT for the Mitsubishi Model CT3701TX. Part no. 334B 083010. Leslie Hine, 9 Well Street, Ulverston, Cumbria LA12 7EG. 01229 582 557.

**For disposal:** Sony KX27PS1 complete with text unit, audio/video unit and cables. CRT in mint condition. Requires LOPT. N. Barras, 11 Oban Avenue, Hawdon, Tyne and Wear OPU28. 0191 295 5964.

**Wanted:** Manual or circuit diagram (photocopies OK) for the Farnell/Scopex 12-4D scope. F. Swainbury, 9 Britons Lane, Beeston Regis, Sheringham, Norfolk NR26 8SJ. 01263 822 709.

**Wanted:** LOPT for the Zanussi/Seleco Model 20ZA374GB. Part no. D523/37. Alex Gregory, 13 Combe Avenue, Portishead BS20 9JR. 01275 847 274.

**Wanted:** Copy of the reference disc for an IBM PS/2 Model 30 in order to alter the BIOS settings. Steve Peters, 40 Beaconsfield Road, Balsall Heath, Birmingham B12 9PH. 0121 440 6434.

**Wanted:** Scan coils for the Philips Model 15CE1518/05 (CP90 chassis). CRT is type A36EAM01X16. L.E. Swain, 53 Park Road, Buckden, Huntingdon PE18 9SL. 01480 811 058.

**Wanted:** Leader LCT910A CRT

tester/rejuvenator complete; Hameg HM205 or HM605 scope; Philips PM5509 pattern generator. Would consider other makes/models. Pat Foran, Knockeen, Castleisland, County Kerry, Ireland. 00 353 066 41601.

**Wanted:** Circuit diagrams or any technical/service information for Amiga computers, especially Models A500 and A1200. J. Clarke, Carrownafe, Merville, Co. Donegal, Ireland.

**Wanted:** Any information on the LAVT10000 TeleVideo tuner, made by Kingsbrook Marketing Co. Ltd. David Hawkins, 5 Talbot Lodge, West End Lane, Esher, Surrey KT10 8NE. 01372 467 264.

**Wanted:** Information on source of spares for a Best TV set. Peter Higham, 60 New Brighton Road, Sychdyn, Mold, Flintshire CH7 6ER. 01352 753 087.

**Wanted:** Instruction book for the SageM satellite receiver/decoder Model ASR1700. S. Orbell, 39 St. Andrew's Road, Gorleston-on-Sea, Gt. Yarmouth, Norfolk NR31 6LT.

**For disposal:** Free to good home, Top Ward 7000 series service manual. Phone Graeme on 0191 284 6471.

**Wanted:** Colour tube data book/equivalents guide (good photocopy OK). James Thomson, 41 Aitken Street, Glasgow G31 3ND. 0141 554 3018.

**Wanted:** IC type 2278CP. It's an 18-pin DIL device and in this particular application is used to switch twelve LEDs on in succession with an increase in signal input and vice versa when the input signal falls. There are no prefix letters and there's no manufacturer's name. Mr Cocks, Sound Service, 86 St. John's Road, Hedgc End, Southampton SO30 4DF. 01489 782 885.

**For sale:** Barco 600 series video projector spares - PCBs, lenses, motherboards etc. - all from stripped out units. Also some Sony projector stuff, service manuals etc. Trevor Wiltshire, Tora Technology, Pelican Road, Pamber Heath, Hants RG26 3EL. 01189 701 163.

**Wanted:** LOPT for the ITT Model 752/T/30/3. K. Simmons, 5 Orchard Close, Littleport, Ely, Cambs CB6 1NV.

**Wanted:** Circuit diagrams for the Advancc SG62 signal generator. Ferguson 1690 chassis (Model 3848), Bush Model TV350, Matsui Model TV1410, EMI M101 scope (LD924E tube) and National WV5310EB monitor. D.A. Griggs, 5 Collingwood Avenue, Muswell Hill. London N10 3EH. 0181 883 3474.

**Wanted:** Teletext panel for the Sony

Model KVM1401 (BE2A chassis), part no. A-1645-017-A (PCB marked 1-639-795-12). Also require Ferguson TX89 chassis main PCB (Model 36K2 or 14M2). Both items working if possible. Alan Dobey, 4 Cypress Avenue, Hillhead of Denmore, Bridge of Don, Aberdeen AB23 8LA. 01224 823 995.

**For disposal:** Two Amstrad PCW9512 word processors, both working, one with 3.5in. floppy disc drive conversion; one Amstrad PCW8512, not working but with spare CPU board; 9512 and 8512 diagnostic panels plus start-up discs for above. Offered in return for a generous donation to a charity for horses. K. Plummer, KC-TV, 10 High Street, Hampton Hill, Middx TW12 1PD. 0181 997 4802.

**Wanted:** Service data, LOPT, line and EHT valves for the Bush type 53 405-line TV receiver; service information, front user controls and rear cover for the 14in. Alba 405-line set circa 1954. Also any 405-line TV sets, particularly console models. Philip Gay, 80A Milton Brow, Weston-Super-Mare, Somerset BS22 8DE.

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**CONTACT US FOR TYPES NOT SHOWN. NB:** Please supply all markings from the original flyback, as some monitors utilise more than one type number.

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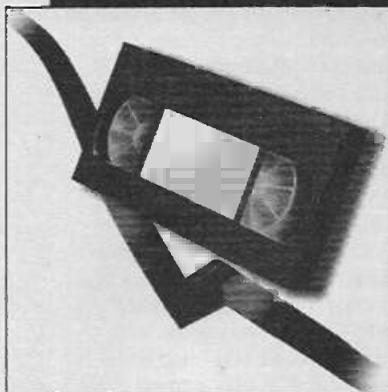
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Large range of Manufacturers Service & User Information available. Original manuals supplied if possible. We only show a few examples here.

AIWA NSX-800	£9.56	AMSTRAD PC4386K	£16.29	AMSTRAD PCS286	£18.31
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**Stephen Leatherbarrow**  
and **Pete Gurney, LCGI**

#### **Philips VR813 etc**

No display with all the functions working has been the fault with several of these machines I've had in recently. In each case the cause has been failure of the 315mA fuse that feeds the fluorescent display. No other fault has been found and a replacement Wickman fuse puts things right. A.J.R.

#### **Sharp VCR8300**

This very old machine was still in excellent condition. It would switch on but did nothing else. The drum drive belt had perished, and the loading arms were halfway up. I replaced the belt, but when I tried to wind the arms down manually I found that the loading motor had seized solid. It's not in the most accessible of places, but by careful manoeuvring I managed to extract the loading motor assembly. A search in my junk box produced an almost identical motor from an old lift assembly. It fitted perfectly, and when the assembly was replaced the machine came to life and worked surprisingly well. A.J.R.

#### **Goodmans TX3950**

The customer had tried to retune the modulator to avoid Channel 5 interference. I don't know what he had used, but the modulator was in a very sorry state. I removed it and sent it to MCES who, as usual, did a superb job and returned it within a couple of days.

After refitting the modulator I found that everything worked

# VCR Clinic

except wind and rewind. In these modes the brakes were not being released. The brake lever is driven by the master cam, and was clearly operating incorrectly. When I removed the loading motor block to gain access to the cam, then the cam itself, I expected to find that one of the grooves was damaged. Instead I found that the lever itself was bent down slightly – enough for it to slip out of the guide groove. A slight upwards bend was enough, and when the cam had been refitted everything worked correctly. Adjusting the modulator to provide an output on ch. 40 (Channel 5 is on ch. 37 here in London) completed the repair. A.J.R.

#### **Philips VR2547**

I had to be careful with this one as it belonged to the dentist! The main problem was damage to the top edge of the tape – this was obviously the cause of sound drop-out. A new pinch roller cured that. He had also complained about an intermittent knocking noise. The machine now seemed to be faultless, but I left it running with a four-hour tape. After some time I was aware of a regular knock, which came from the area of the capstan. Once the noise started it got much louder very quickly. I removed and examined the capstan motor, and found that when the rotor was turned by hand it felt a little stiff at one point. A new motor cured this second fault. A.J.R.

#### **Panasonic NVJ35**

The owner of this machine, which was in excellent condition generally, used it only for dubbing from S-VHS masters. After a while a squeak had developed and the copies had begun to exhibit signs of

capstan servo problems. No, it was not the capstan bearings, though I tried relubricating them. The capstan flywheel 'soft brake' pad had become a very hard brake pad! R.B.

#### **Saisho VR1000**

The owner's complaint was that this machine wouldn't load a cassette. For once this was 100 per cent correct. All functions worked correctly when a cassette was loaded manually. The supply to the carriage motor was missing because of dry-joints at connector CD1009 on the carriage PCB.

This machine was also sold as the Matsui VX800 and the Hinari VXL3. R.B.

#### **JVC HR7700/Ferguson 3V23**

Failure of the tape to lace up was, as usual, the result of transistor X7 (2SA1020) being open-circuit. This was something of a red herring however. When it was replaced the loading arms moved but reached only half way then stopped. The drum was rotating but nothing else happened. I unlaced the tape by manual operation of the microswitches and then found that the 'tape-guard' circuit was coming into operation because the drum pick-up head was open-circuit. A replacement was obtained from a scrap Ferguson machine. R.B.

#### **Ferguson 3V31**

This machine had been 'looked at' by its owner before he brought it to me. He'd covered his tracks so neatly however that this was not immediately obvious. The original fault had been a failed cassette lamp. When the owner had removed and refitted the right-hand panel (tuning and microcontroller) the 2SC1983 transistor Q204 had

become entangled with a wiring loom. As a result it had twisted and one leg had broken. The machine appeared to be dead, but actually there were no switched supplies. R.B.

### Ferguson FV31R

No results and no display were the symptoms with one of these machines. We found that there was no 5V supply because the TIP120 transistor TP73 was open-circuit. J.C.

### Panasonic NVHD200

Intermittent tape loading was the complaint with one of these machines. The cause of the fault can be tracked down by noting the diagnostic code display. F03 and F04 mean incorrect mode operation or incorrect phase alignment respectively. If the display is F06, check the loading motor. J.C.

### JVC HRD660EK

We sometimes get these machines in because of no results/no display. Q1 going short-circuit or the optocoupler and IC1 being faulty are common causes. Check whether R2 or R3 (both 330k $\Omega$ ) is open-circuit. The other thing to check is the 2SC3616 transistor Q2, which may be open-circuit or even blown apart, with the 0.33 $\Omega$  resistor R9 open-circuit. J.C.

### Panasonic NVSD40

Intermittent loss of one channel/tuning drift are problems you sometimes get with these machines. In this event the items to check are the tuner unit and/or the AFC chip IC7653. J.C.

### Matsui VP9601

There was good E-E but when this machine was put into the playback mode the E-E picture remained, with the playback sound coming through clearly. Nearly all the relevant circuitry is in the tuner module (MRF7 UB32), and fortunately I had a spare one available from an old panel. Fitting this cured the problem, but I then had weak E-E. A new tuner module restored correct operation. T.L.

### Toshiba V705

This centre-deck machine came in because of a tape chewing problem. When I tried it there was no reel rotation. I stripped the machine down and found that the reel belt was off the capstan because the pulley had broken. Unfortunately the pulley is not listed separately.

so the capstan motor assembly (part no. 70125660) had to be replaced. Luckily the machine was still under guarantee. T.L.

### Matsui VP9501OP

Slow rewind and mechanical noises were the complaints with this machine. Sure enough it didn't want to go into fast rewind. When I dismantled the deck I found that the spool assembly had sprung apart, with no sign of the circlip. A rebuild was possible, so I obtained a replacement circlip. This cured the fault. Apparently clutch gear assembly problems are quite common with these machines. T.L.

### Philips 14TVCR240

This combination TV and VCR was brought into the workshop with the complaint that the video section would jam inside intermittently. I stripped the machine down and powered it – fortunately these machines can be run while out of the cabinet. I found that the slightest pressure on the cassette when it was being ejected was enough to jam it. The eject mechanism depends on a long pulley shaft which looks as if it is not up to the job. When I examined it this one certainly wasn't – I could see a split in the plastic gear. This made it slip on the plastic shaft. After replacing this item and the cam gear the machine behaved itself. T.L.

### Ferguson FV11

Intermittent signals when hot was the complaint with this nice old machine. I've seen a lot of them over the years, but have never had this fault before. Voltage checks showed that the supply to the 5V regulator IC1 on the tuner/IF panel would fall from the correct 8.5V to 4.3V. The cause was R2, which when heated rose in value to around 430 $\Omega$ . It's a 10 $\Omega$  thermistor. S.L.

### Toshiba V204B

This machine was very dead. As there were no blown fuses, and no short-circuits could be detected, I decided to check the electrolytics on the primary side of the power supply. CP008 (100 $\mu$ F, 25V) and CP007 (10 $\mu$ F, 50V) had both gone low in value. S.L.

### JVC HRJ225

The cassette carriage was loaded and any attempt to power the machine resulted in shutdown after just one second. The supplies were all fine except for the switched

+5V line, which measured 1.2V during the machine's very brief period of operation. This supply is derived from Q851 and Q852.

Checks showed that the print between the base of Q851 and the collector of Q852 was open-circuit. The print run is only about 1cm long, but is straddled by R860 (470 $\Omega$ ) about half way along its length. As no crack or other fault could be seen, I assumed that this was another case of corrosive glue. R860 is a surface-mounted component. S.L.

### Matsui VX3000/Saisho VR3400

Intermittent tape chewing was the complaint with this machine. I eventually saw the machine fail to unload the tape then eject. The mode switch was faulty. A new belt kit (always necessary) and pinch roller completed the repair. S.L.

### Ferguson FV71

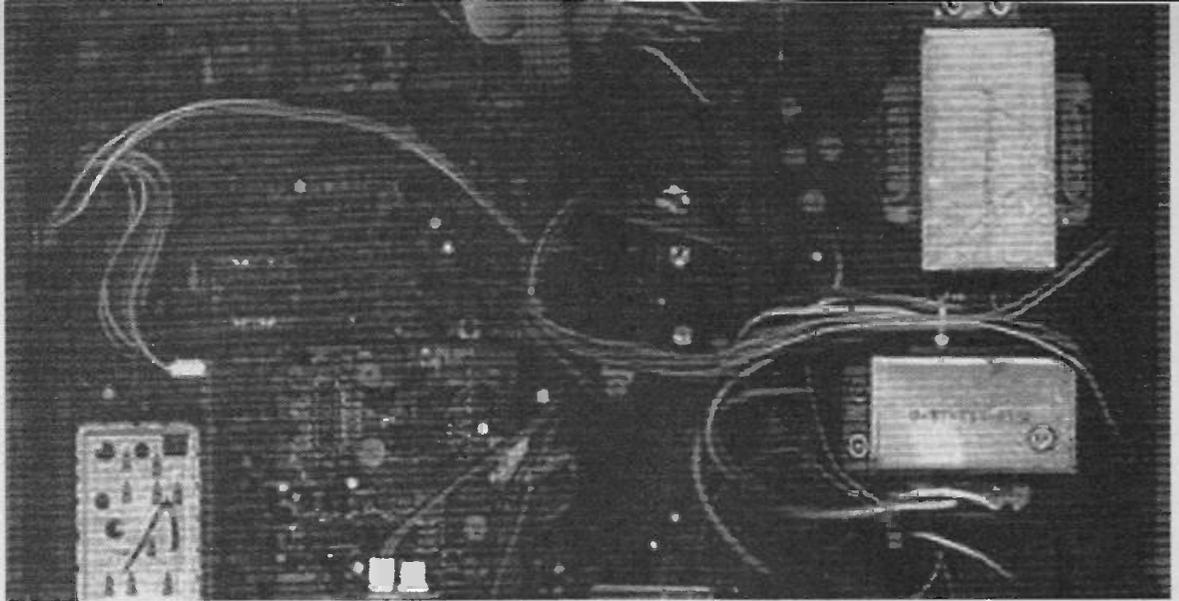
The note that came with this VCR said that it had gone dead overnight. Although it appeared to be dead it had not suffered the usual chopper power supply failure. In fact if you listened to the power supply carefully you could hear that it was tripping very quietly. I've found that the usual culprits for this are CP07 (10 $\mu$ F) and CP08 (100 $\mu$ F). Both were replaced, using components rated at 105 $^{\circ}$ C, but the fault remained.

Substitution checks on the secondary side of the supply then revealed that the culprit was CP71, which was leaky. It's mounted on the print side of the PCB, not in the position marked on the board, and is between the 13V and 33V rails instead of between the 33V supply and chassis, as marked – the circuit diagram is correct however.

Note that this power supply will run correctly only when it is connected to the main chassis. Resistive loads for test purposes will not give any meaningful results. P.G.

### Toshiba V109B

This machine worked all right until the mechanism carried out any function or a tape was loaded. The E-E picture then became unstable, and hum bars appeared with some functions. It was obvious that the fault was in the power supply and was load dependent. The culprit was eventually found to be the STK7253 regulator chip, which was unable to supply sufficient current from its switched 9V output. P.G.



# Satellite Notebook

Reports from  
Hugh Cocks  
Chris Watton  
and  
Michael Maurice

## Pace 559200

This receiver produced nasty-looking pictures on non-scrambled channels and could barely decode the VideoCrypt ones. I suspected trouble with the baseband video coming out of the tuner or in the area just after it. C115, C116 and C120 (all 10 $\mu$ F, 16V) around the UA733 video amplifier chip U21 were all slightly brown after clocking up a few years' service near the tuner. Replacing them brought back good pictures.

The power supply problems we have with these receivers here in Portugal are always the pink mains transformer going short-circuit in the summer and the BUT11A chopper transistor doing the same thing in the winter!

Whilst on the subject of these receivers, we had a customer in recently with an SS9000IRD. He had replaced his TV set, investing in a new large-screen model. The problem was that it produced a noticeable flicker with satellite pictures. We overcame the problem by increasing the value of the surface-mounted capacitor C27, by Q23 in the video clamp circuit, from 180pF to 270pF. Don't increase the value much more than this as the picture can then start to jitter. H.C.

## Pace MSS100

The complaint with this receiver was that it would try to decode VideoCrypt programmes only very intermittently. The non-coded channels were OK. When the card was removed from the decoder there was no on-screen message, and trying the receiver on QVC and Channel 5, both of which use VideoCrypt but don't require a

card, produced no semblance of a picture. At least the card was cleared of suspicion – in the past, fruitless chasing after the cause of decoding faults has often ended up with the card being the culprit.

The signal from the dish was fine. There were strong signals on the non-coded channels, though the pictures looked a little dull. There was, unfortunately, no improvement when the receiver's AFC was switched off and a channel was manually tuned through.

I then headed into the 'secret menu' by pressing Function, Menu, Radio and Store in quick succession (the Prima model is identical). This displays the video level and audio PLL settings as options 1 and 2 respectively – later versions of the MSS100, with a different microcontroller chip, have a third menu option for auto-tuning the audio PLL demodulator. The contrast level should be set at around 47 for Astra, though it may be best to use a slightly lower setting if Eutelsat reception is also required – some of the 'brighter' Eutelsat channels can suffer from video crushing. Try between 40 and 44.

With this particular receiver the contrast level had been set at 33. Normal results were obtained when the setting had been returned to 47. The receiver was in a holiday villa and the main menu had been locked, requiring access via a PIN number. Unfortunately this can't be done with the secret menu. To prevent a recurrence, the function button was rendered inoperative by sticking some tape over its PCB contacts. It seems that one can't be too careful with receivers used in holiday villas! H.C.

## Channel 5 Confusion!

Keith has an oldish receiver that can't tune in the Astra 1D band. He told me that he had ordered "the box" to produce pictures and would give me a ring if he had any trouble connecting it up. I concluded that an Astra 1D converter had been ordered and didn't give it much more thought.

A few days later the phone rang. Keith was rather confused about connecting up his "box". I told him to bring it in, together with his receiver, and Channel 5 would soon appear. Unfortunately what Keith brought in was one of those ch. 37 UHF notch filters Channel 5 supplies in case of interference with other existing equipment.

He hasn't phoned yet for help with "the bigger" black box that should have arrived by now! H.C.

## Patterning Problem

There was fine patterning on the pictures produced by a Pace MSS100 receiver. It was present with either a UHF or a scart output. When the top was removed the patterning disappeared, and no amount of PCB prodding would bring it back. As soon as the lid was replaced, the patterning returned.

The cause of the trouble was bad contact between the spring that's soldered to the top of the tuner to make contact with the metal screening inside the plastic lid. It appears that an 'expert' had taken the top off and had bent the spring away from the lid to help with its replacement – the spring puts a lot of upward pressure on the lid.

The spring provides the only contact between the metal screen and the main chassis earth. If the

screen is allowed to 'float' and is in close proximity to the receiver, it seems that the metal will re-radiate signals – possibly something picked up from the power supply – into the video processing circuitry. **H.C.**

### Sticky Feet

Quite often, especially in the summer months, I come across Pace receivers that have very sticky rubber feet. This is more often than not because the receiver lives on top of a warm VCR. Sometimes the feet have almost 'melted', leaving a mess on top of the VCR or TV set when the receiver is removed for service.

To avoid making marks on the customer's carpet etc., I stick a small piece of Sellotape over each rubber foot if the feet seem at all sticky. It might be advisable to stick a very small piece of tape on the feet of all older models to avoid possible future sticky messes! **H.C.**

### Pace MRD920/Maspro SRE450S MAC-D2 receiver-decoder

These receivers are a few years old now but many continue to provide good MAC reception, mainly for BBC Prime. An external decoder is often used for the Astra VideoCrypt channels.

There can be a problem when you try to connect two dishes to the receiver, which has two inputs, as both LNBs will be powered. Changeover is done by IF switching via pin diodes inside the Sharp tuner.

The receiver naturally runs much hotter when it has to power two LNBs at once. This can result

in a 'whistling' noise on MAC audio and a gradually decreasing volume level.

We have several customers who receive BBC Prime, which has moved to Intelsat 707 at 1°W from Intelsat 601 at 27.5°W. The problem came to light when an old motorised dish was fixed for BBC Prime and a second, small dish was added for Astra.

Where possible power for one of the LNBs should be separate from the receiver, which will then run cooler with no more MAC audio whistling and fading. For good measure, add heatsinks to the MAC chips. They run very warm, and are all on a subpanel that's of identical size to the SS9000/9200 series VideoCrypt board.

We're fortunate with the BBC, as only one polarisation is required with this satellite. In this case LNB powering was easy, as the customer had a very old satellite receiver which was pressed into service, also an IF splitter with a DC pass on only one side.

BBC Prime has started a digital subscription service via Eutelsat at 13°E, though we've not come across anyone who is trying to receive it. Most customers are sticking to their old MAC decoders for the moment, with replacement viewing cards obtained from Norwegian Telecom. This may sound strange, but a Swedish company provided subscription management for the previous MAC service! **H.C.**

### Amstrad SRD500

This receiver worked all right with a scart connection but there was no video output from the UHF socket.

The cause was traced to the modulator's video input coupling capacitor C346 (10µF) which was open-circuit. **C.W.**

### Russian TV Reception

The system consisted of an Amstrad SRD350 satellite receiver which was connected to a SECAM-PAL transcoder via its decoder scart socket. It had been installed to enable the user to view Russian TV. Three TV sets were connected to an aerial splitter system, a JVC AV28F1EK which seemed to work normally, a Toshiba portable that had no colour and a Philips 2A chassis receiver that produced no sound.

I started by connecting the Amstrad receiver's output to a Philips portable, and got no colour or sound. Then I noticed that the Amstrad receiver had a two-pin mains plug: it was a Continental model. So I disconnected the transcoder and retuned the RF converter for 6MHz sound. Then I reconnected the transcoder and found that there was an enormous drop in the sound level and still no colour. The colour fault was cured by slight adjustment of the subcarrier oscillator. The sound fault was caused by the fact that when the transcoder was connected to the scart socket the audio as well as the video was looped through. Well, not quite – the audio pins of the scart socket weren't connected at all! Crosstalk in the scart lead produced what little sound there was. Correct sound was obtained by linking the transcoder scart socket's audio input and output pins. The customer had been putting up with all this for a couple of years. **M.M.**

### Prime-focus Dishes

We are often asked to supply and fit an H/V switching LNB to an old prime-focus dish when a new receiver is installed. It can be difficult to obtain an H/V switching LNB with a C120 flange, and fitting a standard offset-dish LNB in the middle of a prime-focus dish isn't very good, as its feed will see only about half the dish diameter. If it's an enormous old dish which is wanted for only Astra or Eutelsat reception the pictures may be acceptable, but this approach is not to be recommended.

A relatively easy solution is to attach a C120 flange to the LNB feed. Old magnetic polarisers are a good source of these flanges. Saw the offset feed at the front of the new LNB off, then glue the C120 flange on with

Araldite. With care the LNB and the old polariser tube C120 flange assembly can be mated with minimum tube diameter change between one and the other – this is important, as microwaves don't like discontinuity in tube diameters (it attenuates them). When cutting the horn from the front of the LNB, put some paper into its end to prevent metal pieces getting into the LNB works!

With a touch of black spray paint the whole assembly looks very professional. The LNB can then be bolted on to the existing prime-focus dish scalar feedhorn. Needless to say, if you don't feel confident about doing this, don't! For one thing it will void any warranty claims.

A much easier approach is to remove the offset feed plastic cover

and insert a piece of 22mm aluminium tube that runs the length of the offset feed. The microwave signals from the dish will then enter the tube and be transferred directly to the LNB input at the rear of the now-redundant offset feed. Secure the tube by replacing the front plastic cover – make sure that it's fixed in place securely. Pack polystyrene between the outside of the 22mm tube and the inner wall of the original offset feed.

No scalar feed rings can be used with this method. As a result there will be slightly less signal than with a conventional feed. But the results are very acceptable.

If you try the modified LNB with an offset dish the results will be very poor, because the tube can't 'see' the dish properly. **H.C.**

# Servicing

## Panasonic NVL20/25/28 series VCRs

These well-made machines are relatively easy to service, having an established fault pattern. Brian Storm provides a quick-check guide to servicing

**T**hese middle-aged Panasonic VCRs incorporate the G mechanism, super-still video heads, bar-code scanning for clock and timer and have a barcode scanner integrated in the remote control unit. They have a modern-looking rounded design with hidden control panels.

### The Power Supply

The most obvious place for faults to develop is in the ageing chopper power supply. Fig. 1 shows the circuit. To ensure reliable power supply start-up, C1109 should be replaced as a matter of course whenever one of these machines is brought into the workshop. To protect the semiconductor devices from damage, it's a good idea to replace the small electrolytic capacitor C1114; also to remake any ageing solder connections, especially at power components.

The electrolytic capacitors on the secondary side of the chopper transformer (T1101) should be checked with an oscilloscope. A quick check on the ripple level on all the supplies will prevent unnecessary investigation in the video and servo circuits when obscure faults are present.

Here are some common power supply faults.

**Power supply dead:** C1109 (1 $\mu$ F, 400V) is probably open-circuit. Alternatively D1118 (MA180) could be leaky.

**Power supply dead with D1113 (20V zener diode) short-circuit:** Check whether C1114 (47 $\mu$ F, 16V) has fallen in value.

**Servo problems:** Check whether C1122 (330 $\mu$ F, 10V) is open-circuit.

### The Mechanism

The deck has been well documented in previous arti-

cles. Here are some faults that are particularly common with these models.

**Intermittent damage to cam gears and arm P:** The capstan rotor clutch torque is too high. Part no. for the complete rotor is VXP1113.

**Alignment between the cassette housing and the bottom mechanism keeps being lost:** The right-hand cassette housing is broken or worn. Part no. is VXA4078.

**Intermittent picture rolling or poor tracking:** Cause is the back-tension arm sticking off. Clean and regrease it.

**Intermittent drum 'twitching':** The impedance roller is sticking.

**Intermittent solenoid operation:** Tighten plug P1504.

**Noisy rewind or fast forward:** Belt tension roller is worn. Part no. is VXA3516.

### System Control

The system control circuitry is generally very reliable. It uses two microcontroller chips, IC7501 and IC2001, that rarely give any trouble.

Cutting out can be caused by a build-up of dirt and fluff on the reflective surface beneath the take-up spool, where the reel pulses are generated.

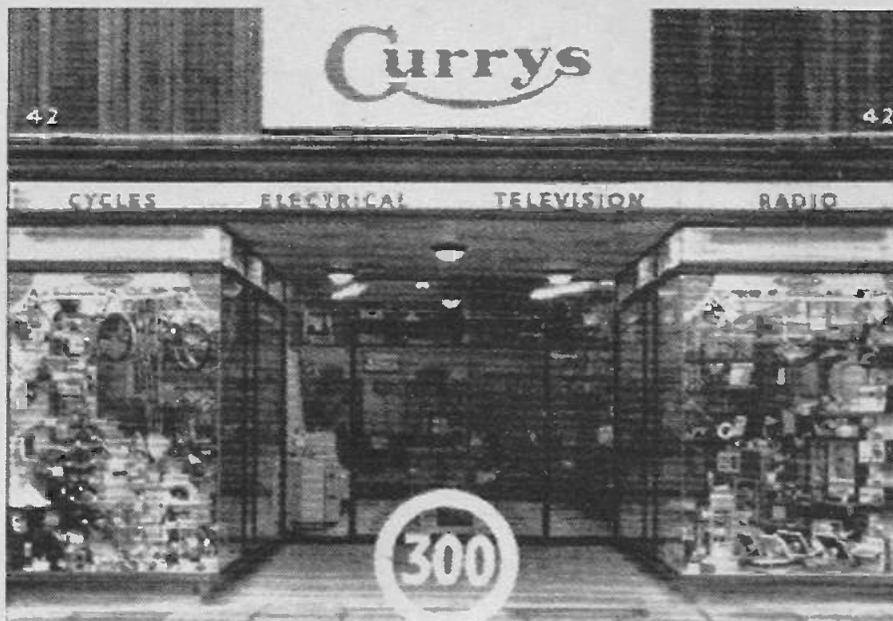
It's not uncommon for problems to occur with the connectors between the main PCB and the timer PCB. An intermittent fluorescent display is probably the most common fault of this type.

Here are some other fairly common faults.

**Operation intermittently 'freezes':** Check for dry-joints at X6101.



Currys' 300th branch, opened in December 1958.



Derek Townsend recalls his workshop experiences over the years since he entered the trade in the late Fifties

## Trade Memoirs

I entered the radio and TV trade, as it was then known, in the late Fifties. In those days you would sign up for a five-year apprenticeship and would go to the local technical college for at least one day a week. I still remember one teacher who referred to a valve's anode as its 'plate'! He taught us radio (or was it wireless?) and TV repair, and told us to take it in two stages. To some extent this is still relevant today.

First was the observation test cold, i.e. look around for visual evidence of faults before powering up. Secondly was the observation test warm, i.e. plug in and check power supplies etc. We used to call this stage "plug in and tune for maximum smoke"! It's a shame that with all the safety devices these days you seldom get this effect.

I'll never forget his face one day when we all connected our oscilloscopes to the test TVs we had on our benches to create little green test cards on the screens. We had connected field and line sync pulses to the scopes' X and Y inputs and the video signal to the Z input at the rear.

This was way before colour TV came to the UK. We were given a couple of brief afternoon lessons on the US NTSC system however, the only colour system at the time. It all seems a lifetime ago. But we learnt something – eventually!

### Workshop Life

One of my earliest recollections of workshop life was of replacing DK91/96 valves in Vidor and Ever Ready portable radio receivers. The valve heaters were powered by a 1.5V battery. When its output fell below 1.1V the local oscillator would cut out. If it did so before the voltage fell it meant a new valve.

Then the transistor radio appeared. There were these soldered-in three-legged devices and no valves. How on earth did they work? About the same time the printed circuit came along. How were we going to cope with all this new technology? No more low-emission DK91/96s and no HT batteries, just low voltages everywhere.

Who remembers the Perdio Piccadilly pocket radio which came in a gold cardboard box? It was really fun to work with, especially if you laid it down on top of its box

to start on it, not realising that the box's gold covering would short out the PCB.

Another tedious apprentice job – after you'd washed and polished the workshop floor, fetched twenty Players for the workshop manager and made the tea – was fitting new elements to Morphy Richards CA75 irons, not forgetting to make sure that the thermostat was set to cut out at 180°C on the wool setting (I think!). Who now remembers the smell and smoke that would emanate from the new element? On this subject, hands up all those of us who remember the smell that a worn-out selenium rectifier produced. The only good thing about these rectifiers was the washers we made from the cooling fins. Do you remember the number of BY100 silicon rectifiers you fitted to replace these smelly devices?

### Was it Easier?

Was servicing easier in those far-off times? Some things were straightforward. Mains droppers, rectifiers and valve heaters would go open-circuit. With the valves it was like Christmas-tree lights – always the last one you came to that was the culprit. But it was not all that simple. The PCC84 and PCF80 valves in tuner units were troublesome, and you had to remember to smear the contacts in Cyldon tuners with Vaseline. Then there was IF instability. This was caused by an open-circuit or leaky capacitor, but just try to find the right one.

Thoughts about capacitors bring back memories of the waxed paper type. These would always become leaky at some stage. After you'd removed them from the equipment on the bench, the procedure was to use a soldering iron to melt the wax into the lid of a tin. You could then use it to stick screws on the end of your screwdriver. In those days there didn't seem to be any cross-cut screws in our industry – maybe they were not invented until later.

Another problem was the EHT rectifier valve, which was soldered to the top of the line output transformer. If you applied too much heat to the terminals they would disappear into the transformer's plastic covering. This plastic was a weird substance that would eventually break down under the stress of the high voltages present, creat-

ing beautiful corona discharges. Some early Baird sets (no, not the ones with the big scanning wheel – I'm not that old!) had a truly lethal EHT supply. It used a winding on the mains transformer to step up the voltage. Just try shorting that out with your screwdriver! Only the service manager was allowed to take the back off these sets.

### Tube Replacement

There is one job I shall never forget from my apprentice days – replacing the CRT in an old BBC-only Ekco TV set. The tube was mounted in a metal cradle, and the mask and implosion guard were fastened at the front. The whole thing was held in by four bolts, similar to today's sets. Sounds easy, doesn't it?

As we know, all TV sets collect dust over the years. The mask around the viewing area in these old sets was made of a weird rubber-cum-plastic substance which became very dirty if not properly sealed. The glass implosion guard was held on to the front of the mask by PVC tape, and a rubber seal was placed between the rear of the mask and the front of the tube. The mask was a whitish colour and was easy to blemish with fingerprints. When you pushed the rubber seal to the back of the mask, there was always the right amount of dust left to drop down between the glass and the mask. The service manager would tell us that tube replacement should take about half an hour. With me it took about four hours! The only way to remove fingerprints from the mask was to dismantle the whole thing and wash the mask in soapy water.

### Modernistic Murphys

I recall the futuristic-looking Murphy V310/410 series sets which had a lift-up control panel lid at the top of the cabinet. This lid was connected to the on/off switch, so that the set came on when the lid was lifted. These sets came with only two sets of coils in the tuner unit, so new coils had to be ordered and fitted if the set was to be used in a different area. To tune the coils you had to use a long knitting needle with its end filed down to form a screwdriver. This was pushed through a hole in the control panel, down a plastic sleeve: if you were lucky enough, you could just about manage to get the screwdriver end to reach the core of the coil inside the tuner. If the core was tight, the needle would snap in the sleeve. A long time was then wasted trying to retrieve it. How many mothers couldn't understand why their knitting needles kept on disappearing?!

### Before the Aerosol

Before the advent of the aerosol switch cleaner all we had was Servisol shake and spill cans. Hard luck if you dropped as much as a spot on a plastic component. We would use this terrible liquid to deal with spiders (don't tell the RSPCA). It was hopeless with something like a noisy volume control, especially if this had a plastic spindle – what a mess! We kept rows of replacement volume controls on the spares shelves, next to the rows of valves. They had different resistance values and some incorporated a switch, either double- or single-pole. What a lot to confuse the young apprentice!

The worst thing you could do with this 'liquid' was to pour it over the multiple-gang wafer switches used in all the better radio receivers of the time. Sometimes you could get away with it, but me – never! The problem was that the HT voltage, about 200V, would track around the Paxolin wafers and make permanent circuits where they weren't supposed to be. The penance for doing this terrible deed was to replace the whole switch bank. This was a complete afternoon's nightmare. We're talking about the days before the PCB: so the first thing you had to do,



*A typical Currys shop display in the Fifties.*

prior to cutting away the wires and components from the switch wafers, was to draw a diagram showing all the connections. If some clever Dick hid your diagram, panic would set in.

### Mechanisms

We also had to deal with record player decks that incorporated autochanger facilities. Then there were those cheap reel-to-reel tape recorders which all seemed to cost 29 gns. Most of them used the BSR deck. Think of all those broken jockey springs that had to be replaced!

If you were really lucky you could work on a Philips deck, adjusting the clutches with things that looked like sweets, or on Grundig TK5/8s with worn out belts that could stretch for miles. I think we all gave a sigh of relief when some clever engineer came up with the audio tape cassette. But it might have been good training for the VCR mechanics that were to come along twenty or so years later.

### Colour TV

How many of us in this trade suffer from bad backs and blame it on the advent of colour TV? It had been bad enough carrying an old radiogram the size of a large sideboard. To deliver the new dual-standard colour TV sets was no mean feat either. For one thing they had proper wooden cabinets. They also had switches whose contacts became tarnished. Thank goodness by now we had Servisol in aerosol cans – it just didn't smell the same any more!

The coming of colour TV introduced the chopper power supply to TV, initially in the Ferguson 3000 chassis. We had just got over the 2000 chassis with its weird EHT regulator panel. Some manufacturers were still making hybrid colour TVs, with big PL509s etc. If you had one of these in your lounge you didn't need central heating. They consumed a great deal of power – and what a fire hazard some of them were.

### Video and All

Subsequently we had to deal with video cassette recorders, of various sorts before the VHS system became the standard. The early Philips cassette system had one reel above the other and ran for about an hour. The Sony and Sanyo Betamax machines were giants. Then there were those Hitachi disc players, like glorified audio LP machines – they had a stylus playing system.

We've been through a great deal during my long participation in the trade. Am I really this old? And are there many other engineers who have been in it for as long as I have? There don't seem to be many of us, around here anyway.

# Pace PRD800/900 PSU Repair

**Pete Haylor on how to carry out repairs without tears**

**T**he phone rings. "My satellite has stopped working. It was all right yesterday. There are no lights on." Those familiar words usually mean that another PSU has gone!

This short article has been written after carrying out several hundred power supply repairs to Pace PRD800 and PRD900 satellite receivers and their variants with the aim of helping others confronted with the problem.

## Access

Disconnect the receiver from the mains supply before you open the case, which is held by a screw at each side and three at the back. Remove these five screws. Then remove all screws on the back panel along with the nut on the LNB connector.

Inside, the PCB is usually held to the case by four rivets. The best way to remove them is to slide a small screwdriver or similar tool underneath then twist it until the top section lifts. Remove it then use a small pair of tweezers to lift out the remaining part. Sometimes there are three rivets and a screw which also has to be removed.

Two support prongs pop up through the PCB. To release them, use a pair of long-nose pliers to squeeze the ends together. Then lift the PCB carefully. The complete PCB should lift from the front then slide forwards to release.

## Repair

Start the repair by obtaining a repair kit. Then check that it includes all the parts. I always desolder the components using a solder mop only. Do not attempt to remove them at this point. Turn the PCB component side upwards then, using a pair of small side cutters, cut the leads from all the components to be replaced. Finally, remove the remaining lead sections carefully. Turn the PCB over and check that the holes are all clear. If you have a PCB cleaner, clean the board before fitting the replacement components.

Solder the capacitors at one leg only. Turn the PCB

over and push them away from the power transistor, then solder the other legs. Fit the IC and the other small components. Finally, preform the 100kΩ resistor's leads so that it is held off the PCB, then solder the leads at the print side.

Double check the solder joints. Use a magnifier to check all the solder joints in the power supply, especially at the transformer pins. Now check the whole PCB for any other poor joints – the IR module is a particular favourite for dry-joints.

## Moment of Truth!

Fortunately I have a variac. If you can obtain one, grab it! Use it to increase the mains input to the receiver slowly. At 120-180V the power supply should switch on. If so, try changing channels and test the receiver with a suitable TV set and dish. If all's well, increase the mains voltage to 230V and leave the receiver on for as long as possible. Finally, connect the receiver to the mains supply directly and give it a soak test.

If you don't have a variac, try to find some way of preventing application of the full mains voltage at first switch on. It may be possible to use a mains lamp as a way of limiting the initial current surge, but I have not tried this myself.

Most of the scrap satellite receivers I've seen have been damaged by 'expert repairers' who have destroyed the print in the power supply area.

## Variants

The Pace PRD800 also appeared as the Ferguson SRD5, Goodmans ST700, Granada M/N92MR1/A, Hitachi SR1050D, Maspro SRE250S/1, Mitsubishi ST-PB10 and the Philips STU802/05M and STU812/05M.

The PRD900 also appeared as the Ferguson SRD16, Grundig STR11RD, Maspro SRE350S/1 (later), Nokia SAT1600, Panasonic TU-SD200 and Philips STU824.

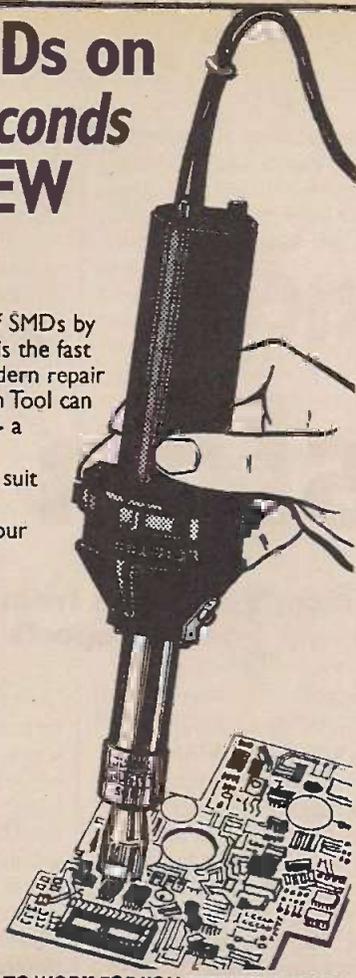
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# Long-distance Television

Terrestrial DX and satellite TV reception, news from abroad and various items of DX interest. **Roger Bunney** reports

October was a very quiet month for DX reception. But news continues to come in about the excellent late-September tropospheric openings. Paul Logan in Northern Ireland received several Spanish VHF-FM radio channels. This was over a difficult path, to Co. Fermanagh. Sud Radio from the Toulouse Pic du Midi (southern France) 1,050kHz transmitter was received in the Netherlands, a wholly land path. During the same period Norwegian VHF stations were being received in the Netherlands.

While on the subject of FM radio DX reception, Mike Gaskin (Cornwall) comments in *Teleradio News* (HS Publications, Derby),

issue 91, on events during an SpE opening to Spain on July 9th. Short N/S-skip back-scatter reception occurred across the UK, and the 50MHz amateur band was open to the USA. On the following day, at 0900, Mike heard a music station at 87.8MHz with an American voice declaiming "easy listening through the night on your downtown radio". Unfortunately there was no identification before fade-out at 0915. Scandinavian and Icelandic stations were heard later. Just after 2000 the 87.8MHz signal returned and Mike noted the comment "Eastern Standard Time is now 1310". He feels that the propagation might have been via an auroral trans-polar path – it has happened before, with distant Russian ch. R1 signals. I have no reports of low-band VHF-DX during the early July period – can folks please check their logs?

With the start of the new solar cycle, number 23, there has already been an auroral event – on October 11th, when there was a beautiful display in Ottawa, Canada. When solar activity is on the increase auroras, solar storms etc. become more common. Watch out for possible signals via auroral reflection.

Back to the poor DX-TV reception during October. A prolonged SpE opening produced RAI (Italy) chs. IA and IB on the afternoon of the 15th. And that was it!

## Satellite Reception

In a very interesting letter James Broughton (Yateley, Hants) describes how he modified his motorised H-H mount, adding an extra 6in. actuator drive to allow satellites with an inclined orbit to

be tracked. The system also enables single-band LNBs to be stacked vertically, and provides precise dish peaking with setting-up tracking inaccuracies removed. See the accompanying photograph. The top motor bolt is connected to half of a square-section UHF aerial bracket. The lower motor bolt passes through a home-made clevis joint. A bent 10mm threaded rod connects to the H-H motor rotor arm. The added weight provides a further bonus in that the counterweight action reduces the effort needed by the horizontal motor – and reduces motor noise.

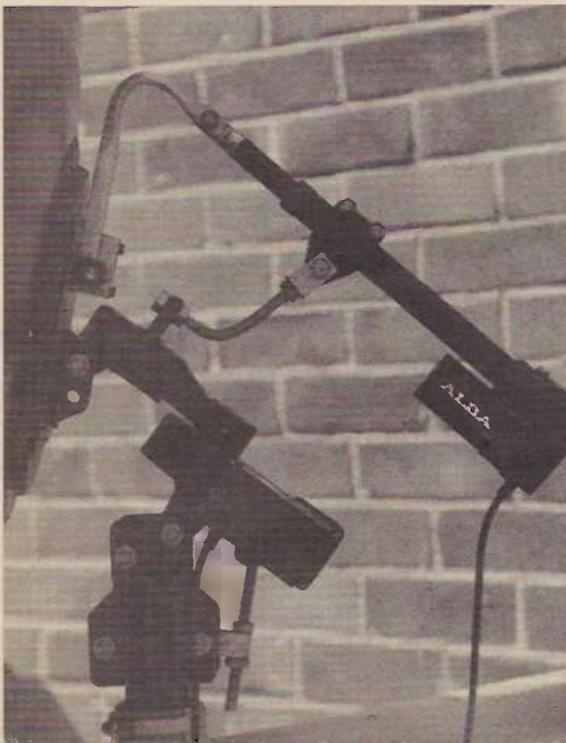
Dean Rogers (London SE2) has been using his 80cm dish to monitor the Ryder Cup golf world feed via Eutelsat II F4 at 7°E. The test pattern included the identification "CTV" – for Carlton TV, which provided the technical facilities for European Tour Productions.

The Louise Woodward trial led to many live news feeds and inserts across the Atlantic during the late October period, with both NTSC and PAL signals. PAS-3R at 43°W seemed to be the most commonly used satellite for analogue feeds.

There have been fewer analogue signals via Orion 1 at 37.5°W, though RTP (Portugal) was present in the clear on October 16th, at 12.607GHz (vertical). The signal disappeared thereafter. The CMT feed to Europe on the 15th via Intelsat 601/803 at 27.5°W was also in clear analogue form, but only for a short period.

John Locker (Wirral) has managed to identify some very unusual signals received via Intelsat 601/803 at 27.5°W during several days in mid-October. When

A close-up view of James Broughton's modified H-H dish mount, showing the inclined-orbit drive system.



I checked during the early evening one day there were, in clear analogue at 11.59GHz horizontal, NTSC video shots from an aircraft, with a screen overlay of numbers, graphics etc. (see accompanying photograph). The moving pictures would suddenly flick through a progression of zoomed shots, from a wide shot to close-ups. These showed buildings, airfields and tanks, obviously subjects of military interest. There was no active audio subcarrier.

During the early afternoon on the following day there were more silent NTSC pictures, this time showing an unmanned aircraft. The tail had two downwards-pointing fins and a propeller behind. It was seen taking off along a desert runway. There were then more air views, demos etc.

John tells me that it was an unmanned surveillance aircraft undergoing tests prior to use in Yugoslavia. Manned surveillance aircraft are now flying in this area. An interesting sighting!

PAS-3R at 43°W has been carrying some interesting analogue material. One reader reports seeing an educational feature entitled The Second Annual Worldwide Lessons in Leadership Series (Fortune magazine) with dubbed Spanish = the original English was available on another subcarrier. I've noticed that such lectures/educational programmes tend to be seen around tea time, UK. It's well worth checking at 27.5, 37.5 and 43°W for such offerings. Typical of the more unusual programmes was the United Nations Television UN Day Concert from NY via PAS-3R on October 24th: rather heavy stuff, with serious music and speeches!

Roy Carmen (Sandown) comments on the lack of signals from Eutelsat I F5 at 25.5°E. This satellite now has a variable inclined orbit. He has seen numerous UK Breakfast TV show feeds via Intelsat K at 21.5°W, usually prior to 0745 UK time. The Reuters Uplink-2 truck seems to be very active here. Check out 11.538GHz horizontal for early morning activity.

### Terrestrial TV News

**UK:** Dave Rushton hopes to obtain one of the new local RSL licences for his TexTV service in Edinburgh. He had originally planned to use ch. 34, but this was halted when the ITC advised retuning domestic VCRs etc. to ch. 34 as a result of the local Channel 5 transmissions.

**Gibraltar:** A local company Peninsula Productions Ltd. has applied to take over the running of radio/TV services from GBC, which is not popular and is running at a loss.

**Greece:** The state channel ET-2 has been renamed Net TV, with a new programme line up. The aim is to gain audience share. The government is to tell private broadcasters that following a recent frequency reorganisation two fewer TV networks will be allowed – fewer channels are available than originally thought.

**Italy:** Padova based RETE Nord has been renamed TV Set following a change of ownership. It will provide a new regional network covering the NE corner of Italy.

**South Africa:** The Independent Broadcasting Authority has received seven applications to operate the first independent TV network in South Africa. A decision is due to be announced in March.

**Germany:** Three digital terrestrial TV transmitters are being tested in Berlin, using 1kW ERP on chs. E43, E48 and E59. The ch. 5 transmitter at the Alexanderplatz in Berlin is now used by TV Berlin.

In the Hamburg area satellite TV services are being transmitted on chs. E22 (TM3) and E44 (Nickelodeon 0600-1800, VOX 1800-0600).

Six states are blocking digital TV development following the recently announced partnership between the Kirch Group and Deutsche Telekom.

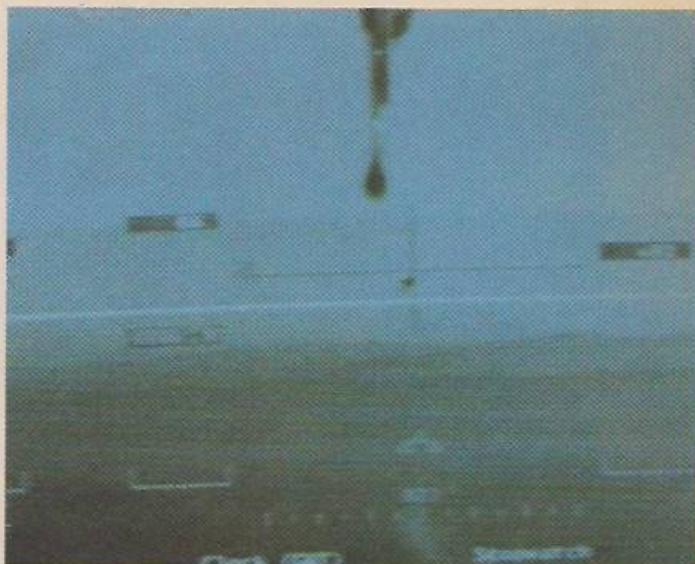
**Internet DX Club:** The Club European de DX Radio Television (CEDRT) has set up a web site at: <http://www.ndirect.co.uk/~sorwin/cedrt.htm>

Content is in French. The UK representative is Mr. J Winsor whose e-mail address is: [sorwin@ndirect.co.uk](mailto:sorwin@ndirect.co.uk)

### Satellite News

PAS-5 arrived at 58°W in early September, with 24 C band and 24 Ku band transponders. The satellite is intended for communications between Europe and the Americas. It's rather low on the horizon in the UK, but you should be able to receive it if you have clear sight to the SW.

Intelsat 803, which was launched in late September, is to move from 27.5°W to 21.5°W this month (January). It has taken over many of the duties of 601, which has moved to 34.5°W. 603 has moved from 34.5°W to 24.5°W, replacing 605



which seems to have a downlink telemetry problem. 605 is working however and has been parked at 29.5°W pending its move to a "less demanding" slot.

In Italy, agreement is expected between Canal+/Tele+ and RAI/STET to use a common standard for their digital packages.

The French Canal Satellite digital

**This NTSC shot from an aircraft, with screen overlay, was received via Intelsat at 27.5°W.**

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The unmanned surveillance craft seen taxiing for take-off. From Intelsat at 27.5°W.

package will add a 100 per cent sports channel early next year (1999).

The Indian INSAT-2D satellite, below the UK horizon at 72.5°E, suffered a massive power-out on October 1st and has now been written off. It may be replaced by INSAT-2E, which is due for launch shortly, though nine C band transponders aboard this satellite have already been leased by Intelsat.

We now have a new flock of birds, the Iridium LEOS (low earth orbiting satellites) which orbit the earth at a height of around 420 miles. There will eventually be 66 of them in operation plus six spares. The first five were launched on May 5th, followed by seven on June 18th and five on August 20th. One of those launched on June 18th has refused to function correctly however. At least forty of the Iridium LEOS were due to be operational by the end of 1997, providing cellphone and data communications from anywhere to anywhere on earth. The full global service should be available sometime during 1998, with about eleven uplink hubs ('gateways'). The satellites have a life expectancy of seven years.

Other rival operators have appeared, including Globalstar, Celestri and Motorola's Teledesic. Teledesic plans a 'super' LEO system with 288 satellites. Celestri's plans are more modest – 63 satellites in operation from the year 2002. Various UK/European partners, including Vodafone, France Telecom and Alcatel, are involved.

So we now have GEOS (geosynchronous satellites, such as the Astra and Eutelsat craft) that orbit at 22,300 miles, MEOS (medium earth orbiting satellites) at 1,500-6,500 miles and LEOS at 400-1,500 miles.

## Band I Allocations

After checking with the DTI on the recent 48MHz and 52MHz OB link frequency allocations I received part 2 of the UK Radio Frequency Allocations list. There's a massive range of allocations within the TV-DXing Band 1, ranging from "services ancillary to broadcasting" (SABs) to wind profiler radars.

Of particular interest is "video transmissions for railways, track to train, using leaky feeder techniques on 50.5MHz". I'd be interested to know whether any reader living close to a main rail service has seen anything at this frequency.

One-way paging systems use 48-99375-49-49375MHz; two-way paging systems use spot frequencies 48-9750 and 48-9875MHz; on-site spot frequencies for hospital paging are 49-4250, 49-4375, 49-4500, 49-4625 and 49-4750MHz.

## Sunspots

We now appear to be into the rapidly rising solar cycle no. 23: high averaged-out sunspot counts were recorded in both July and August, the highest for some years. This should mean improved HF propagation, particularly during the daytime in winter. It's unlikely that we shall get low VHF MUFs (maximum usable frequencies) this year, but there's the possibility of solar flares and related disturbances – even Auroral activity (see earlier).

Those with knowledge of this subject are suggesting that the solar maximum, with the highest reflected frequencies, will occur in about the year 2000. With the rapid move to digital transmissions, satellite reception etc., the coming cycle could well be the last opportunity for analogue Band I DX-TV. The peak of cycle 24 will see completely different TV transmissions, unlikely to be at VHF! In the USA the FCC has suggested closure of analogue terrestrial transmissions by the year 2007, and the year 2015 is being considered in Australia.

Incidentally cycle 22 lasted for only nine and a half years – we normally expect a sunspot cycle to last for about eleven years, though there is no such thing as an 'average cycle'!

## New Products

Leaflets received from Aerial Techniques (01202 738 232) feature two recently introduced colour TV sets with unusual features. There's a 12/24V, PAL/NTSC/SECAM, all bands including cable, 10in. (25cm) model with teletext and remote

control. A 14in. model is basically similar but with French system L and Middle Eastern system B/G SECAM. The sets are made by Thomson – the 12/24V operation suggests that they are intended for long-distance lorry/holiday driving.

A New Zealand company, Tennatron of Motueka, has introduced a co-channel interference filter. The description claims that fitting the filter in-line with the aerial signal removes unwanted signal/interference across the wanted channel. I don't know whether this is an advanced phasing system of some sort, using phase shifting to achieve cancellation, and have requested further technical details – and a price.

## What Causes Sporadic E?

There has always been controversy over the causes of Sporadic E – ionisation in the E layer, which is about 75 miles above the earth's surface. Such ionisation can reflect VHF signals, making reception across considerable distances possible.

The August 1997 issue of *Six News* contained an item entitled "The Cometary Origin of Sporadic E", which was an edited version of a paper submitted to the AGM of the Society of Amateur Radio Astronomers, West Virginia, on July 15th, 1996. It suggests that thunderstorms can be discounted as a cause of SpE.

Now turn to the May 1995 issue of the *Benelux DX Bulletin*. It contained an article by Bill Thompson, published earlier in the *WFTDA Magazine*, entitled "E-Skip: Myths versus Facts". In the section on thunderstorms and E-skip, it claims that while the theory is controversial "the evidence is now overwhelming". The view put forward is that severe thunderstorm activity produces high-altitude wind shears which form the basis of sporadic E ionisation clouds. An interesting example was quoted. Rapidly moving severe thunder/hailstorms/tornados produced SpE clouds that moved NW across North America at speeds up to 200 m.p.h. At the same time there were SpE openings. A comparison between the storm track paths and received signals showed a direct correlation, which tends to confirm the thunderstorm theory.

As a veteran TV-DXer, my comment is that you can actually 'feel' when signals are present given a warm, humid, overcast day in say June/July with thunderstorms forecast. Any comments?



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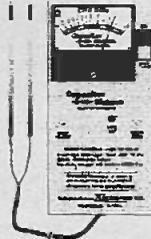
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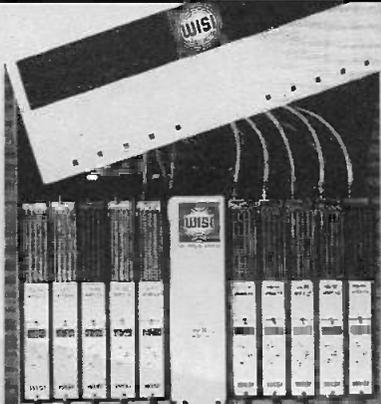


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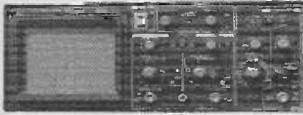
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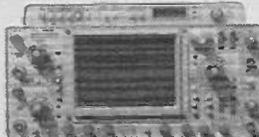


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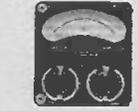
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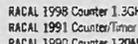
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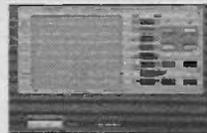


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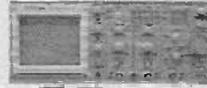


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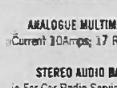
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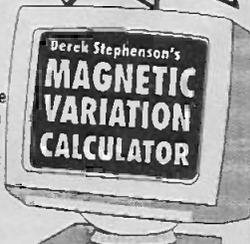
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## Answer to Test Case 421

- see page 165 -

This Sony SLV315 fault was not a nice one at all. It was not a common fault either, as Sage's call to Sony's technical office confirmed. At least the symptom was not intermittent, which would have made things even more difficult. Unfortunately it's not possible to analyse the serial data stream that passes between two microcontroller chips.

The scrap pile came to the rescue! Sage found an SLV315 that was marked "video heads worn, all else OK". He carried it back to his bench in triumph. His first step was to insert the MF126 board from the scrap VCR in the faulty one to confirm the innocence of its stop and eject switches and its IR receiver. The fault was still present. So he inserted the MF125 board from the scrap VCR, the one that contains the timer/tuner microcontroller chip and the fluorescent display panel. This restored normal operation. When the suspect panel was inserted in the scrap machine, the fault went with it.

The easiest course would have been to leave it at that. But the job was a chargeable one, and so far as Sage is concerned a second-hand PCB is not a satisfactory solution in such a case. The faulty machine worked correctly, with its own MF125 PCB, once this had been fitted with a new CXP50116 microcontroller chip. Who can tell exactly what had been going on inside the original one? Happy Christmas to you all!

## NEXT MONTH IN TELEVISION

### The Ferguson TX805 Chassis

J. LeJeune takes a look at the technology used in this Thomson-designed small-screen chassis. Interesting features include the use of a Wessel circuit which employs a single transistor as both the chopper and the line output device.

### The Language of Digital TV

Digital TV brings new signal processing and modulation techniques and a whole new language - Digspeak! Mark Paul starts an explanatory listing of the terms you will encounter and need to understand.

### Build this LOPT Tester

It's very helpful to have a means of testing line output transformers. Charles Ritchie presents a simple tester design based on a TBA920 line generator chip.

### The Onwa Power Supply

Chinese made Onwa chassis are used in many Alba, Bush, Perdio and other models. Their power supply has proved to be troublesome. An account of the circuit's operation and a guide to what goes wrong.

### Pace PRD800/900 Modification

Martin Pickering, B.Eng., has discovered an unused microcontroller option in these satellite TV receivers. It can be used to control an external device.

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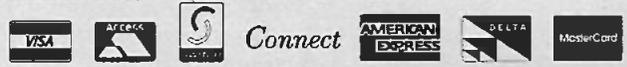
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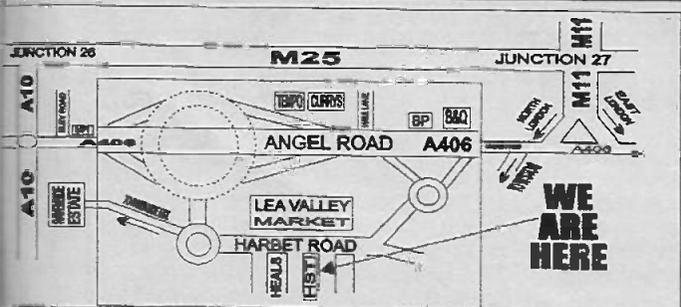
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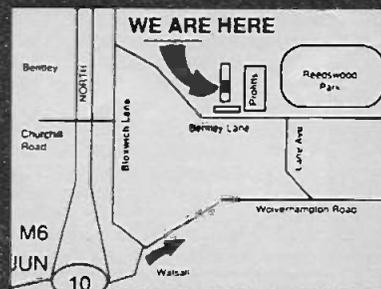
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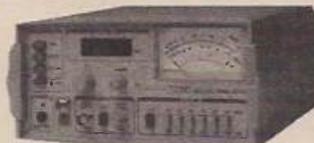
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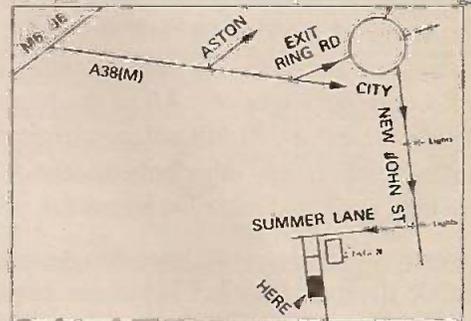
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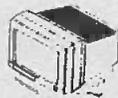
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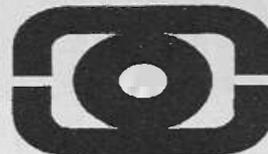
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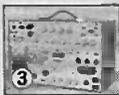


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