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TELEVISION

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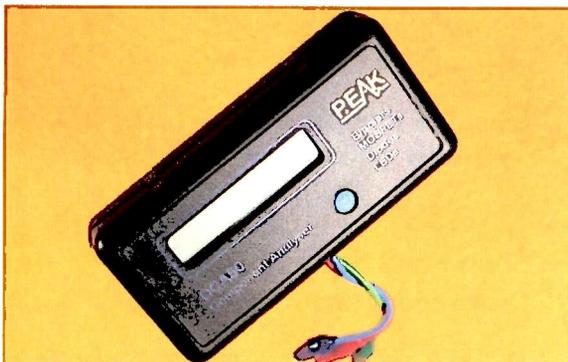
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Editor
John A. Reddihough

Production Editor
Tessa Winford

Consultant Editor
Martin Eccles

Publisher
Mick Elliott

Advertisement Manager
Kate Hale
0181-652 3076

Advertisement Sales Executive
Pat Bunce
0181-652 8339
Fax 0181-652 8931

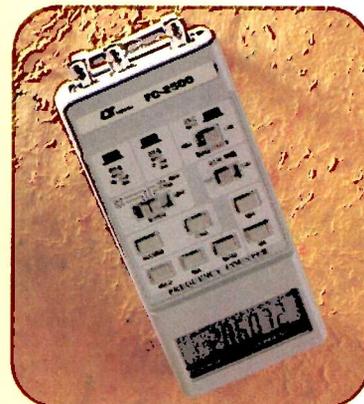
Editorial Office
0181-652 8120
Fax 0181-652 8956

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March issue on sale February 18th. Next issue dated April on sale March 18th.

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A WORLD

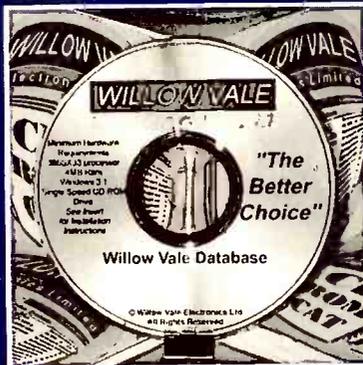
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Crunch Time Coming

It all seems so straightforward at first glance. TV is in for a glorious, digital future. Digital transmissions will mean lots and lots of channels, which is what people want, isn't it? Plenty of choice. Sport galore, popular films as and when you want them, plenty of scope for minority-interest programming and so on. Let's sit back and enjoy it, while the broadcasters rake in the shekels. But it might not turn out quite like this. In fact there are at present so many problems that many of those in the broadcasting and electronics industries may be cursing the day when digital TV was first proposed.

Not least of the worries is the fact that digital TV is quite a gamble. We are told that the analogue TV switch-off will be just a few years hence, by which time we will be enjoying a much wider choice of programmes with better quality vision and sound. But this all depends on whether the public goes for digital TV with sufficient enthusiasm. If it turns out to be a costly debacle, we could find ourselves left with the present services. The digital broadcasters will need all the marketing muscle they can gather: the fact that the digital TV set-top boxes are to be subsidised is an admission that persuading the public to go digital is not going to be that easy.

The overriding consideration is the public's likely response. People do a lot of viewing already, and must be reasonably content with what's being offered to them. The fact is that a saturation point has long since been passed. The total number of hours devoted to viewing has declined slightly in recent years. This is not surprising: there are many other demands on people's time. It is very unlikely that, however many channels are on offer, viewing will increase significantly. Especially as we've got to fit all that internet browsing

in! All this means that new services can succeed only at the expense of existing ones. BSkyB has been a remarkable success to date: is it feasible to suppose that the company can produce a repeat performance?

One factor is who gets going first, BSkyB via satellite or BDB via terrestrial transmissions? BSkyB had planned to start up first, and probably will. But the satellite is not up yet, nor are the set-top boxes in production. BSkyB has the advantage of being able to offer more prospective channels, but a new dish will be needed in addition to the set-top box – unless the 19.2°E or 19.2/13°E dish is swung to 28°E (where the digital signals will come from), losing existing services, or a motorised system is installed. More expense for prospective viewers. At least with BDB the existing aerial will suffice. Once viewers are confronted with this, will they bother with a dish change?

One thing seems reasonably certain: few people are likely to opt for both prospective services. Why should they, in addition to what they already have? Ah, but "content is king" as they say in the media world. People will sign up if the programmes are sufficiently enticing. Obviously so, but we shall see. Sport and films are the big attractions. If BSkyB or anyone else can corner the market, it's hard luck for the other broadcasters. Fortunately no one is likely to have a deep enough pocket to be able to dominate in this way.

The broadcasters have to generate the income required to finance their services, either by subscription/pay-per-view and/or advertising. People are sensitive to what they may be asked to pay, especially as broadcasting has traditionally been, in a sense, 'free'. If you can get people to pay extra to watch something special, it means they won't be

watching something else. Advertising revenue depends on the number of viewers who switch on. It will be spread more widely, and will bring in less per channel. It's a sort of no-win situation.

This may be an unduly pessimistic view, but investors don't seem to have been greatly encouraged by the prospects: at the time of writing, BSkyB's shares are trading at around 360p compared with a high of 666p or so during the past year. It's hardly a vote of confidence.

The preparations for digital TV have been a bit of a botch, with several postponements to the planned start of the services. BSkyB's satellite, Astra 2A to be more exact, has taken longer than expected to build. There have been many problems with software and getting the required clearance from the broadcasting regulatory authorities. The delays have affected set-top box manufacturers adversely, coupled with which Pace seems to have a problem with patent fees. No one, at present, is happy.

The future must lie with digital delivery eventually, since the technology is superior and offers more for less in terms of spectrum space. But it's unlikely that there will be a huge, sudden rush to acquire digital set-top boxes or receivers. One danger is that the government might be 'bounced' into forcing the issue by switching off the analogue signals prematurely. We should be left with our usual services until digital TV really does look like taking over – as 625 lines and colour did thirty years ago.

Meanwhile a lot of nail-biting is in prospect for those involved in getting digital TV started – BSkyB and BDB in the UK. They could well have a difficult time, for several years at least.

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All correspondence regarding advertisements should be addressed to the Advertisement Manager, "Television", Reed Business Information, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS. Editorial correspondence should be addressed to "Television", Editorial Department, Reed Business Information, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS.

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2SB891	0.60	2SD401A	0.77	BC309B	0.10	BF422	0.19	BYD14J	0.35	LA4280	3.12	STK5342	4.07	TD2579A	4.91	TIPL761A	1.52
2SB892	0.35	2SD468	0.28	BC327	0.10	BF423	0.14	BYD33D	0.12	LA4282	5.11	STK5372H	6.84	TD2581Q	2.57	TIPL791A	1.25
2SC1008	0.24	2SD667	0.38	BC328	0.14	BF459	0.43	BYD33J	0.16	LA4445	3.45	STK5421	9.52	TD2582	3.85	TLO72CP	1.03
2SC124	0.48	2SD669A	0.64	BC337	0.14	BF471	0.37	BYD33M	0.26	LA4460	2.50	STK5481	8.12	TD2593	1.12	TMP47C432AP8189	15.19
2SC1318	0.19	2SD718	1.90	BC338	0.06	BF487	0.57	BYV1040	2.55	LA4470	4.27	STK5481	8.12	TD2600	7.69		
2SC1473	0.21	2SD756	0.47	BC368	0.18	BF491	0.18	BYV95B	0.21	LA6324	2.05	STK7253	7.69	TD2611A	0.64	TMP47C434N3537	15.22
2SC1573	0.52	2SD837B	1.12	BC369	0.18	BF494	0.12	BYV95C	0.28	LA6510	2.94	STK7308	6.41	TD2653A	4.70	TMP47C434N3555	16.63
2SC1675	0.14	2SD856	0.79	BC372	0.53	BF759	0.38	BYV96D	0.27	LA7830	1.88	STR4211	9.40	TD3330	2.05	TPU2732	10.05
2SC1685	0.21	2SD882	0.43	BC546A	0.11	BF869	0.38	BYV96E	0.53	LA7832	2.40	STR50020	9.38	TD3330	2.05	U2829B	3.40
2SC1740	0.16	2SD898B	6.41	BC546B	0.12	BF871	0.41	BYW56	0.31	LA7835	2.99	STR50103	4.48	TD3505	2.40	UC3842	1.46
2SC1815V	0.11	2SD965	0.67	BC547	0.11	BF959	0.18	BYW56C	0.21	LA7837	4.19	STR50103A	5.56	TD3560	6.13	UC3844	1.20
2SC2001	0.23	2SD965R	1.05	BC547A	0.04	BF960	0.30	BYW96E	0.50	LC7132	4.70	STR54041	5.15	TD3562A	4.62	UC3844N	1.91
2SC2023	3.18	2SK1117	3.40	BC547B	0.11	BF970	0.43	BYX55600	0.23	LED3G	0.10	STR5412	4.02	TD3565A	2.74	UCP1318AV	3.85
2SC2073	1.03	2SK1118	3.40	BC548	0.11	BF990A	0.68	BZV10	1.34	LED3R	0.10	STR58041	3.42	TD3566	6.41	UCP1365C	1.70
2SC2078	1.00	2SK30A	0.35	BC548A	0.11	BFY51	0.39	BZ									

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BU508A X 5 £4.15	BUT11A X 5 £1.75	S2000AF X 5 £5.25
BU508AF X 5 £3.50	CNX62A X 5 £3.00	TDA3653B X 2 £1.80
BU508D X 5 £4.45	UC3842 X 5 £2.95	TDA3654 X 2 £1.80

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Philips type 2.4 volt Back up battery	X 5	£8.75
Scart - Scart lead 1.5m Fully wired	X 2	£2.90
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Std video sensor lamp + plug	X10	£4.00
3V29 etc. Belt kit	X 5	£4.50
3V35/36 etc. Belt kit	X 5	£4.25
VT11E etc. Belt kit	X 5	£5.50
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PSU repair - refurb kits

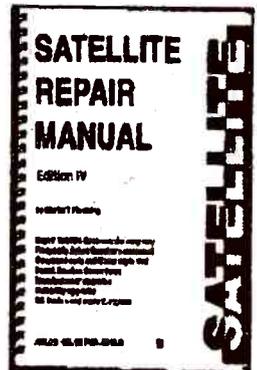
Over **120,000** kits sold

KIT1 £4.95 Pace - PRD800, PRD900, PSR800, PSR900, Ferguson SRD5, SRD16, Grundig STR1, Maspro SRE250S/1, 350S/1, Philips STU802/05M, Manhattan 850, 950 Goodmans ST700, Toshiba TU-SD200, SAT99	KIT12 £16.45 Echostar SR5500 (early PSU with adjuster)
KIT2 £8.95 Pace - SR900, 9200, 9210, MRD920, Ferguson SRV1, Grundig GIRD2000, 3000, Philips STU801, Network 900, 9200, Bush IRD150, Nokia SAT1500, Maspro SRE250S, 350S, 450S, Alba SAT6600, Finlux SR5700, Thompson SR54	KIT14 £23.95 Amstrad SRD600
KIT3 £6.95 Amstrad - SR510, 520, 540, SRDR45, SRD550	KIT5 £6.95 Amstrad SRD 500
KIT4 £6.95 Amstrad SRD 500	KIT6 £6.95 Pace D100, 120
KIT5 £6.95 Amstrad SRD320, 340 etc (export models)	KIT7 £6.95 Pace MSS100
KIT6 £6.95 Churchill D2MAC decoder	KIT8 £13.11 Pace MSS500, 1000
KIT7 £6.95 Churchill D2MAC decoder	
KIT8 £9.45 Pace MSS200, 300, Apollo	
KIT9 £5.95 Ferguson SRD4	
KIT10 £29.71 Echostar SR6500, 7700, 8700	
KIT11 £7.95 Minterc (Sorenson PSU type only)	
KIT12 £8.95 Amstrad SRD700, SR950, SRX100, 301, 501, 1002, 2001, SRD2000, SAT250	

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Satellite division Satellite division
"The Satellite Repair Manual"

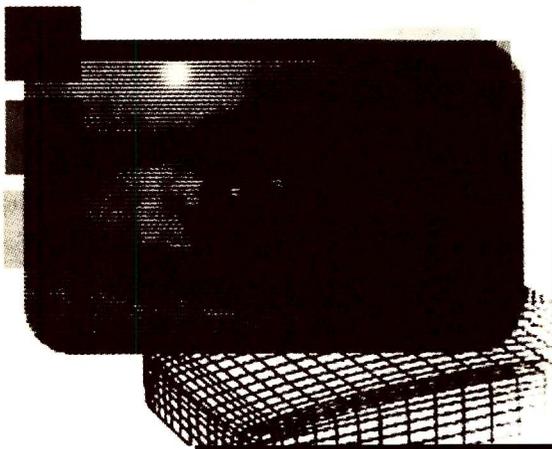
You could say that what Martin Pickering doesn't know about satellite receivers isn't worth knowing. What he does know has become legendary. Having been at it since the start of consumer satellite TV, he has built up a massive data base on satellite receivers. Not only on their faults, common and less common but also on modifications and upgrades. Martin brings in-depth expertise to the subject, having previously been involved with equipment reliability testing and component specification. This book has become established as a bible for satellite TV repair. But 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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Reports from
Adrian Spriddell
I. Field and
Gerry Mumford

Mitac 1564PDM

The brightness was very low when this monitor was first switched on. It improved after an hour. The cause of the trouble was the line output transformer. **A.S.**

Royal DN1782G

This monitor was dead. Checks showed that the BU2527AX line output transistor was short-circuit. I fitted a BU2527AF as a replacement then turned attention to the line generator circuitry. One leg of the line oscillator transformer's centre-tapped winding was found to have burnt off. Fortunately there was enough of the remains of the lead-out wire for it to be reconnected.

In addition the 22Ω resistor in series with the emitter of the line output transistor had gone open-circuit. **A.S.**

Taxan MV789LR

There was very high brightness, the front panel control having no effect. R325 (27kΩ) in the brightness control network was open-circuit. **A.S.**

ICPI VGA 72G9140

This monitor was dead. It didn't take us long to discover that the 33kΩ, 1W resistors R603/604 in the power supply were open-circuit. **A.S.**

Mitac AM4050PD

This monitor was dead – its line oscillator had stopped. There was no supply to this stage because of a

Monitors

dry-joint at jumper wire JW806 in the feed to the line oscillator transformer.

We've had several of these monitors in recently with bad joints. They look OK, but when touched with a hot soldering iron the solder falls off, revealing a blackened component or jumper leg beneath. It's worth checking the six 47kΩ resistors on the CRT base panel and the legs of the RGB output transistors.

Another tip: to correct a poor black level, check C763 (47μF, 100V) by substitution before adjusting the first anode supply potentiometer. **A.S.**

Ultra UM1595

The picture was compressed at the top. A new TDA8172AP field output chip restored linear scanning. **A.S.**

Eizo 9060S

The power supply would run for only 1.5 seconds then switch off. The cause was eventually traced to C963 (33μF) on the power supply PCB. **A.S.**

AST VGA LR14

Changes colour after half an hour was the complaint. I didn't have to wait: this monitor did a fair impersonation of disco lighting from cold, and got worse as it warmed up! It's almost identical to the Viglen CA1426LT, but uses a conventional CRT instead of a Trinitron CRT. The CRT base is easy to work on (the Viglen version has a clamp band that secures the CRT base to the CRT neck), and there's no danger to the print lands when the tinplate screen is unsoldered – it slides on, and is secured by solder bridges to wire links at either side and a pressed out 'tongue' which is soldered to the print side through an aperture.

The soldering was sparse. With a gentle tug, the blue transistor came away from the PCB. The other two video output transistors

had clearly visible fatigue marks around all three pins. I recommend that when resoldering one of these AST or Viglen monitors the PCB is thoroughly defluxed and all weak-looking solder joints are attended to. **I.F.**

ADI PV448

This monitor was completely dead because of a power supply blow up. Casualties included the 2SK2038 chopper transistor Q901, R990 (0.33Ω, 2W) and the BYV28 rectifier diode D962 on the secondary side of the power supply: Q901 and D962 were short-circuit. Replacements got the supply going again, but the line output stage would shut down very quickly. This was because the HT (B+) voltage at the LOPT was high (about 140V instead of 90V). The cause of this was the 2SB649A power switching transistor Q921 which was also short-circuit. **G.M.**

ASTVision 4L CMC-1423B1

There was no picture, though the LED lit up and a faint clicking noise came from within the monitor. The cause was not the usual blown line output transistor but the associated resistor R516 (1Ω, 1W) which was open-circuit. **G.M.**

Commodore JD144K

This monitor displayed a white raster. When the brightness control was at its minimum setting however a very faint picture became visible. With the brightness control at maximum, the tube's G1 voltage was at less than +1V. R437 (220kΩ, 0.25W) in the brightness control circuit had risen in value to 300kΩ. **G.M.**

AOC CM335

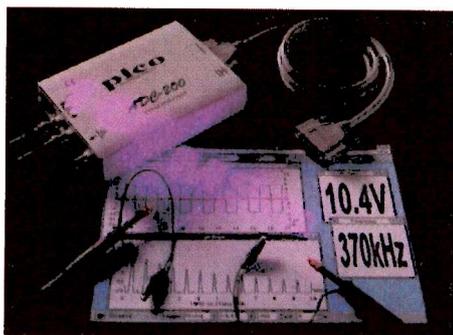
This monitor was dead because one of the series-connected start-up resistors R907/8 (220kΩ, 0.5W) was open-circuit. As is usual with start-up resistor pairs only one of them had failed, but for reliability it's best to replace them both. **G.M.**

Free cover disk and reader offer

Test Equipment has come a long way over the last few years. Traditional 'benchtop' instruments such as oscilloscopes are giving way both to smaller hand-held units and more recently to PC-based instruments. Pico Technology is at the forefront of these developments and, in conjunction with *Television* magazine, gives you the chance to save 15% off the purchase price of any Pico product.

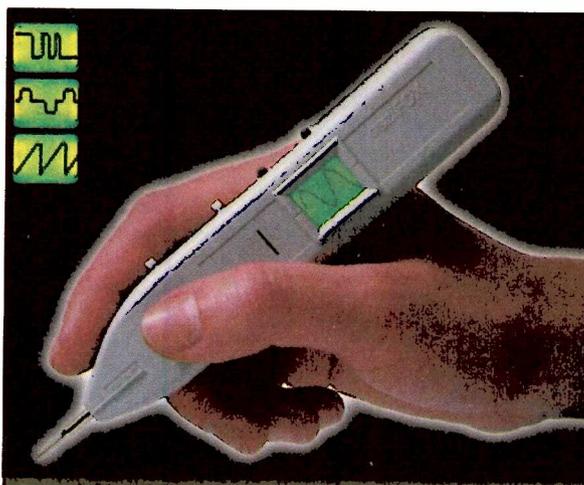
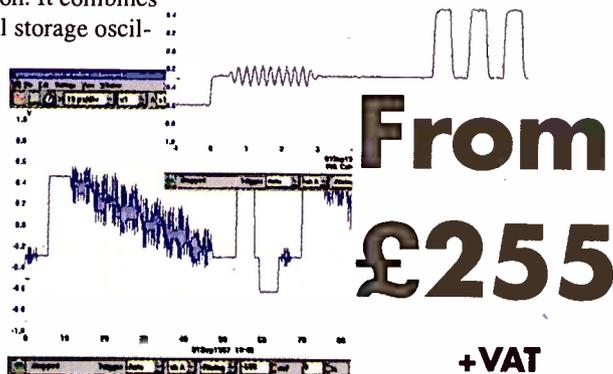
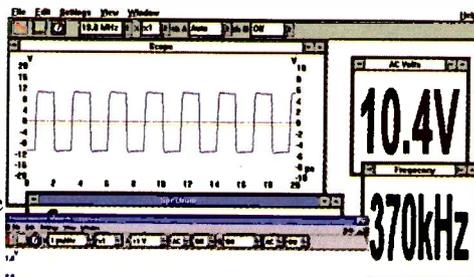
The disk on the cover of this magazine contains two programs: the first is a demonstration version of PicoScope for Windows (see screen shots below) and the second an on-line catalogue and order form that allows you to buy any Pico product at a 15% discount. Alternatively you can order either the ADC200 or osziFOX oscilloscopes using the order form below. Please note that this offer is valid until 15 April 1998.

Transform your PC into an oscilloscope, spectrum analyser and multimeter . . .



The ADC200 range of PC-based oscilloscopes offers performance previously available only with the most expensive 'benchtop' scopes. By integrating several instruments into one unit, the ADC200 is both flexible and cost effective. There are three models in the ADC200 range (see the on-line catalogue on the floppy disk for full details and specifications). For video signals the ADC200/50 is an ideal solution. It combines a dual-channel 50MS/s digital storage oscilloscope with a 25MHz spectrum analyser. The screen shots of PAL video signals shown opposite were captured using an ADC200/50.

Connection to a PC gives the ADC200 the edge over traditional scopes: the ability to print and save waveforms is just one example. Advanced trigger modes, such as save to disk on trigger, make tracking down those elusive intermittent faults much easier. The ADC200 is supplied with Pico Scope for Windows (see disk for demo version) which is powerful, yet simple to use, especially with its comprehensive on-line help.



A scope at your fingertips...

Oscilloscopes were once heavy and clumsy to handle, but over the years they've got smaller and smaller. The latest development in this field has just arrived: a digital storage oscilloscope in a handy slim housing, scarcely longer than a pencil and about as thick as your thumb.

Despite its small size, its performance can match that of a service oscilloscope. With a sampling rate of up to 20MS/s even signals in microprocessor circuits can be recorded. Using its voltmeter function, numeric AC and DC voltages can be easily measured.

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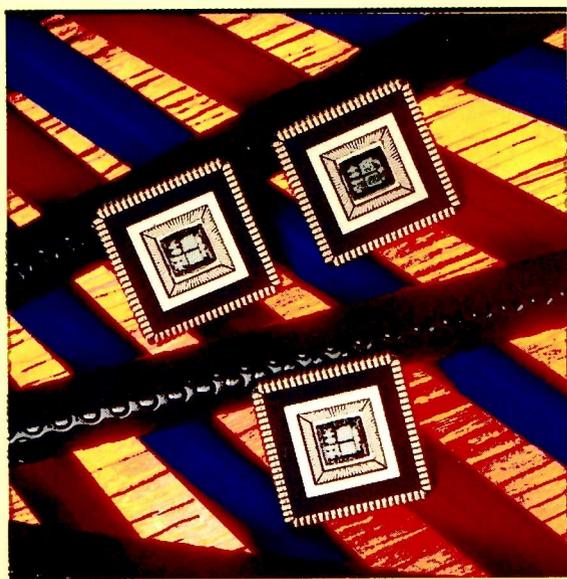
BSkyB's Digital Launch

According to BSkyB, its digital satellite TV service will start before the end of June. The company is to order one million set-top boxes which will be manufactured by Pace, Panasonic, Amstrad and Grundig. They are to be made available to viewers at a subsidised price of around £200.

The original plan was that the subsidy would be provided jointly by BSkyB and British Interactive Broadcasting (BIB). But the fact that BSkyB owns 32.5 per cent of BIB has concerned the European Commission, from which clearance is required. BSkyB has now announced that to start with it will provide the subsidy itself.

Concern about regulatory clearance, delays in confirming the orders, and problems with the final specification for non-exclusive software for interactive operation have all contributed to a delay in the start of set-top box production. Some observers continue to feel that the start of the service may be delayed until the autumn.

Incidentally British Digital Broadcasting (BDB) will also be subsidising the cost of the set-top boxes required for reception of its digital terrestrial transmissions. The cost is put at some £550m over twelve years. BDB will be spending £150m on promoting and subsidising its services, which are due to start this autumn, over the next two and a half years.



A digital image filter chip, type GF2246, that provides the 75MHz performance required for HDTV operation has been introduced by Garfield Microelectronics, Norfolk House, Herriard Business Park, Herriard, Basingstoke, Hants RG25 2PN (01256 384 300). It forms part of the company's range of building blocks for digital TV consumer and broadcast applications. The filter is ideal for pixel interpolation in image manipulation and filtering applications: when used with an image resampling sequencer, it can perform bilateral interpolation of an image at real-time video rates.

US TV Goes Digital

The first digital terrestrial TV (DTT) services in the USA are to start later this year – working receivers, many with HDTV capability, were on display at the Las Vegas Consumer Electronics Show in January. Broadcasters have assured the Federal Communications Commission (FCC) that transmissions will be available in the ten areas of greatest population density – New York, Las Vegas, Chicago, Philadelphia, San Francisco, Boston, Washington, Dallas, Detroit and Atlanta, which account in total for thirty per cent of the population – by May 1999. Services are to be extended to the next twenty main areas by November 1999. The digital signals will be able to provide either standard or HDTV resolution depending on the receiver being used. The FCC expects the analogue TV switch off to occur in the year 2006, when the freed spectrum space would be auctioned off for other uses.

Setmakers that are to launch digital TV receivers this year include Sony, Philips, Panasonic, Hitachi and Sharp. The industry expects sales to be around 100,000 in the first year, rising to one and a half million in 2002. A boom period is assured if things work out this way!

CRTs

The increasing amount of effort being put into flat-screen display technology doesn't mean that the CRT has reached the end of its development. Sony has come up with a new version of the Trinitron called the Wega – after the brightest star in the Lyra constellation. It has a much flatter screen and, to increase the length of the electron-lens system, a longer gun. The result is a bright picture with twice the resolution of previous Trinitron tubes. Corner resolution is particu-

larly good. Sets fitted with the tube were on show at CES, Las Vegas.

Toshiba has announced, in Japan, a series of wide-screen models (32Z1P, 32Z1D, 28Z1P and 28Z1D) that are fitted with a newly-developed, virtually-flat CRT. They employ progressive as opposed to interlaced scanning, and will be compatible with the Japanese digital TV broadcasting system. Transmissions are due to begin in the year 2000. The sets will not be sold outside Japan.

News from CPC

As part of a £10m investment aimed at further increasing CPC's business capacity over the next six years the company has bought almost six acres of land adjacent to its Faraday Drive, Fulwood, Preston site. CPC is also running trials of an on-line catalogue service which the company expects to introduce later this year.

The investment project will be split into two phases, the first starting this year with the building of a 56,000 sq ft warehouse. Phase two, scheduled to start in 2000, will add a 60,000 sq ft building which will include a high-bay (20m tall) warehouse. When both phases have been completed, CPC's total storage space will be around 270,000 sq ft.

CPC has added a range of compatible repair and replacement parts for video games consoles to the computer spares and accessories the company already stocks. Because of their specialised nature, spares for games units are often difficult to obtain in the UK. CPC can now help with controller replacement pads, circuit diagrams for popular video games systems, game cartridge opening tools, replacement cables, connectors and a selection of memory cards. A ten-piece kit of compatible replacement parts for games controllers is available, containing all the commonly needed items for repairing two controllers.

CPC has also launched a new support service for customers needing assistance with its preprogrammed remote control handsets. The Remote Control Help-Line, number 0891 633 261, is



Items from CPC's new range of video games parts.

specifically designed to assist end users of universal handsets. The line goes directly to a help desk centre manned by a team of qualified technical personnel. Calls are charged at 50p per minute – the line is open from 8.30am to 5.30pm Monday to Friday. Extra capacity is being built in to serve customers requiring technical assistance with other CPC products.

Philips' Chip Developments

Philips has been investing heavily in its TriMedia processor technology – several hundred engineers have been working on the project. The stage has now been reached where Philips is in talks about second sourcing and joint industry development of the processing architecture. The TriMedia processor can be used as the basis of a number of chip sets for various consumer information and entertainment applications, and can bring consumer-quality video and audio to PCs.

The stage of the technology is the use of a very long instruction word (VLIW) central processor core, enabling five instructions to be processed per clock cycle. Thus some four billion operations per second can be carried out at the relatively slow clock rate of 100MHz. Further development aims to increase the frequency to 133MHz and then 166MHz. The TriMedia compiler can be used with C programming, and handles the VLIW scheduling as part of the compilation processing.

A single-chip TriMedia based digital TV design called TM2 is due to be released later this year. The technology is already in use in a Samsung set-top box, while Polycom's videoconferencing unit uses two TriMedia chips. Philips' aim is that the top TV manufacturers will adopt the technology for their digital TV products, opening up a huge market.

Another major development from Philips is the recently announced TDA8060 chip, which is the world's first zero-IF QPSK downconverter IC for use in digital TV tuners. Zero-IF simply means that there is no need for a mixer-oscillator and IF section: the output from the dish is processed directly, enabling receivers for DVB and DBS broadcast systems worldwide to be implemented using only three low-cost ICs instead of five. Manufacturing costs are reduced by minimising the component count and eliminating the need for IF circuit alignment. The overall saving can be as high as 30 per cent. In addition screening is simplified – intermediate frequencies are a common source of radiated interference.

There are also performance advantages. Since there is no possibility of an IF interfering with other signals in the receiver, the number of errors present in the MPEG digital video and audio information extracted from the broadcast signal is reduced, particularly under poor-signal conditions. The result is better picture and sound quality.

The TDA8060 covers all the frequency bands in use worldwide for digital video broadcasting (DVB) and direct broadcast satellite (DBS) systems. It is also compatible with the SMA-TV standard currently being developed in the USA.

Video Developments

JVC has developed the DualCam, which is a combined VHS-C camcorder and digital still camera. The digital camera section can store up to 44 pictures in flash memory in the standard mode, or up to 22 pictures in the fine mode. These stills can be displayed as thumbnail images on the camcorder's LCD screen or fed to a PC. They can also be transferred to VHS-C tape. The DualCam Model GRX880 is due to be released in May.

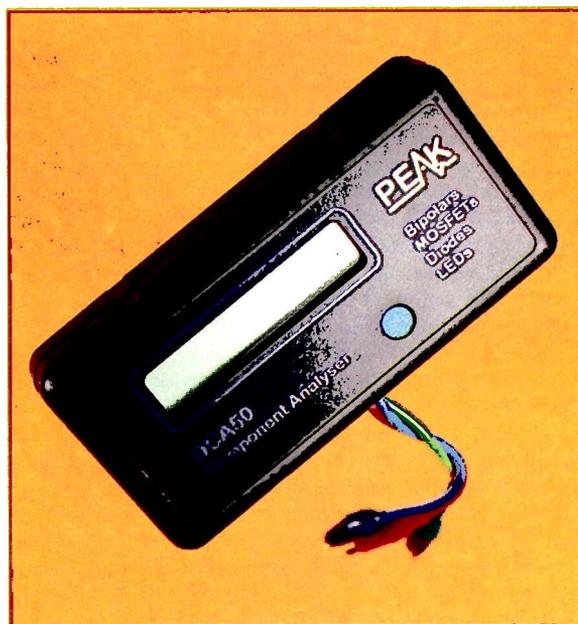
Sony has developed a new videotape library system known as SmartFile. It stores information about the programmes recorded on a tape in a memory IC inside the cassette label. Stored details include programme name, channel number, date and length. VCRs for use with the system are equipped with two SmartFile

sensors to read the data and display it on the TV screen being used. One sensor is on the machine's front panel, the other inside. Sony is to launch the system in the UK later this year. More on these new technologies in next month's CES report.

The Sharp Viewcam Model VLDC3H is a highly compact (167 x 101 x 73mm) digital video cassette system that weighs just 595g. It has a 4in. LCD screen, a 270° rotating lens and provides several special effects such as still and strobe. Maximum recording time is two hours in the standard mode, 50 per cent extra in the long-play mode. Price is around £1,500. An optional digital stills unit, Model VR3SUP, is available for an extra £300.

Test Report

The Peak DCA50 Component Analyser



The DCA50 provides a simple, fast method of determining what an unknown device is and its pin connections. **Michael Dranfield** finds it an invaluable aid for the service department

If, like me, you find data books a real bind when checking transistor pin connections, you need the new DCA50 Component Analyser from Peak Electronic Design Ltd. Though measuring only 13 x 6.5 x 3cms, it's a very advanced semiconductor device checker.

What it Does

The DCA50 automatically identifies the nature of almost any bipolar or MOSFET transistor, diode or LED when the device is attached to its clip-terminated, colour-coded connecting leads. You simply connect the unknown device to the gold-plated crocodile clips, any way round, then press the small, blue recessed button to start the test routine. After a couple of seconds the large, clear two-line character liquid-crystal display (6.5 x 1.5cm) presents the results. The finding is displayed for about twenty seconds – even when the device under test has been disconnected.

On Test

As a first test I connected a 2SC1815 transistor to the clips. It's a general-purpose Japanese transistor. After pressing the button and waiting briefly I was greeted with the following information: NPN transistor, Hfe 380, RGB = EBC. The latter indicates that I had connected the emitter to the red lead, the base to the green lead and the collector to the blue lead. Truly amazing!

The current gain (Hfe) finding for a bipolar transistor could be very useful for engineers who deal with audio/hi-fi equipment, where an amplifier might require a matched pair of transistors to provide optimum performance.

I must say that I was surprised to discover the extent to which the gain of a bipolar transistor can vary, even with devices that have come from the same batch. I checked ten 2SC1815 transistors taken straight off a bandoleer and found that the Hfe figure varied between 90 and 400. Presumably the Thorn T numbered transistors, such as the T9053, were gain-selected BU devices.

The DCA50 can display gain figures from 5-995. In the case of high-gain Darlington types, such as the TIP110, a small arrow is added next to the figure 995 to indicate that the gain exceeds 995.

In the unlikely event that the DCA50 cannot identify the device you have connected to it, the message "no valid part found" is displayed. This message also appears if the device is defective or its operational parameters are outside the limits listed in the User Guide.

With a diode or LED you simply use any two of the test leads. When an LED is tested its anode and cathode are identified and the device flashes on and off. No current-limiting resistor is required – the DCA50 limits the test lead currents internally to very safe levels. With a zener diode you can check the polarity but not the reverse breakdown voltage.

A useful feature is the ability to check three-terminal, surface-mounted double-diode networks. These are used extensively in camcorders but look just like a surface-mounted transistor. The DCA50 detects the two junctions and alternates its display between them, telling you whether there is a common anode or a common cathode.

Most MOSFET transistors can be checked, the DCA50 indicating the gate, drain and source connections, also whether the device has a p or an n channel. The rare depletion-mode MOSFET cannot be checked.

In General

The source of power is a PP3 (or equivalent) battery – one comes with the unit. Should the battery voltage drop below 7.8V the DCA50 displays the message "warning low battery" before it starts to carry out a test. The battery should last for up to eighteen months. There is automatic power on and power off.

The unit has two good-quality fibreglass PCBs inside. One is fitted with a custom-programmed PIC16C64 microcontroller and six smaller chips – all surface-mounted. The other one holds the liquid-crystal display and its driver chips.

This is a good-quality piece of test equipment that should provide years of service. I have found it to be invaluable.

The DCA50 does not seem to be available through any of the large distributors. It can be bought direct from Peak Electronic Design Ltd., 70 Nunsfield Road, Buxton, Derbyshire SK17 7BW at an all-inclusive price of £59. Peak's telephone number is 01298 70 012, the fax number being 01298 70 046.

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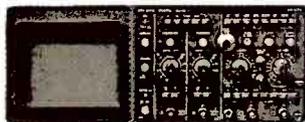
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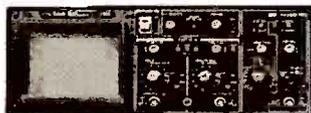
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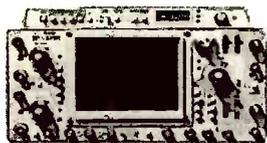


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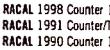


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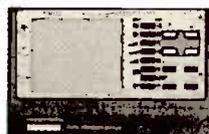


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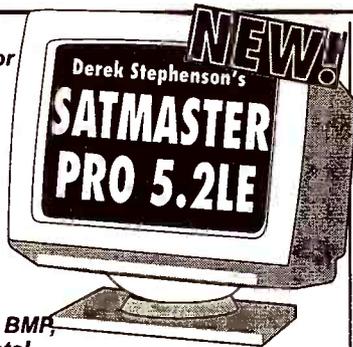
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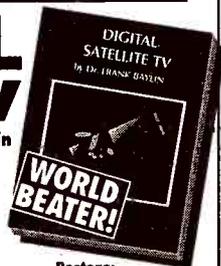
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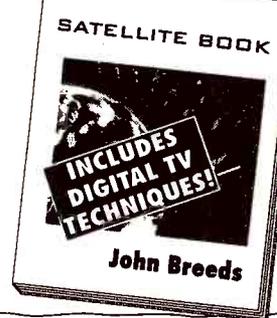
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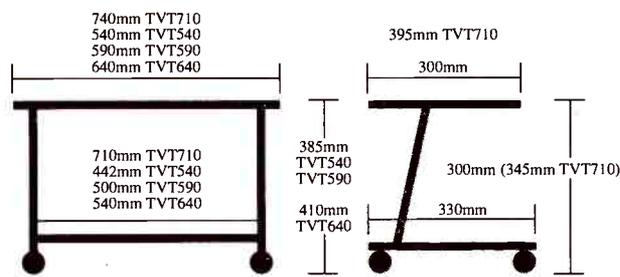
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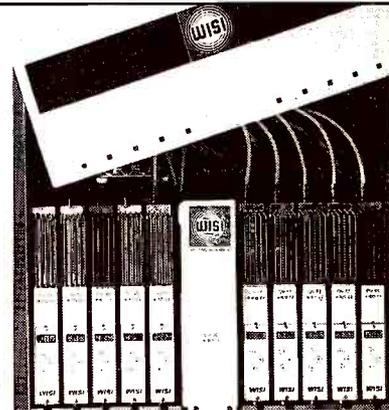
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DYNAMO FLASHLIGHT Interesting concept, no batteries needed just squeeze the trigger for instant light apparently even works under water in an emergency although we haven't tried it yet! £6.99 ref SC152

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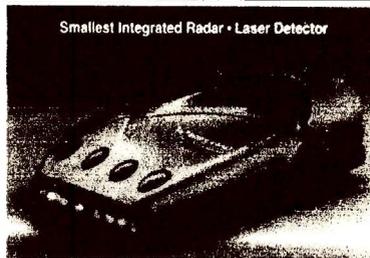
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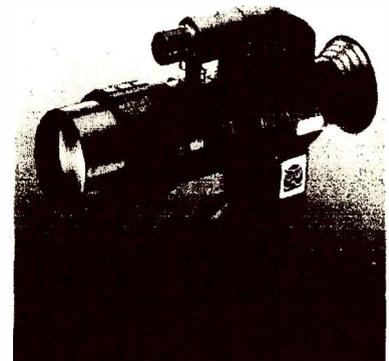
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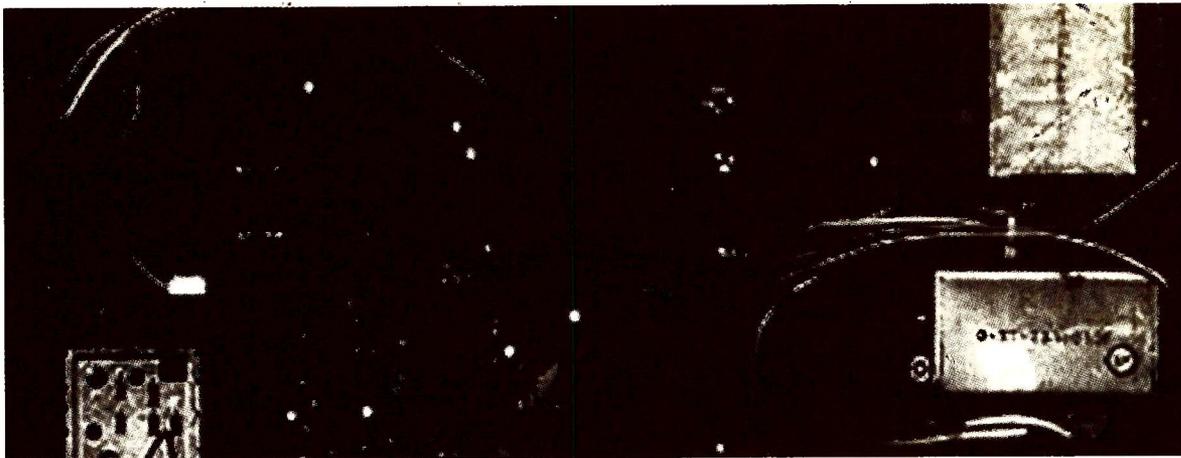
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Satellite Notebook

Reports from
Michael Dranfield
Pete Gurney, LCGI
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Amstrad SRD510

If the problem is patterning that sweeps vertically and is especially easy to see on dark scenes, first try replacing C46 (470 μ F, 10V). If this doesn't clear the fault, replace C86 (100 μ F, 16V) which is next to TR9.

If you repair Amstrad receivers on a regular basis it's worth getting a hundred 47k Ω 0.75W metal-film resistors, part no. 337-377, from Farnell Electronic Components (phone 01132 636 311). These resistors are rated at 350V. Fit them and you will never get a comeback again. **M.Dr.**

Pace SS9000

The owner of this set was new to the area. After moving in he found that his receiver refused to power up with the dish connected. I was told that the power supply had been rebuilt some months previously.

After checking for feeder shorts etc. I turned attention to the power supply. With the set on the bench it was obvious that even without an LNB connection the supply line voltages were much too low – the 5V line was at nearer 3.8V. Scope checks showed that the electrolytic capacitors on the secondary side of the supply were intact, but I replaced them all anyway because they were the original ones which do tend to dry out. I then replaced the usual items on the primary side – the 100 Ω resistor R5, the 1 μ F capacitor C11 and the potential divider that supplies pin 7 of the TDA8380 chopper control chip U23 – though their values were all correct. Further checks showed that the voltage at pins 14/15 of U23 was a little high. When the 0.22 Ω fusible resistor here (R13) was checked it was found to have risen to almost twice the correct value. As a result, the power supply was in the current-limit mode. A replacement of the specified type restored correct

supply line voltages and cured the fault. **P.G.**

Hwa Lin Modulators

Pace SS9000/9200 series receivers, also the D100 and D155 MAC decoders, use Hwa Lin UHF modulators. In recent weeks I've had three separate SS9200 receivers and one D150 decoder that have produced good pictures via the scart socket but poor video quality with the UHF output. The symptoms were tearing on captions and wobbly verticals. No amount of TV receiver fine tuning helped.

The culprit is soon found when you remove the modulator's cover. A 1 μ F capacitor, normally green, is used for video input coupling. It's next to the preset resistor and the third modulator pin from the left-hand side of the can, looking in from the rear of the receiver (mains input socket on the left).

For good measure, also replace the other two electrolytics in the can – the adjacent green one is 0.1 μ F, the black one by the intercarrier sound coil 10 μ F.

The problem must be coming to light now that these capacitors have taken their maximum dose of heat as a result of living inside the receiver.

The modulator in Model SS9000 is slightly different, with two intercarrier sound coils. I've not as yet had the capacitor problem with this one – probably because fewer of these receivers are still in use. **H.C.**

Pace MSS100

One of our customers rang to complain that a flashing, unset clock was always present with radio reception. TV channels didn't display the clock. The clock display on a blank radio screen can be switched on and off by pressing the i and store buttons in quick succession – whether

or not the menus are locked with a PIN.

I've never really understood the clock feature with Pace receivers. If the mains power is removed, even briefly, the time is lost. In this part of the world (Portugal), where power supply cuts are fairly common, it's barely worth setting the clock with a new installation. It would, ideally, be nice to have the clock retain memory – even limited – in the event of a power supply failure, or to have the facility in the set-up menu to add or delete the clock. Failing this, how about replacing the flashing clock, when it's not set, with just a non-flashing "clock not set" message? **H.C.**

The Green Box

A few weeks ago I installed a number of Pace MSS100 receivers at holiday villas. With one exception, each villa had its own fairly recently installed terrestrial TV aerial, with good quality coaxial cable. As the cable route into the villas was a bit difficult, I decided to use the existing cables where possible, with diplexers to combine and split the terrestrial and satellite TV signals.

There was an urgent request to install a system at one of the villas late on a Friday afternoon. The two adjacent villas were to be fed from the same dish on the following Monday. As they were occupied at the time, I didn't have access to them.

I diplexed the satellite IF signal into the existing terrestrial aerial cable and was rewarded with good results. At the time I didn't take much notice, but one of the villas to be visited on the Monday didn't have a terrestrial TV aerial on the roof.

When Monday came I had access to the other two villas. My first job

was to locate the existing cable routes. The first villa had good local TV reception, and I then recalled the absence of a terrestrial TV aerial. Eventually I found a small plastic box outside, with the feeds from the roof. This included Friday's satellite IF feed. The box's inputs and outputs were linked by simply being twisted together – for good measure the connections had corroded and gone green! It was a surprise that everything had worked so well on Friday, with no evidence of HF roll-off or the odd weak channel. The satellite IF signal was present at the TV aerial socket, along with the DC voltage for the LNB.

In the end I fed the three adjacent villas via a magic switch, with the terrestrial signals fed to it from one aerial. This worked well, and made one of the existing two terrestrial TV aerials redundant.

Another villa gave me a headache as the coaxial cable, which was in an underground pipe, provided good terrestrial reception but didn't have DC continuity. It was well and truly stuck, and couldn't be moved. A lot of drilling through thick walls was required to bring a new cable into the villa.

In another case the satellite signals ceased within a few hours. The cause was a poor connection inside the diplexer, between the F socket's inner tab and the PCB. **H.C.**

Pace SS9000/9200

I normally carry a Pace remote control unit with me in the car. Some customers lose their remote control units and are content to use the front-panel controls to change channels. At one such customer's house I had to do some retuning and had left the remote control unit in the workshop. Fortunately you can, with the SS9000/9200, use the front buttons to tune and store channels.

When you press standby and channel up at the same time the normal tuning menu appears. The up/down buttons then have the same functions as when you tune via the remote control unit. To go down through the tuning menu you press standby alone – this is the same as pressing setup with the remote control unit. To store a channel you press channel up/down and standby at the same time, then select the number you want to use to store the reprogrammed channel via the up/down buttons. Store again by pressing all three buttons at once.

If standby and down are pressed at the same time the receiver will scan through the band – same as setup followed by 3, or 3, 6, 9 using the remote control unit. **H.C.**

Universal Remote Controls

Quite a few of our customers use these nowadays. They abuse them just the same. This particular one had a small green LED that should flash twice when the initial TV/sat receiver/VCR code is correctly entered, but all it did was to flash when the batteries were installed. After that it did nothing.

I cleaned up the PCB, though there wasn't much evidence of dirt on it. This made no difference. So I opened the unit again and noticed some muck between two of the pins of a large, surface-mounted IC. Once I'd carefully cleaned up around the chip and applied power, normal operation was resumed. **H.C.**

Cambridge RD480

All sorts of erratic operation problems with these receivers can be caused by dried out capacitors in the power supply. Known culprits are C47 (22µF), C58 (0.47µF), C39 (10µF), C16 and C20 (both 1µF) and C173 (100µF). We now replace all these capacitors as a matter of course. It generally makes further investigation unnecessary. **A.S.**

Panasonic TUSD200

There was no display though the power supply worked. Checks on the secondary side of the circuit showed that the voltage at the cathode of the 14V supply rectifier D14 was low. Its associated reservoir capacitor C21 (2,200µF, 25V) looked a little brown on top and turned out to be the cause of the fault.

Another problem was that the centre pin at the aerial input had moved back into the socket. It can be pushed back from the rear then secured with some Araldite. I've had several of these Pace receivers (PRD800/900 series) with this fault. **I.R.**

Lighting Trouble

The owner of a Pace MSS200 receiver phoned to say that his house had very nearly had a direct lightning hit. This had caused various problems one of which, unsurprisingly, was the satellite system now permanently displaying the "LNB Short-circuit" message. The telephone line enters the house near the dish. As the phone/fax no longer worked, it was likely that the LNB was indeed faulty. In addition to the lightning, a small hurricane had brought down trees in the vicinity.

When I replaced the LNB I was greeted with the same message. A replacement receiver then produced normal results – once the dish had

been realigned (it had adjusted itself very nicely for reception of the Eutelsat bird at 16°E!).

At this point I beat a hasty retreat to the workshop with the suspect LNB and the faulty receiver. The LNB turned out to be dead. The receiver worked normally when not supplying any LNB power: the correct H/V voltages were present at the receiver's F socket, but the slightest load (in this case a satellite signal meter) reduced the voltage with the result that the overload detection circuit came into operation and the pink screen message appeared.

The culprits turned out to be R452 and R208, which were open-circuit. They are both 1.8kΩ resistors and are connected in parallel between the 14V supply and the collector of Q25, at the front of the PCB – roughly in the middle.

Apart from the damage to these resistors the receiver was OK! It's interesting that R452 was added when early production receivers were found to be over sensitive to the LNB current, with the result that the warning circuit would operate. **H.C.**

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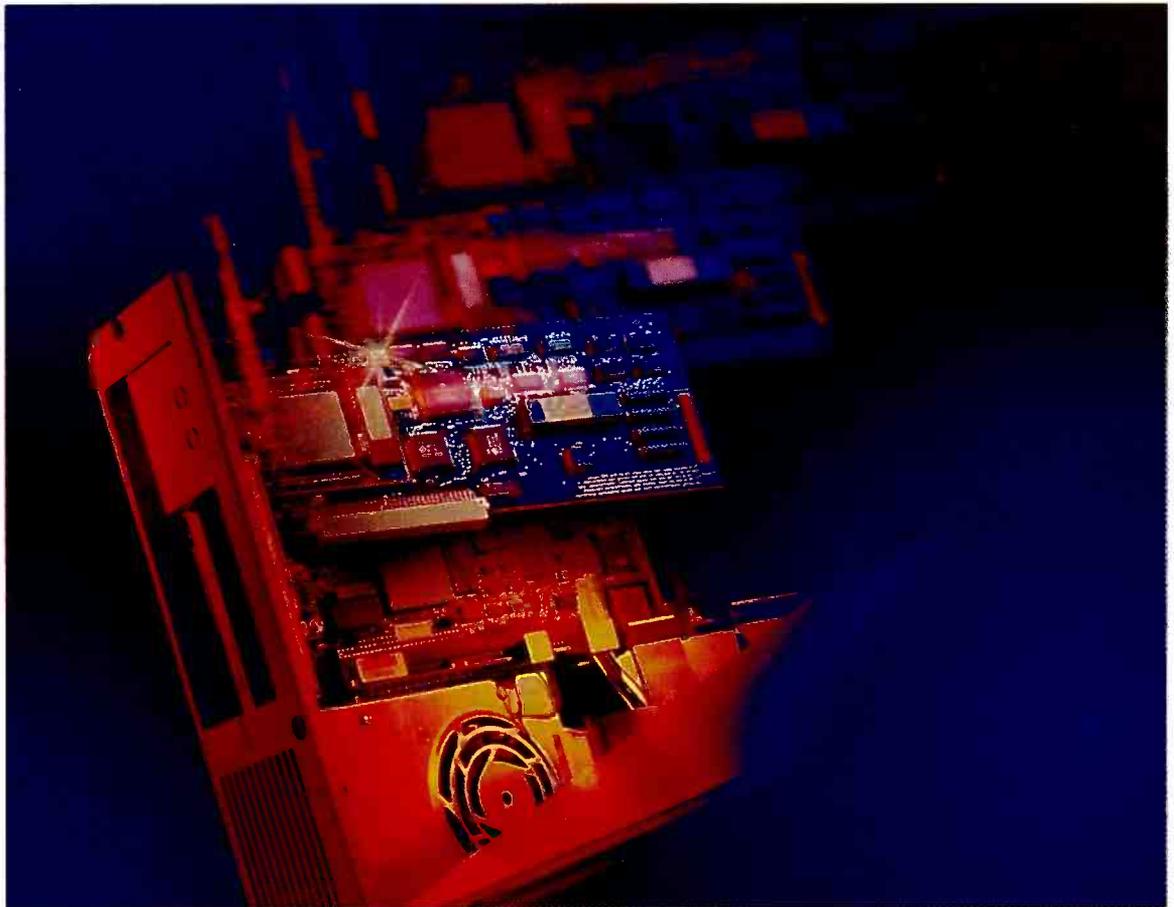
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PC Pitfalls

Personal computers can provide scope for a worthwhile extension of the service engineer's activities. Upgrades in particular are often requested, but there can be problems with these. Colin McCormick provides guidance on what can be done and the snags that can arise. The article is in two parts, to be concluded next month

It is all too easy to fall into the belief that building or upgrading a PC is simply a matter of fitting the parts and installing the relevant drivers. In a good day this can be the case, but there are many pitfalls that can result in wasted time and money and a poorly performing PC. In this article, which is not claimed to be exhaustive, some of the difficulties I've encountered will be described.

It's assumed that the reader is aware of the main items in a PC and what they do. We will be considering relatively modern machines. The intention is to provide advice on some of the main areas that cause

problems for those who build and upgrade PCs, rather than to tell the reader how to build a PC.

Processors

No one would today contemplate building a PC with a processor of 486 or earlier specification. This is not to say that a high-performance 486 is of no value: it would simply not make economic sense to use one. Many people assume that an Intel Pentium is the processor to use. This is fine if finances allow, but there are alternatives worth considering. In particular the AMD K5 and K6 and the Cyrix 6X86, which is also sold under the IBM name, all fit the Socket 7 standard Pentium class motherboard. But the fact that a processor fits doesn't mean it will work: the motherboard's instructions will have to list the processor you specifically want to use.

The AMD K5 for example is a conventional Pentium equivalent. While the K5 PR133 and earlier processors are now becoming obsolete, the K5 PR166 is still widely available at a very reasonable price, offering excellent value. It runs at 166MHz internally: the motherboard is set to run at 66MHz (bus speed). The other motherboard settings you need to know are the multiplication factor and the supply voltage. With the K5 PR166 the nominal supply voltage is 3.52V, but the device will work between 3.45V and 3.6V.

The bus speed, multiplication factor and supply voltage information for each processor type will often be found in the motherboard's instructions, but not always. Sometimes the instructions merely list the various settings available, so you must know what settings are required for the processor you wish to fit. This information is often available at the processor manufacturer's web site, for which you need internet access of course.

Sometimes the settings are not as obvious as they appear to be, for example processor speed. Non-Intel processors have a PR rating, which is a Pentium equivalent performance figure. The K5 PR100 does run at 100MHz, but the Cyrix 6X86 PR200+ runs at 150MHz. Although the 6X86 PR200+ claims to have somewhat more processing power than the Pentium 200 – hence the name PR200+ – in practice this is an optimistic claim.

The AMD K5 PR166 processor has an unusual multiplication factor, 1.75, which is preset within the chip. The motherboard's multiplication factor will not have any effect on the processor's operation, but for neatness set it as though the processor is a Pentium 166MHz. Table 1 lists the settings for various processors – it has been compiled from the best information I have available. Contradictory information is sometimes issued, and manufacturing processes keep changing – so don't blame me if this list is not flawless!

MMX is one of the newer processor technologies. AMD K6 series chips and the Cyrix/IBM 6X86MX (may be referred to as M2) as well as the Pentium MMX itself are all MMX compatible. It provides a modest performance gain, but again the motherboard will have to be able to work with such a processor. These processors require dual voltage supplies, for their I/O interface and for the core. If your motherboard says it's MMX compatible, it should meet this requirement – even if the instructions on how to achieve this are less than clear.

A word of warning about Cyrix/IBM 6X86 processors: some motherboards claim to be able to work with them but won't. The reason for this is as follows. Earlier 6X86 (C028 process) versions require a 3.52V supply. Later ones (C016 process) require a 3.3V supply. Later ones again (6X86L) require dual 3.3V and 2.8V supplies. The instructions for some motherboards say that a 6X86 processor can be used, but this may not be true of all versions. Be sure that your motherboard can provide the correct supplies before you consider using one of these processors. If you obtain a 3.52V version, note that it requires a special high-power cooling fan rather than the normal Pentium type.

There have been reports that certain applications won't work with these chips. The cause may not be with the processor but with the fact that some badly written software relies on loops in the code for timing: the processor outwits these loops, so the applications fail. Ways of dealing with this are often to be found on the internet.

Because of bus driving capability, earlier versions of the 6X86 can cause problems for users of Windows NT4. For such users the 6X86L is advisable.

Some non-Intel processors, such as the 6X86 PR200+, require a motherboard speed of 75MHz. Since no Intel processors require this, Intel motherboards don't provide it. This is not as selfish as it may sound. If the motherboard is run at 75MHz, the PCI (Peripheral Component Interconnect) bus must run at

half this speed, i.e. 37.5MHz, which is higher than the 33MHz that's guaranteed to work. Some PCI devices, such as video cards, might not work properly though modern cards should be OK. Some processors require a 3.5X clock multiplier, but not all motherboards have links for this. In this case the 1.5X setting may be identical to 3.5X – you can't tell until you try it!

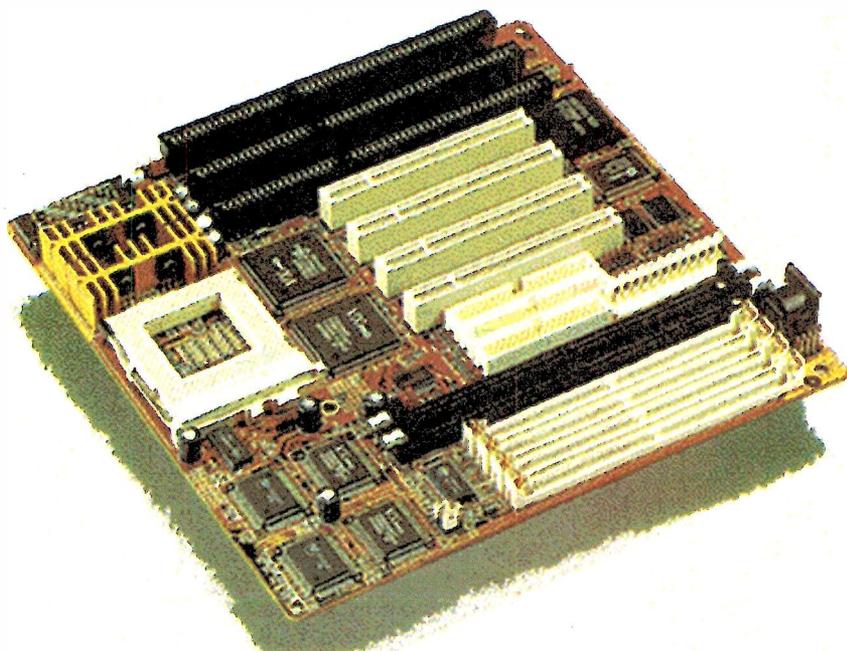
The new Cyrix MediaGX processor is not Socket 7 compatible. It incorporates much of the multimedia processing on-chip. Intel Pentium II processors require a motherboard with the Intel Slot 1 rather than (or as well as) Socket 7. The Pentium Pro processor requires a special motherboard: it's intended mostly for commercial applications that use Windows NT.

Note that Pentium class processors take a fan and heatsink that clip on the motherboard's Socket 7, whereas 486 processor fans clip on the processor itself. Use of some heatsink compound is highly recommended. The fan usually takes power via a plug-and-socket arrangement which is in line with the power supply to the hard disc or suchlike.

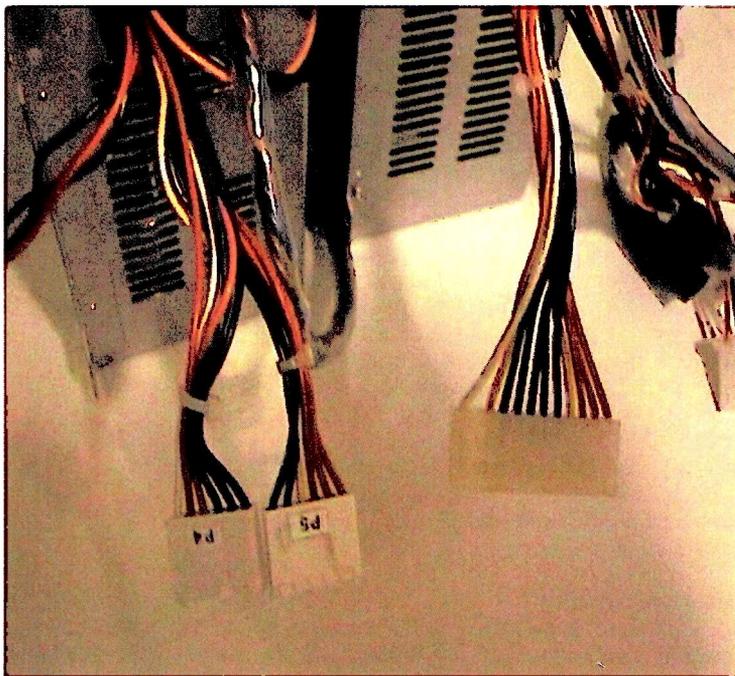
Motherboards

From the above it may seem that selection of a motherboard is simply a matter of finding one that satisfies the requirements of all the processors you might ever want to use with it. A range of motherboards with varying performances is available however, fitted with chip sets from different manufacturers. Intel is one of the largest, and just as with selection of an Intel processor an Intel motherboard may be the way to achieve a hassle-free system, though not necessarily providing the best value for money. Intel's current offerings have either an economy chip set called VX, a higher-performance one called HX or the latest which is called TX. These chip sets may also be used with motherboards from other companies. There are alternative chip set manufacturers such as OPTi and SiS, also ranges called VXPro, HXPro and TXPro. These latter illustrate some of the good and bad points of using a board other than an Intel one.

One of the cheapest motherboards is the PCChips M537 VXPro which I have installed, with an AMD



The PCChips M537 motherboard.



Two motherboard power supply connectors (left) or a single connector (right) may be used.

K5 PR166 processor, in my own PC. It can be bought for around £50. This looks like excellent value, and within certain constraints it is. One problem is that none of the currently available tape streamers will work with its floppy interface. The reason for this is that all new tape streamers (over 1Gbytes capacity) require at least a 1Mbyte floppy interface instead of the older 500Kbytes standard. Another problem is that if a hard disc that has a previously installed version of Windows 95 is used with the motherboard the IDE (Integrated Drive Electronics) interface is not properly recognised. As a result, Windows 95 drops to a slower 'compatibility mode'. This can be overcome by installing driver software, which is very painful: the best solution is to wipe Windows 95 and reinstall it. One final problem can be failure of the board to identify the floppy drives correctly, and the A/B swap facility not working correctly. So installation can be hard work. Despite this, the board works well and fast and offers several features not normally present with Intel boards.

What all this illustrates is the effort that may be required with a non-Intel solution. But for the experienced PC enthusiast the result may be worthwhile. The PCChips M537 VXPro board can be bought from Choice Peripherals (0845 144 4444). For a description, refer to the PCChips web site (www.pchips.com).

Other considerations when selecting a motherboard may be mechanical rather than electrical. Often there are only three ISA (Industry Standard Architecture) slots, and one of these is usually shared with the first of the PCI slots. So there can be a shortage of ISA slots. Since most PCs will use one of these for the sound card and perhaps another for a hand-scanner interface, only one is left for a tape streamer accelerator or a video capture card. One ISA slot can be freed by using a PCI sound card. But these cards are not particularly common, possibly because they cannot work with DOS applications other than Windows 95.

Another mechanical consideration can be the processor placing relative to the ISA and PCI slots. Some longer cards may clash with the processor or memory, so that fitting is difficult or impossible. With some motherboards the mounting fixtures will not be in the same place as in the case you intend to use, and occasionally you may find that a vital component such as the processor fan collides case drive bays. I even had one case where the motherboard's power supply connector was so placed that the power supply cables wouldn't reach it.

Connections

The case's front panel connectors (reset, lock and turbo switches and LEDs and the speaker) will usually fit any modern motherboard with only a modest amount of messing about. Motherboards tend to supply a signal to the front panel to indicate whether the board is in the turbo or low-speed mode, but the case's front panel sometimes doesn't have a cable for this – the signal is taken directly from the turbo switch. Care needs to be taken when fitting the fiddly front panel connectors: it is possible to short across the 5V line, which could result in track damage. I usually check everything out with a meter initially – even then it's possible to get the lock/unlock or turbo/slow conditions crossed.

Some cases have a two or three seven-segment LED display at the front. Typically this will show the processor's speed or PR rating in MHz when in the turbo position and some other parameter in the slow-speed position. Years ago this would have been something like 20 (MHz) turbo and 8 (MHz) slow. The slow position has become increasingly meaningless over the years however – modern processors still go like the wind even when asked to run with the brakes on! You can get the display to read "LO" in the slow position if you have a mind to, but fitting the links on the PCB behind this display can be very tricky to get right unless you have the appropriate instructions – or just as tricky if you have them!

Some power supplies have one motherboard connector, others have two. If there are two, they are inserted together so that the black wires to each connector are side by side. I often superglue the connectors together in this way to prevent subsequent confusion.

Testing

Each time I build a PC I am reminded that on the previous occasion I vowed "never again"! Possibly the most terrifying moment comes when you have fitted the processor, memory and video card to a brand new motherboard. You will have spent some time hoping that you have understood which links go where, and double-checking them, especially the supply voltage ones. You then switch on and hope that the BIOS (Basic Input/Output System) start-up screen will appear. Maybe it will. Or maybe you will get some ugly beeps from the speaker.

It is unlikely that the motherboard's instructions will be so helpful as to tell you what the particular bit of Morse code you have just heard actually signifies, but it may be telling you that there is an impermissible memory configuration or that the video card isn't working. The worst that can happen is that you get nothing when you switch the PC on – no beeps, no display, nothing whatsoever. Have you made a mistake that has destroyed the processor, motherboard, memory, video card or a combination of these? It can happen, but you would be very unlucky if it did.

If you have just built or upgraded a PC and you get no results or nasty sounding beeps, you must start by stripping all the non-essential items off the motherboard. Leave the board with just the processor, memory and video card. Once you have that working, add the floppy and hard discs followed by niceties such as the sound card and interfaces for scanners, tape drives etc. It might seem like hard work to have to do this stripping down, but it's the only way of getting to the bottom of a seriously unwell PC.

A good example is what happened when I added some memory to my own PC recently. After doing this there was no display and the PC wouldn't boot up. I removed the new memory and it still didn't run. The cause of the problem was the video card, which had been pushed by some cables and didn't make proper contact in its PCI slot.

The Case

Before you contemplate the upgrade of a PC's motherboard, be sure that the case is a standard one. Some manufacturers, such as Dell, Hewlett-Packard, Compaq and Packard Bell, have built PCs using their own layout. Such PCs often won't accept a standard replacement motherboard. They may also have some functions such as the video driver built on to the motherboard, so these will also have to be replaced.

Most slimline desk-top PCs have non-standard arrangements. To upgrade the motherboard in such a PC you will probably have to buy a new case and whatever other items may be non-standard, such as the memory, floppy drive, keyboard and mouse. It may be simpler to discard the lot and start afresh. For this reason I would advise against purchasing a PC of this type in the first case. Some upgrades to this type of PC might be possible however, such as the processor or hard disc. You are likely to need the motherboard instructions to be able to check for compatibility.

Memory

Most memory is these days supplied as either 72-pin SIMMs (Single In-line Memory Modules) or 168-pin DIMs (Dual In-line Memory - the other m got lost somewhere along the line!). The latter is the new, faster standard, but is more costly. A Pentium-class motherboard with 72-pin SIMM sockets can use conventional 72-pin SIMMs DRAM "fast-page mode" memory left over from a 486, but a modest performance improvement will be obtained by using the now cheaper EDO (Extended Data Out) SIMMs.

Synchronous DRAM (SDRAM) is now available at a higher cost, and runs at the full motherboard speed. But on many boards the two types cannot be mixed.

DIMs are a bit more complicated. They come in 3-3V and 5V versions: a motherboard with DIM sockets will invariably be able to supply both voltages. There's another form of memory, BEDO (Burst EDO). This is faster than EDO when the motherboard speed is higher than 66MHz. It's relatively uncommon however, so let's not allow it to confuse us.

Modern motherboards usually come with all the cache (buffer) memory they will take (often 512Kbytes of Pipelined Burst Synchronous cache). Some older ones have a slot or DIL sockets to enable more to be added. The addition of extra cache memory once a motherboard has been purchased can be fraught with incompatibility problems: quite frankly, I don't recommend it. Performance improvements are marginal anyway, particularly if you use EDO memory which has its own cache.

Table 1: Processor settings

Processor	Motherboard speed (MHz)	Multiplication factor	Notes
Pentium-75	50	1.5X clock (50/75MHz)	-
Pentium-90	60	1.5X clock (60/90MHz)	-
Pentium-100	66	1.5X clock (66/100MHz)	-
Pentium-120	60	2X clock (60/120MHz)	-
Pentium-133	66	2X clock (66/133MHz)	-
Pentium-166	66	2.5X clock (55/166MHz)	-
6X86 PR120+	50	2X clock (50/100MHz)	-
6X86 PR133+	55	2X clock (55/110MHz)	(1)
6X86 PR150+	60	2X clock (60/120MHz)	(2)
6X86 PR166+	66	2X clock (66/133MHz)	(3)
6X86 PR200+	75	2X clock (75/150MHz)	(4)
6X86MX PR166	66	2X clock (66/133MHz)	(5)
6X86MX PR200	66/75	2.5X 66MHz or 2X 75MHz	(5)
6X86MX PR233	75	2.5X clock (75/187MHz)	(5)
AMD K5 PR75	50	1.5X clock (50/75MHz)	(6)
AMD K5 PR90	60	1.5X clock (60/90MHz)	(7)
AMD K5 PR100	66	1.5X clock (66/100MHz)	(7)
AMD K5 PR120	90	1.5X clock (60/90MHz)	(8)
AMD K5 PR133	66	1.5X clock (66/100MHz)	(8)
AMD K5 PR166	66	1.75X clock (66/116.6MHz)	(9)
AMD K6 PR166	66	2.5X clock (66/166MHz)	(10)
AMD K6 PR200	66	3X clock (66/200MHz)	(10)
AMD K6 PR233	66	3.5X clock (66/233MHz)	(11)

(1) Few boards work at 55MHz.

(2) Same as Pentium-120.

(3) Same as Pentium-133.

(4) 75MHz motherboard.

(5) 2-8-3V core. With 6X86MX PR233 see (4).

(6) Same as Pentium-75

(7) Same as Pentium 90.

(8) Set multiplier links to 2X.

(9) Set multiplier links to 2.5X.

(10) 2.9V \pm 145mV 7.5A supply.

(11) 3.2V \pm 100mV 9.5A supply.

Older motherboards, including some 486 ones, use 30-pin SIMMs. These are now expensive. With most systems they need to be fitted in pairs, and mixing different types or speeds can cause troubles. The 72-pin SIMMs used with Pentium class PCs need to be fitted in pairs. They can be fitted singly in a 468 PC. DIMs can always be fitted singly. Most motherboards have listed in their instructions the combinations that can or cannot be fitted to obtain various amounts of memory.

Further confusion can arise because not all 72-pin SIMMs are the same, particularly 8Mbyte ones which can be single- or double-banked (often called single-/double-sided, which is not entirely accurate). Some motherboard instructions may say that certain combinations that don't work are permissible, or that they won't work though they do! Experimentation may be the only sure way to find out: no damage should arise.

Most modern 468 and Pentium PCs do not require parity (ninth check bit) at their 30-pin or 72-pin SIMMs, but there are exceptions. Some 468 motherboards provide selection of parity or non-parity memory in the BIOS set up.

TO BE CONTINUED

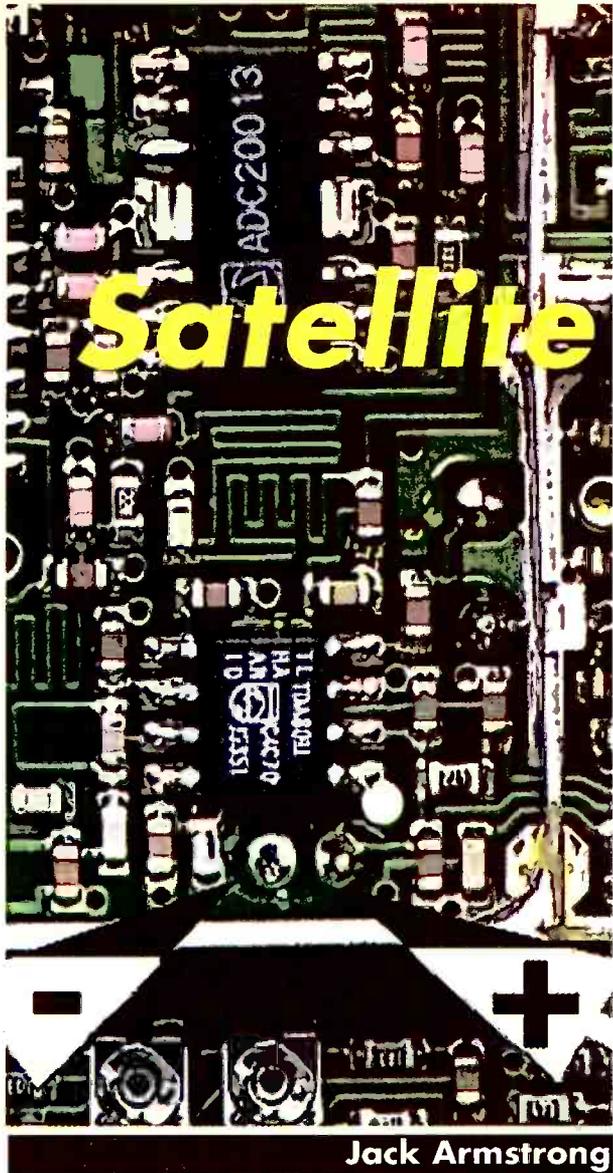


Fig. 1 (above): Positions of the pads for C41 in the Amstrad Model SR950+.

Amstrad SR950+

"I've written my diagnosis on the label" the customer said.

"That's helpful" I replied, "but I can't read it and I'd prefer to know the symptoms."

"Symptoms? Ah, symptoms. I didn't get where I am today without knowing how to describe a symptom. It's the tuner. Faulty."

As Dr Smith is getting on a bit I didn't like to press him for more information. So I filled in the ticket and handed him the receipt.

Satellite WORKSHOP

The SR950+ is actually a rebadged SRD700. Tuner faults are usually bad news with these receivers: most of the video and sound demodulation circuitry is incorporated in the tuner, which is therefore very expensive. I feared the worst when I connected the LNB cable and saw very sparkly pictures. I tried the tuning mode, but that didn't improve matters at all.

Rather than condemn the tuner outright, I decided to check whether the cause of the problem might be a faulty electrolytic capacitor. Inspection of a dead tuner from another of these receivers revealed that C41 (10 μ F) is mounted close to the IC, and is thus the most likely capacitor to suffer from excessive heat. As removal of the tuner takes about half an hour, I connected a new 10 μ F capacitor across the relevant print pads (see Fig. 1) then switched on. My guess proved to have been correct: the picture was now perfect. So I phoned Dr Smith.

"Hello, doctor. The patient has been cured and the prognosis is good – provided you keep her cool. No, you won't need an ambulance. Just bring your car – and, er, don't forget your cheque book."

Toshiba TS540

The TS540 is actually the Pace MSS500. This particular one had a very dim fluorescent display. When I'd replaced the 22 μ F electrolytic

C2 on the display panel with a 1 μ F, 50V multilayer ceramic capacitor, as recommended by Pace, the display was nice and bright.

In fact nowadays I cheat. It's a delicate task to remove the display panel without cracking it in half, so I solder the replacement capacitor across the pads on the back of the board instead. Since the original electrolytic capacitor goes open-circuit when it fails, I see no problem with this 'bodge'. It saves time and avoids calamities. The trick lies in knowing the exact position of C2.

When the LNB was connected to the receiver there were bad black and white sparklies on several channels. This is quite a common effect with some Pace tuners when the receiver has been in a cold place for a time. On this occasion however use of the hairdryer to warm the tuner produced no improvement. Even with the AFC set to manual some sparklies remained. I decided that the tuner was faulty.

The AFC worked nicely and the pictures were free from sparklies once a new tuner (part no. 221-2178012) had been fitted. But the picture looked decidedly streaky and, after half an hour, very strong broken white lines appeared across it. I suspected that this might happen when I saw the colour of the electrolytic capacitors in the power supply.

I dismantled the receiver again and replaced all the electrolytics in the power supply area. Experience has taught me that it's quicker to do this than to trace the two or three actual culprits. Conveniently, the parts are available in the SatCure (phone 01270 753 311) reliability kit Relkit 6: it contains the correct 105 $^{\circ}$ C, low-ESR and Ultra High Reliability capacitors that Pace recommends.

The final invoice was rather high compared with say a PRD800 receiver repair, and the customer declined my offer to fit a miniature cooling fan. I didn't mind. "See you again in twelve months" I said cheerfully to the customer, who is one of those who likes to keep his equipment nice and warm.

TV, Video and Satellite Servicing

Lots of people are taking advantage of my free help service via e-mail. But some forget that I handle only satellite receiver repairs. Anyone in the TV trade who would like to join an e-mail self-help group that deals with TV sets and VCRs should contact Chris Davies by e-mail at:

dad@deathdoor.com

or try the following Web page:

<http://www.geocities.com/CapeCanaveral/Lab/116>

Jon Lye runs a bulletin board – phone 01275 879 005. Contact Chris Davies if you want further e-mail information.

Previous issues of Satellite Workshop are now available via the SatCure website:

<http://www.netcentral.co.uk/satcure/>

They are unedited and unexpurgated originals, warts and all! There are also frequently asked questions (and answers) about the most common UK satellite receivers, and some 'bargain buy' electronic components, both new and surplus.

Grundig GRD150

For some reason I've had a lot more trouble with these receivers than with the average Pace or Amstrad model. Though the receiver is inherently more reliable, or was during the guarantee period, the faults that are now occurring seem to be difficult ones to trace. Perhaps this is because most of the signal processing is carried out by an "application specific integrated circuit", which is a 64-pin, surface-mounted device.

Anyway the receiver that came to me on Christmas Day (yes, people really do need to watch satellite TV that badly!) was "stuck in standby". It would light up but didn't respond to button presses. This was tricky.

After checking the power supply voltages I jumped in with both feet and replaced the microcontroller chip and its associated crystal. I was clutching at straws – and I was wrong. It had to be something that's connected to the I2C data bus. Maybe the EEPROM. But wait a minute – the tuner is also connected to the data bus. As I looked across to it I spotted a crack which had propagated from the tuner securing lugs across two

adjacent tracks. Repairing these cured the fault.

The pub owner's wife was impressed by my speedy service. Her husband was less impressed with my invoice – but he still drew me a pint.

Pace PRD800

Christmas time always brings some curious faults – and some curious people as well. In walked this fellow who was wearing a red coat with hood and sported a snow-white beard. He pulled a PRD800 out of his sack.

"Just on me way t't' school" he mumbled, "gotta give out t' presents t't' kids you know. Darn satellite won't tune above 11.573. All I get is snow. Missing me Eurosport. Faulty fuse, I'll bet. Bung us in another, ta." He then shuffled outside into the snow and disappeared.

Sure enough there were no programmes above a certain frequency. At first I thought that the power supply might be switching my universal LNB to high-band operation, but there was no sign of interference on the supply rails. Unconvinced, I fitted a new tuner. It made no difference at all. When

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.

I monitored the tuning voltage I found that above a certain frequency it switched from 1.6V to 4.8V and stayed there. This couldn't be caused by anything other than the Nicky IC. So I replaced it and was rewarded with normal operation.

The customer had thoughtfully put his name on the label, but there was no telephone number. Maybe I could get it from directory enquiries? He sounded local. Unfortunately the operator had no listing for "Mr S. Claws".

Test Case 423

Poor old Cathode Ray! He'd no sooner mastered phasing up a Sanyo VR150 deck than he got involved with a pumping Thomson TV set. This had to be put to one side while he pondered a mistracking problem with an urgently required Panasonic S-VHS VCR. He'd hardly found where the oscilloscope probes were to go when the wretched loudspeaker above the workshop door summoned him to the office to be sent off on some outside service calls. And all he wanted to do was to watch his Wallace and Gromit tape.

The above problems were all resolved in the fullness of time, with some help from his friends. But one of the field calls resulted in a new model to us being brought into the workshop, an Hitachi C2514TE. Though it couldn't be dealt with at the customer's home, the fault was a fairly minor one: the teletext image flickered. Ray assessed the set's performance carefully. The off-air pictures were OK, but the captions and graphics on text pages had a flickering, skimming effect. Not vertical judder exactly, but more lively and disturbing to watch than the text displays produced by other sets in the workshop.

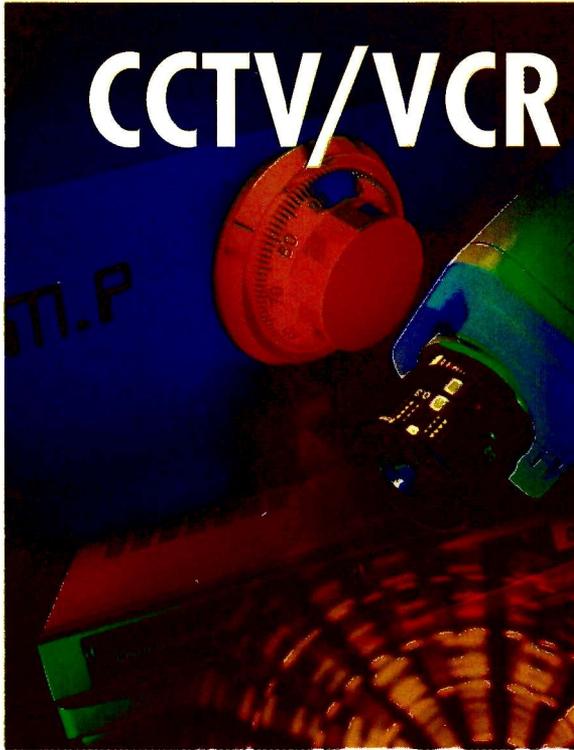
Ray kicked off by feeding a signal from another set to the Hitachi receiver's scart socket. As before, the picture was OK but the text flickered. A close examination of the text display revealed that there were no clearly visible scanning lines: with the other sets in the workshop, the text displays had a coarser but 'steady' line structure. So the problem had to be something to do with the field scanning. Off came the back, and out came the circuit diagram. Most of the circuitry in this 1996

design is contained within two 52-pin chips, an SAA5296 microcontroller (IC001) and a TDA8361 signal processor (IC201). Apart from the power sections there's very little else. IC601 provides the drive to the field scan coils: it's purely an output device, the field ramp generator and sync sections being within the mighty signal processor chip.

An oscilloscope check at pin 43 (vertical output) of IC201 showed a ramp waveform which remained the same when the set was switched between picture and text displays. It wasn't very clear to Ray which of the two big chips contained the text decoder, but this didn't seem to matter as the decoding was OK: the data on the screen was correct – but flickery. There are only two links between IC601 and IC201, the ramp output from IC201 and a feedback network that takes in the height control. Both of them appeared to be in order, and the field scanning was full and linear. Where next?

Another technician had a look at the screen and told Ray that there was an interlace fault. What he was seeing was interline flicker. The text display was interlaced: it shouldn't be. He drew Ray's attention to pin 27 of IC001 and to Q009 nearby. The IC pin passes a 25Hz squarewave to the transistor, whose collector is connected to the earthy side of the field scan coils. How could this have anything to do with interlacing, which as Ray understood it is concerned with the timing of the start of successive field scans? There was a 50Hz ramp-and-pulse waveform at the collector of Q009.

How does this circuit work – and why wasn't it doing so in this particular set? See page 365 for the solution.



Trigger/Timer

This simple unit, designed by Ian Rees, enables a standard domestic VCR to be used with a CCTV surveillance system to make short recordings

Closed-circuit TV for surveillance is now readily available and cheap. The basic camera can be connected to a scart or RF input or viewed using its own monitor. But the facility of being able to record what's going on, using a time-lapse VCR, is still very expensive. This article describes a way of using a domestic VCR to record short bites of scenes viewed by a camera. The recording process can be triggered by sensors.

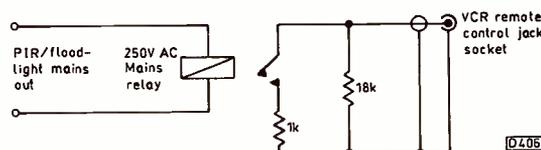
Initial System

My first attempt to use a VCR for CCTV recording was based on an old top-loading Ferguson machine which had a wired remote-control jack at the front. I used a relay to connect a 1kΩ resistor across the jack input to start recording. In the stop state an 18kΩ resistor was connected across the jack. The relay was controlled by a PIR set to two minutes in the 'walk test' mode. See Fig. 1. The camera's video output was fed to the VCR, while its RF output was connected to a standard monochrome TV set that acted as a monitor.

This simple system was satisfactory, but there were drawbacks. The time required to lace up the tape resulted in some loss of the recorded event. Partial compensation could be achieved by triggering from a greater distance. A potentially more difficult problem to cure was the tape coming to an end while the VCR was triggered to make a recording. As the relay held the 1kΩ resistor across the VCR's jack input for the duration of the record cycle, the VCR could go into a record/rewind mode, i.e. it would try to record and rewind at the same time! To prevent this, there always had to be enough tape left to run.

But customers who came in began to spread the word about the system, and I picked up some orders from garages and shops. It soon became obvious that an improved, universal design was required.

Fig. 1: The simple wired remote-trigger system originally used.



The redesigned universal trigger unit can be used with a large number of modern VCRs, including LP and ready-lace models, and can be set off by either normally-open or normally-closed sensors.

Circuit

Fig. 2 shows the circuit diagram of the trigger/timer unit. The timer section consists of a monostable switch – IC1 and its associated components.

If either an open- or a closed-circuit is applied to the relevant input, Tr1 or Tr2 will switch on as C1 or C2 charges. Relay RLY1 then pulses once, sending a record signal to the VCR via its contacts. A low at pins 8/9 of IC1a, via R4, sets IC1 in its timing mode. When the timing period ends, a high from the output of IC1d (pin 11) is fed via C4 to the base of Tr3, which switches RLY2 on momentarily to send a stop signal to the VCR.

Power for the unit is obtained from an unregulated 1A power supply of the type that can be purchased with a mains plug as part of its moulded casing. The output from this is fed to a 12V regulator (IC2) which is attached to a small heatsink. If required, the camera and/or PIR can be obtained from the same source.

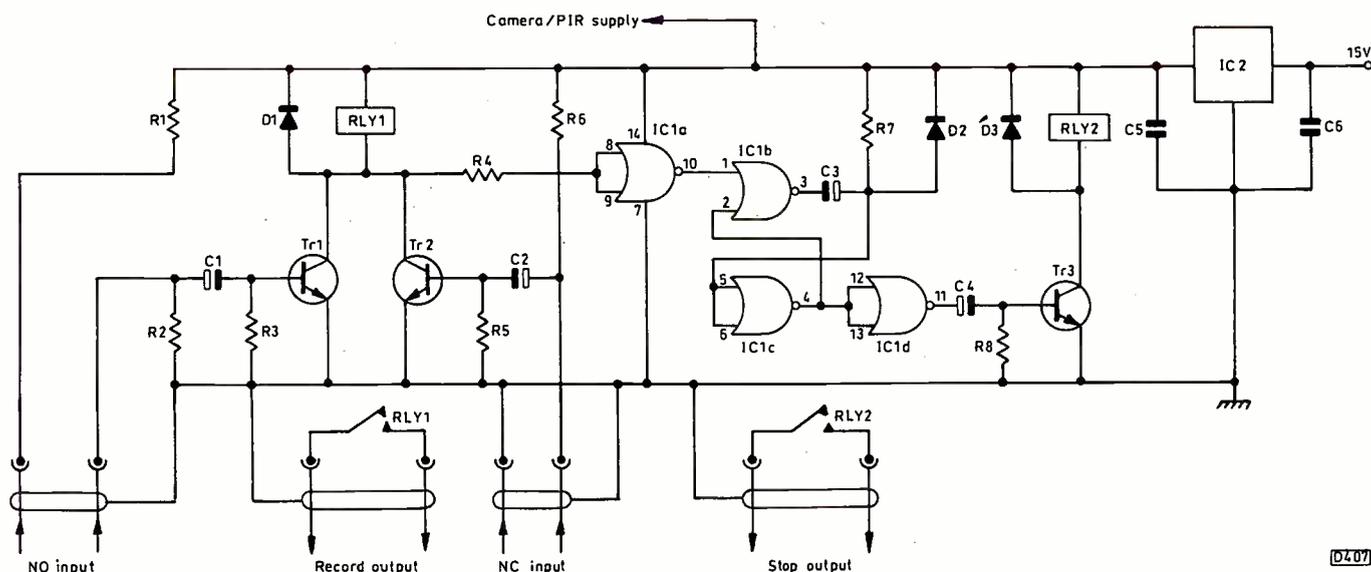
Construction

There is nothing critical about construction of the unit. I have built it in several forms, including one which contained the timer, camera and PIR. If you have to use very long leads to trigger the inputs/outputs, screen them to prevent false triggering.

The regulator's heatsink has to be positioned to dissipate its heat, which can be used to prevent fogging of the camera lens when this is mounted in the same case. If you use a bare PCB pinhole camera, you will find that it develops quite a bit of heat. One thing I learnt about these is that it's a good thing to fire the camera up to find out which way the image will be presented. It seems that little care is taken with fitting the camera mosaic during manufacture. Four-to-one odds of it being correct are not very good!

Installation

Most of my installations have been in small shops, where



DZ07

a pressure mat or reed switch on the door is all that's required. A PIR detector can be switched in at night to cover areas where conventional entrance may not be gained – PIR detectors used during normal shop hours tend to be triggered by staff, which is not satisfactory. Strategically-positioned pressure mats can be avoided by staff, reducing unwanted operation.

With domestic premises the unit can be triggered by conventional PIR/floodlight circuits at night, using a mains relay in the lamp auxiliary circuit to switch the timer. Some other method will be required during daylight hours: say a switch at the front gate.

Conventional PIRs can be used in daylight, but should be of the counting type to reduce false alarms as a result of changes in sunlight intensity etc. Other types of detector, e.g. break beam, are easy to incorporate.

The small PIRs used in burglar alarm systems have a normally-closed output when powered, giving an open state when triggered. They can be connected to the unit's NC input. Reed switches give a normally-closed output when a magnet is brought into close proximity, and can be mixed with PIRs by connection in series with the NC input.

Mats are normally-open until trodden on. They should thus be connected to the NO input. A reed switch can be made to operate as normally-open by arranging for a magnet to pass it, say as a door opens. All normally-open detectors are connected in parallel with the unit's NO input.

The trigger connections to the VCR can be arranged in several ways. My original top-loader VCR, switched by the two-resistor stop/start method, is still in use in my workshop. Two other alternatives are possible. The first requires a direct connection between the VCR's record and stop buttons and the contacts of RLY1 and RLY2. If preferred, a connection could be made to the equivalent VCR remote control unit buttons. The original lace-up time shortcoming remains. If a ready-laced VCR is used, this problem will be virtually eliminated.

The unit's momentary switching action reduces the end-stop/rewind/recording problem. Care is still required to ensure that a tape has plenty of run time, but rapid cycling against the end-stop no longer occurs. Note however that some VCRs just stop when the end of a tape is reached and don't automatically rewind.

The value of C3 determines the length of the recordings. Increasing its value increases the recording time: about two minutes seems adequate. In the standard play mode a four-hour tape will provide 120 triggers. With an

LP machine this number will obviously be doubled.

Results

The system in the approach to my workshop is still triggered by a PIR in the 'walk' mode. I have a switch to disable it during the day, but covertly switch it on should this seem advisable. It's left on when the workshop is unattended – and has recorded some strange happenings!

The CCTV camera is a pinhole device with six infrared LEDs to illuminate the scene in darkness. The camera's 12V supply is taken from the trigger/timer unit. Its output signal is fed directly to the VCR's video input, along with audio from an electret microphone which is mounted in the camera's case.

Clarity is excellent, and playback just as good. I feel it important that callers know there is an active camera in operation, and display notices to say so. At least one monitor is on view to callers, showing their actions at all times.

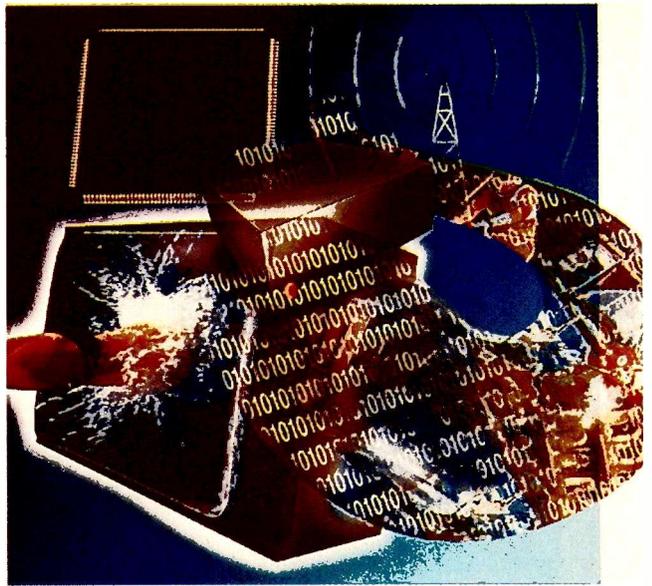
Long before I fitted active CCTV I had a dummy decoy camera stolen (then thrown away outside). I continue to employ dummy cameras and, as it is accessible, camouflage the genuine one to prevent theft.

With professional systems the tapes are time stamped. This can easily be arranged by leaving a large clock in the camera's field of view.

Shops report that petty pilfering is greatly reduced. I find that dodgy characters are less inclined to hang about when faced with a monitor that displays their images.

Components required

R1, R3-6, R8	2.2k Ω
R2	47k Ω
R7	1.5M Ω
All	0.25W, 5%
C1, C2, C4	470 μ F, 25V electrolytic
C3	100 μ F, 50V electrolytic
C5, C6	0.1 μ F, 30V disc ceramic
D1, D2, D3	1N4148
IC1	CD4001 quad two-input NOR gate
IC2	LM7812 12V, 1A regulator
Tr1, Tr2, Tr3	BC639
RLY1, RLY2	Sub-miniature relays. 12V coil. One pole changeover



Part 2 of Mark Paul's guide to the terminology of digital TV makes a start on definitions of commonly used terms

The Language of Digital TV

In Part 1 last month detailed explanations of the most commonly encountered abbreviations used in connection with digital TV were provided. This time a start is made on defining the terms used. The series will be concluded next month.

Definitions

Access Unit With MPEG video, the coded representation of a picture. The term is also used for coded audio data. After decoding, the units are referred to as Presentation Units.

Algorithm Rule for solving a mathematical problem in a finite number of steps: a kind of flow chart or programme, providing a set of instructions/steps for solving a problem.

Aliasing A disturbance created by spectrum mixing when the bandwidth of a signal being sampled is greater than half the sampling frequency. The term comes from the word alias, which means an assumed name.

During A-to-D conversion, the analogue signal is sampled at a fixed rate, creating a digital signal that has less detail than the original signal. Fidelity to the original signal thus depends on the sampling frequency: the higher the sampling frequency, the better the fidelity.

Analogue Signal An electrical signal produced by a sensor such as a microphone, solid-state imager or camera tube. Consists of a varying waveform that corresponds with the original sound or image.

Asynchronous Lack of synchronism or correspondence with time. In IEEE 1394 serial data interface terminology, asynchronous means the transmission of data with varying time intervals between the characters, and transmission of data as available.

B Picture Coded picture obtained from I and P coded pictures by bidirectional interpolation. The picture is coded using motion-compensation prediction from past and/or future I and P pictures.

Baseband Term used for the frequency band occupied by an analogue or data signal prior to modulation or after demodulation.

Block In JPEG or MPEG compression, an 8 x 8 pixel section to which DCT is applied.

Buffer A data storage device used to provide at its output a constant data flow rate.

Burst Errors Name given to multiple errors that occur in a short time, with relatively longer in-between, error-free periods.

Channel Coding Also referred to as **Forward Error Correction**. Addition of coding to a digital signal prior to transmission to enable errors to be corrected at the receiving end. The coding is matched to the characteristics of the form of transmission used.

Checksum Mathematical sum of all the bits in a sequence. Used for error checking.

Clock Synchronising signal used for all the encoding and decoding processes in a data transmission/reception path. Consider it as the digital heartbeat.

CODEC Combination of a coder and a complementary decoder.

Comb Filter Filter whose response is akin to the teeth of a comb. Used for separating signals that are part of a single transmission.

Compression Reduction of the number of bits used to represent an item.

Compression Layer With MPEG, the output from individual audio and video encoders. This is the Elementary Stream of compressed data.

Conditional Access System permitting subscriber access to programmes on a controlled basis, e.g. pay TV or pay per view.

Constant Bit Rate Coded Video Compressed video bit stream with a constant average bit rate.

Constellation Display in I/Q phase co-ordinates of all the possible states of a QAM or QPSK signal.

Convolutional Coding The inner part of channel coding for satellite and terrestrial transmissions. It provides two bit streams from the original one: this data increase is used mainly to correct random errors caused by noise in the transmission path.

Decoding Time Stamp (DTS) Field that may be present in a packetised elementary data stream packet header to indicate the correct decoding time for an MPEG Access Unit.

Delta Modulation Form of differential pulse-code modulation in which only the sign for the difference between each signal sample and its predicted value is retained and encoded.

Differential Coding Source coding (i.e. compression) method that uses the difference between the value of a sample and a predicted value.

Differential Pulse-code Modulation (DPCM) Process in which the difference between each sample of a signal and its predicted value, derived from a succession of previous samples (or quantised values), is quantised. The resulting series of quantised values is converted, by coding, into a digital signal.

Discrete Cosine Transform MPEG/JPEG conversion of a block of pixels into a series of coefficients that represent the cosine harmonic functions of the pixels.

Echo Equaliser Device used for the cancellation or attenuation of echoes (ghosting) in a transmission path. Used particularly with cable transmission.

Elementary Stream Bit stream generated by an MPEG video or audio encoder.

Elementary Stream Clock Reference (ESCR) Time stamp present with a packetised elementary stream for the control of decoder timing.

Encryption Coding of transmitted information to make it available only to those authorised by a conditional access system.

Energy Dispersal Combination of a digital bit stream with a pseudo-random binary sequence (PRBS) to obtain even energy distribution after modulation.

Entropy Coding Coding principle used with variable-length data words, whereby the encoding of information elements depends on their probability of occurrence. Also

known as variable-length coding (VLC). The best known method is the Huffman Algorithm.

Eurocrypt Conditional access system used mainly with the D2-MAC standard.

Fast Fourier Transform A fast algorithm for performing a discrete Fourier transform.

Flash Memory (EEPROM) A large, non-volatile electrically erasable and programmable read only memory. Can be overwritten only in blocks, not individual addresses or cells. Rather like an electronic hard disc.

Flicker: Disturbing periodic variation in the brightness of a scanned raster when the refresh rate is below 50Hz.

Fourier Analysis Establishing the harmonic components of a complex waveform. The result is a Fourier Series that represents the waveform.

Fourier Principle The principle which shows that all repetitive waveforms can be resolved into a series of sinewave components that consist of the fundamental frequency and a series of harmonics at multiples of this frequency. Named after the French mathematician J.B.J. Fourier (1772-1837).

Frame In reference to audio, an elementary period during which psycho-acoustical coding takes place. Corresponds to twelve times 32 pulse-code modulation (PCM) samples. The duration of the period varies between 8-12msec depending on the sampling frequency.

Generic Coding Method of digital coding for pictures, based on a specific algorithm, enabling it to be used for a number of applications. Enables the same ICs and components to be used for different applications such as TV broadcasting, computer graphics, videotelephony etc.

Granule In layer two MPEG audio this term means a definitive group of three consecutive sub-band samples, corresponding to 96 PCM samples.

Hexadecimal Numbering system with a base of 16 numbers instead of, as in decimal notation, ten. Uses a character set of 0-9 plus A-F. Employs 16 arrangements of four bits.

I Frame/Picture An intra-coded picture, i.e. one which has been coded using only information from itself (compare with B and P pictures).

Interframe Coding Predictive frame coding, where the values for prediction for a frame are taken from the previous and current frames.

Interlaced Scanning The conventional TV picture scanning arrangement in which successive fields scan out the odd and even lines of the picture.

Interpolation Technique of generating information by averaging the values of data from adjacent picture fields.

Interrupt A signal that breaks into a running digital processor program.

Intracoding Coding of a macroblock or picture using only information in that macroblock or picture.

Intraframe Coding Predictive frame coding where the values for prediction are taken from the same frame.

Isochronous Something performed in equal times, in regular periods. With IEEE 1394, means the transmission of time-critical data in the quasi-synchronous mode, i.e. real-time audio and video.

Joint Photographic Experts Group (JPEG) An ISO/IEC group that developed the image compression algorithm for continuous-tone still colour pictures.

Joint Stereo MPEG audio technique which exploits redundancy between the left and right channels. There are two sub-modes. MS Stereo means coding of L + R and L - R channels; Intensity Stereo means coding the common sub-band coefficients for high-band L and R channels.

JPEG-1 Standard, with several levels of compression, for digital still colour pictures. The levels give various resolutions in Y, Cb, Cr and RGB formats.

Latch Mechanism for temporarily storing data. Used in conjunction with shift registers so that data streams can have their format altered, i.e. SIPO (serial data in, parallel data out) and PISO (parallel data in, serial data out).

Layer With MPEG audio, the algorithm used for compression from sequence to block (there are three different layers); with MPEG video, hierarchical decomposition from sequence to block (see Fig. 1).

Level With MPEG-2, the spatial resolution of the picture to be coded.

Line-locked Clock Clock synchronised to the line-scan frequency of a video signal, controlled by a phase-locked loop (PLL) circuit.

Lossless Compression Also known as Reversible Coding. The opposite of lossy compression.

Lossy Compression Compression process that discards some imperceptible information.

Macroblock Used for motion prediction. Consists of four 8 x 8 blocks of luminance data and two of chroma data (4-2-0 format), or four luminance and two each Cr and Cb blocks (4-2-2 format), or four luminance, four Cr and four Cb blocks (4-4-4 format).

Masking A sound concealed by a more powerful one at a near frequency. This is a property of human hearing. The phenomenon is made use of for MPEG audio. Masking can be in terms of frequency and/or time.

Motion Compensation Use of motion vectors to improve the efficiency of motion prediction. The vectors provide offsets into past and/or future reference frames or fields (I pictures) that contain the decoded sample values used to form a prediction error signal.

Motion Estimation Process of estimating motion vectors for encoding. The term relates to the derivation of a motion vector from a previous picture, to enable conditions in an area of a picture to be deduced.

Motion Vector Two-dimensional vector used for motion compensation. It provides an offset from the coordinate position in the current picture or field to the coordinates in a reference (I) frame or field.

Motion Picture Experts Group (MPEG) The ISO/IEC group that develops compression standards for moving pictures and associated information.

MPEG Video Data Hierarchy The MPEG video structure, see Fig. 1. One pixel (picture element) is defined as the size of a scanning spot at rest, i.e. one line high and one line wide. It is used to form blocks of 8 x 8 luminance pixels plus 4 x 4 red and blue chroma pixels (the later are referred to as Cr and Cb respectively). The next step up is the macroblock, see above.

Several macroblocks are then grouped in sequences known as slices, which are positioned in the same left-to-right and top-to-bottom order as with conventional picture scanning. Slices are used as sets of data, being suitable for error detection purposes. If an error is detected in part of the data stream that makes up a slice, the decoder ignores the data in that slice and moves to the start of the next one.

The data slices are combined to form the active picture area of a video frame – usually referred to as a picture – which can be regarded as the system's basic coding unit. Twelve of these pictures, referred to as a GOP (Group of Pictures), are combined to form the basis of interframe coding. As a result of this process, most frames are represented as their differences from a reference frame (an I or intraframe). Each twelfth frame is an intraframe. Organising the pictures in groups simplifies random access to a group and provides recognisable boundaries for interframe coding.

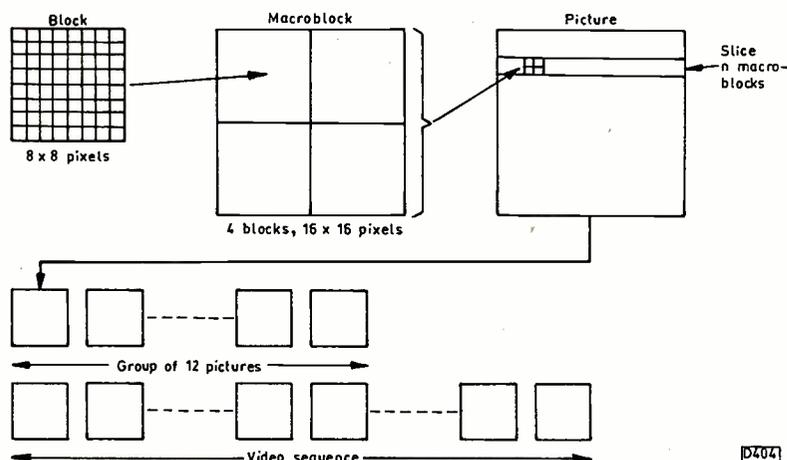
Finally, the MPEG system allows several groups of pictures to be gathered together in what is called a Video Sequence. This is an uninterrupted series of GOPs that have the same basic parameters. This sequence consists of a sequence header code, one or more GOPs and an end of sequence code.

Multicrypt DVB conditional access option based on a detachable CA module which is connected via the DVB-CI common interface.

Multiplexing A system that enables two or more signals to be transmitted simultaneously via a single channel.

MUSICAM – Masking pattern-adapted Universal Sub-band Integrated Coding and Multiplexing An audio bit-rate reduction system based on sub-band coding and psycho-acoustic masking.

Fig. 1: The MPEG video layers, from pixel blocks to a sequence of pictures (video sequence).



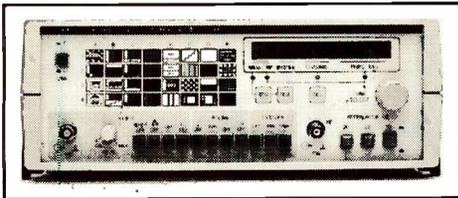


PROMAX

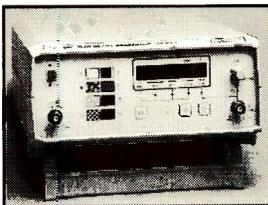
TEST EQUIPMENT

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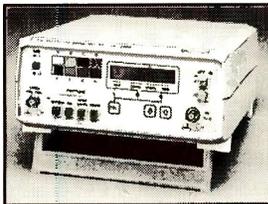
TELEVISION TEST PATTERN GENERATORS



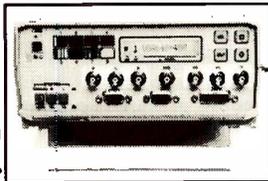
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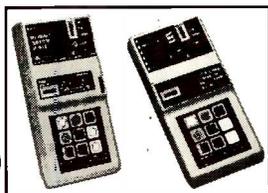
GV 264 SATELLITE TV GENERATOR
Simulates satellite TV signals, with output level control and voltage / load measurement. Repairs on satellite TV receivers can now be conducted under stable test signal conditions.



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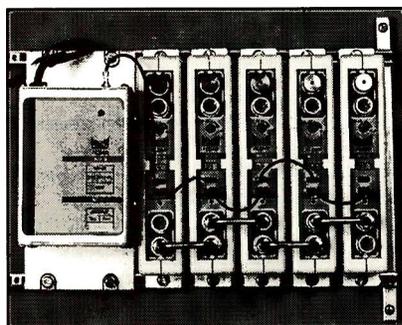
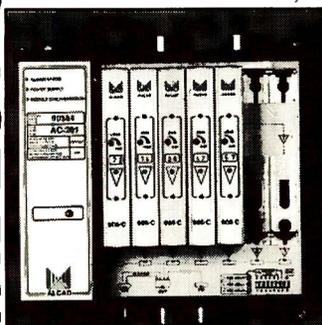
GV 241 COMPUTER MONITOR TEST GENERATOR
Simulates the computer interface, offers user friendly connector arrangement, achieving widest range of monitor compatibility. Essential to all technicians who test monitors.



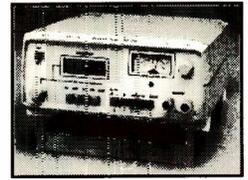
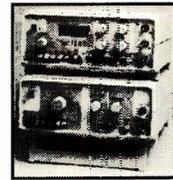
VG 90 & GC 981B PORTABLE PATTERN GENERATORS
Internal rechargeable batteries means these pocket size generators can be used anywhere. Field staff can test with confidence. Supplied with carry case, cables and AC mains charger.



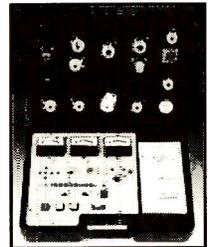
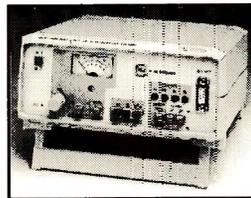
TELEVISION CHANNELISED & MAST HEAD AMPLIFIERS



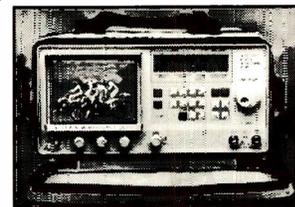
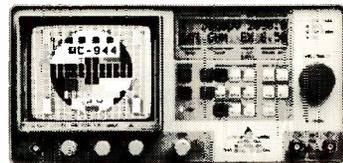
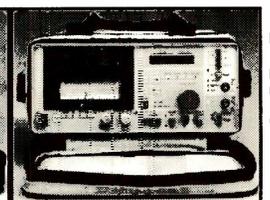
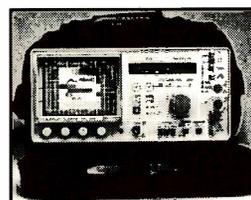
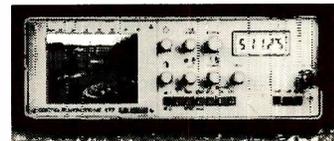
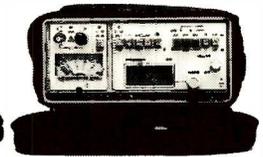
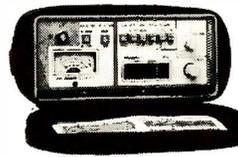
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What a Life!

Problems as diverse as wow with a Dansette record player to an hourglass picture with a recent JVC TV set came Donald Bullock's way this month

Just as I had sat down to write my *Television* article, Greeneyes came in and turned the TV on. I don't much like the TV being on at all, especially when I'm trying to write an extremely intellectual article. So I told Greeneyes that she was a cretin, and we had a row about my manners and her mother. Then the TV's brightness went – it's a Sanyo CTP6256 – and I laughed nastily.

Greeneyes said I'd have to mend it right away. So I put my writing aside, took the back off the set and looked at the chassis. The brightness returned.

"How did you manage that?" asked Greeneyes.

"Cleverness and influence" I said, refitting the back.

When I'd finished and sat down again, the brightness had gone. Greeneyes shot me a withering look. Time to start all over again. I took the back off, leant it against the wall, then turned to the set which was now OK. Greeneyes' big ginger cat strolled over, looked at the screen and laughed at me. So I touched it with my foot. Greeneyes saw it shoot off, and we had a row about my wickedness and her lavishing all her affection on cats and dogs and turtles instead of me.

When we'd finished our row and agreed that she was right and I was wrong, and that the red pair of shoes in Clarks would go well with the green frock she's going to get from River Island, the brightness went again. This time it stayed off, and I started to tap around with the pen I'd intended to use for my article. As I couldn't make it come back I decided to take the set to the workshop, and put the rear cover back on. The brightness returned and I made a bit of a scene.

"Have we got to call Snoddies?"

Greeneyes asked, "or shall I ask son John to mend the set. We can't go on like this."

Then the phone rang for me, and while I was talking Greeneyes got John to take a look at the set. He went out for a soldering iron and a few minutes later had the set working – even with the back on. It didn't fail again.

I pretended not to notice that the set was now working satisfactorily, or that it had been fixed so quickly, until Greeneyes went out to fix a banquet for her cats and dogs and turtles. Then I casually asked John what the trouble had been.

"R622" he said. "It's a two-inch tall ceramic resistor stood up on end. The solder joint at the top was dry."

"Thought it would be" I said.

Harry's Dansette

There are two types of people I can't stand. Three if you count traffic wardens. One is the type of chap who concentrates so hard on making silly remarks that you can't hold a proper conversation with him. A customer of ours, Harry Quipper, is one of these. Otherwise he's a decent chap. He called in the other day with an old Dansette record player which, he said, he'd found.

"Gosh, Harry, I didn't think there was one of these left in the country" I said, "what's up with it?"

"Dead" he replied.

I noticed that the cheap mains plugtop didn't secure the outer cover of the mains lead, and that the conductors were straggly. So I tugged at them and they pulled out. I remade the lead and plugged it in, then tried out the Dansette with our 33 r.p.m. record of classical piano music – there's no finer type of record for detecting turntable variations.

This one sounded awful. I frowned. "Where's that wow coming from?" I said aloud.

Harry's silly face lit up. "From the Gwamophone, of course" he quipped.

I told him to come back in a couple of hours' time then gave the record player a service, right down to oiling the motor, but the wow remained. Then I noticed that the blip occurred once per revolution of the record. I finally lifted the turntable mat and found that a little inspection label, not much bigger than a stamp, had been carelessly stuck on. So there was a ruck in it. Removing the label cured the trouble.

The Other Sort

Then Mr Magic came in with a Toshiba portable, Model 1400TBT. His real name is Cyril Pipe, and he spends his spare time dressing up and doing conjuring tricks at children's parties. I can't stand conjurers.

I looked at the set. "Nice one, Cyril" I said, "what's wrong with it?"

Cyril hunched his back and drew his head down into his shoulders. "Picture like this" he said. Then he pulled from his pocket a shabby pack of cards which he fanned out. "Pick a card, pick a card" he said.

I looked pained. "Bugger the cards" I replied, "let's think about the set."

I plugged it in and sure enough there was bad field cramping at the top of the picture. The set uses an AN5515 field output chip, and I recalled a similar fault with a similar model. I traced the IC's supply from pin 7 back to the rectifier circuit C311/D309/R317 which is fed from a winding on the line output transformer. When I checked the

value of the 7.5Ω surge limiter resistor R317 I got a reading of 48Ω. A replacement resistor of the correct value cured the fault. As I boxed up the set I thought that Cyril ought to be relieved of eleven pounds, a tenner for the repair and a pound for his bit of conjuring.

As I turned to him he said "Wait a minute" and drew a £1 coin from my ear.

"Put that on the counter close to me Cyril" I said, "and add another one plus a tenner. It'll get you out of debt and your conscience good."

G11 Problems

Meanwhile Paul, who spends most of each day on VCRs because he's so good at them, pulled a Philips set fitted with the G11 chassis on to the bench. "We've made some money out of these" he commented, thinking of all the BU208As, the smoothing blocks, the field time-base chips and the odd tube or two we've replaced. This one was dead, and Paul soon found that the negative side of the mains lead was connected to the plugtop loosely.

"I've had this before with these sets" he said, "but why is it always the negative connection that becomes loose in the plugtop? The little retaining screw loosens, doesn't it?"

"And how" I replied. "It's because of the thyristor power supply, which does violence to the nice smooth mains supply waveform. If you were the little screw at the top of the plug's negative lead you'd jigger about with the sudden current pulses, I'll bet."

When he'd seen to the plugtop he found that there were intermittent outputs from the line output transformer because of dry-joints at the pins. Resoldering them restored the set to life, though the width still varied and tried to collapse now and again. "What makes the line output transformer's pins go dry at their joints to the board?" he asked.

"More hammer" I said. "That transformer is vibrating at a very good lick, and producing heat. The solder joints have to contend with the rapid pulse waveforms at the pins while the heat affects the chemical makeup of the fluxes in the joints. They eventually shake loose. It's much the same with the other wound components in the line output stage. In view of the picture width variations I reckon you'll find some more dry-joints in this area."

He did, and after some careful resoldering all round he had a good, steady picture.

"Remember" I said "any transformer that vibrates at a high frequency and has to handle spikey waveforms will tend to develop dry-joints at its connecting pins. And the next time you get intermittent brightness with a chassis that uses a tiny line driver transformer, like the old ITT Compact, check this item for dry-joints. Resolder the pins, even if you can't actually see any poor joints."

Interlude

Just then a chap with some steps poked his head through the door.

"Window cleaner" he called.

"Who, me?" I reacted.

At this point a girl who looked like Keyhole Kate picked her way into the shop. "Yoo-hoo" she trilled, "anybody home?"

I moved towards the door.

"Oh. You're somebody else, aren't you?" she said.

"No I'm not" I replied, "I'm the same chap I've always been."

"What I mean is, you're not Steven or Paul, are you?"

Steven came to the rescue.

"That Ferguson of ours you mended back last summer" she said, "the picture's got thin bands of lighter picture all over it. What will it be and what will it cost?"

"Ah, your TX90" said Steven.

"The cause will be C189, a 22μF 50V electrolytic reservoir capacitor, and the cost will be ten pounds, if you bring the set in."

Keyhole Kate gulped. "Electro what . . ." she stammered.

"Ten pounds" Steven said.

Then the window cleaner came in. "Clean now?" he asked, jerking his thumb at the window.

I pushed some money into his hand.

"I suppose your sons are quite competent by now" he commented.

"They're coming on" I replied.

"Of course it will take them some time to pick up all I've learnt over the last fifty years. I feed them the answers, quietly."

A JVC MXII

Then Mr and Mrs Murphy came in. Nice people, also the smallest couple we've ever seen. Steven gave them a smile.

"We've got our JVC telly in the car, Mr Blockhead" he said. "The picture's like an hourglass. Last time you did it while we waited. Can we wait for it again?"

Steven brought it in and put it in front of me. "Can you look at it quickly?" he said. "It's the modern Nicam stereo set - MXII chassis.



... So I touched it with my foot.

Tends to get this fault."

The Murphys smiled at me as I began to take the back off. Steven continued with his instructions.

"The chassis uses an electronic screwdriver chip, IC707, for picture geometry adjustment. The chip's cheap enough, and we've got one in stock - from Willow Vale, part number 87028M - but you'll need the manual to enter the screwdriver menu and program the new chip. The repair takes only a few minutes, as you know.

I knew nothing of the sort, and stood there trying to digest what he'd said. None of the chips looked like a screwdriver to me, and I grew increasingly puzzled. Five minutes later I was no further forward. Steven looked over and began to lick his lips.

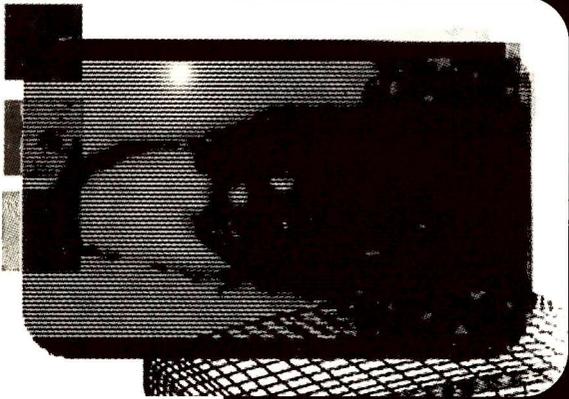
"Gosh, I'd like a cup of tea" he said. "The sort you make. How do you do it? Is it three bags or five?"

"I'll do it" I said, and he was on my stool before I'd left it.

When I brought in the tea the set had been boxed up and displayed a perfect picture.

Harry Quipper came back for his gram just as Mr and Mrs Murphy were paying Steven a few browns. He had one of his irritating smiles as he watched. As they left, he turned to us.

"Nice handful of cabbage that" he said, "talk about being grateful for small Murphies!"



Reports from
Philip Blundell, AMIEEIE
Michael J. Cousins
Keith F. Brown
Michael Dranfield
Graham Colebourn
David Smith
Glyn Dickinson
Chris Watton
Nick Beer and
Roger F. White

Thorn CI5012R (Samsung P68SC Chassis)

This set produced a picture with weak red content. When I checked the voltages at the collectors of the RGB output transistors I found that the red output transistor's voltage was at a higher level than that in the green and blue output stages. Checks on the colour-drive signals from the mother board, at plug CN901, showed that the DC bias in the red channel was low. I traced back through the circuit and found that the red drive was being dragged down by diode RD09, which adds the on-screen display to the drive from the colour decoder. This 1N4148 diode was leaky. For green channel problems check RD10, for blue channel problems RD11.

Incidentally the spares address for Thorn brand TV sets is Thorn UK Ltd., Glaisdale Drive, Bilborough, Notts NG8 4LA (01159 290 434). Trade only. P.B.

Mitsubishi CT2555STX (Euro 4Z Chassis)

Teletext was OK but the vision signal produced a weak, smeary picture. I connected a staircase test pattern and traced the path of the signal from the IF module along to PCB VC/RGB-CTI, where the video signal became low around the

TV Fault Finding

Y amplifier Q253. The 12V supply to this transistor was missing because of a break in the print at the very top edge of the PCB, where the plastic retaining bracket is connected. P.B.

GoldStar CIT9902F (PC04A Chassis)

This set wouldn't come out of standby. When checks were carried out around the microcontroller chip IC701 I soon discovered that crystal X701 (10MHz) wasn't oscillating. A replacement crystal was required. P.B.

Ferguson ICC9 Chassis

This monster (Model D78N) had no green. As I didn't fancy hauling it back to the workshop it had to be fixed on site. A tube analyser cleared the CRT, and the TEA5101A RGB output chip IB01 was OK. Tracing the signal path back brought me to the STV2160 multifunction chip IV01. This seemed to be the most likely suspect, especially as there have been reported cases of failure because of CRT flashovers (there's a modification for this - remove jumper link JV56 and fit a surface-mounted 4.7k Ω resistor in its place). Needless to say a replacement chip didn't cure the fault.

Only one area remained: the buffer amplifier transistors, the relevant one being TV76 (BC858B). This surface-mounted pnp transistor had been cold checked and found to be OK, but a replacement restored the tube's green drive. If only I had a nice, compact scope or a few more muscles! M.J.C.

Sharp DV5935 (BCTV-A Chassis)

When cold checks were carried out on this dead set I found that the 2SD1546 chopper transistor Q705 and the MC44602 control chip

IC700 were short-circuit. In addition the 100 μ F chopper drive coupling capacitor C712 was low in value. On the secondary side of the circuit rectifier diode D708 and its feed resistor (not shown in the circuit diagram) were badly burnt. These items were replaced and the set was then powered. It produced outputs on the secondary side of the power supply except for D708, which supplies a 12V regulator transistor and an 8V regulator IC. In view of the previously distressed state of D708 I thought that the cause of the problem was heavy loading, but eventually found that the chopper transformer T700 was damaged. A new transformer restored the 12V and 8V supplies and the set sprang to life. M.J.C.

Mitsubishi CT2553STX (Euro 4Z Chassis)

The reported fault was no signals - scart operation was OK. An attempt to retune the set showed that while channels could be found they couldn't be stored. The EPROM chip IC702 was suspected, but checks showed that its -31V supply at pin 2 was missing. This is derived from transformer T951, via rectifier D955. The cause of the problem was an open-circuit secondary winding on T951. A replacement transformer restored IC702's -31V supply and hence the picture and sound. M.J.C.

Goodmans 1450T (Onwa Chassis)

This set was dead apart from the fact that the standby light was on, there was a click from the relay and the power supply was producing a 115V HT output. No visible damage could be seen. The cause of the problem was loss of the supply to pin 42 of the multifunction chip IC301 because R323 (6.8k Ω , 5W) was open-circuit. A replacement

restored the picture and sound. If this doesn't cure the fault check C909 and C911 (both 47 μ F, 50V), the 12V, 1W zener diode ZD402 and IC301 (AN5601K). **K.F.B.**

Tatung 190 Chassis

There was sound but no picture - no EHT in fact. The cause of the problem was that R413 (18 Ω , metal film) in the supply to the line driver transistor was open-circuit. No reason for its failure could be found. **M.Dr.**

Hitachi CPT2174 (G6P Chassis)

This set was brought in because it made a whistling noise. We suspected a noisy inductor. Not this time however: the whistling occurred only with scene changes and bright pictures. The culprit turned out to be the HT smoothing capacitor C909 (220 μ F, 160V) which had fallen to a very low value. **M.Dr.**

Sony AE2 Chassis

This set tripped back to standby after two seconds. The manual says a two-second trip means that there's a field fault. When the set was switched on and off in quick succession there was only half a field scan - the top half. The TDA8179S field output chip in this chassis requires + and -15V supplies. The latter was missing because safety resistor R854 (0.47 Ω) was open-circuit. But the replacement failed at switch on: a new field output chip was required. For good measure we also replaced the flyback boost capacitor C1505 (220 μ F, 50V). **M.Dr.**

Hitachi G8Q Chassis

If the power supply is tripping and you can't find any shorts on the secondary side of the circuit, try replacing C908 (220 μ F) on the primary side. In one case we had in recently this capacitor had fallen in value to 150 μ F. A replacement rated at 105 $^{\circ}$ C cured the problem. **M.Dr.**

Bush 1500

Another dealer had attempted to repair this set. In the process he'd removed two transistors which he had not replaced. With the help of a similar, scrap chassis we decided that a 2SC1815 would be suitable in positions Q104 and Q611. After fitting a couple of these transistors the set came on but was off tune. In addition the automatic station search didn't stop when a station

was found. After spending a lot of time on the problem we found that replacing the vision detector coil T101 cured the fault. **M.Dr.**

Philips CF1 Chassis

For loss of field sync, replace C2377 (10 μ F, 63V). This will cure the problem, but for good measure C2368 and C2369 should also be replaced. They are both 4.7 μ F, 63V. **M.Dr.**

Hitachi CPT2476 (G6P Chassis)

If the set comes on with a bright white screen, there is only 20V at the tube's cathodes, and the set switches to standby after two seconds, replace the 12V zener diode ZD301 which is on the main panel. It's in series with all three RGB output transistors. **M.Dr.**

Ferguson ICC5/IMC Chassis

There was a very odd problem with one of these sets: no sound, no picture, and a raster when one of the tube's cathodes was earthed via a 10k Ω resistor. This proved that the cause of the problem was not field collapse. When we advanced the setting of the first anode control we got a blank, unmodulated raster with flyback lines.

We thought that the set might be stuck in the AV mode. When a VCR was connected to the scart socket we got good sound but still no picture. A lot of time was spent carrying out various checks before we noticed that the power supply's 8V output was low at 5.4V. The culprit was CP37 (4,700 μ F, 25V, 105 $^{\circ}$ C) which was open-circuit. **M.Dr.**

Sony KVM2170/2171

Although these sets are still quite new we have had a couple of them suddenly go completely dead. The chopper power supply was working, but one of its outputs was missing. There should be 135V at the cathode of D606, 20V at the cathode of D607 and 8.5V at the cathode of D608. In both cases the 8.5V supply was missing because ICP PS603 was open-circuit. It's rated at 1A (N25 type). The current through the replacement was between 0.4-0.5A, so all was considered to be OK. Neither set has bounced - the repairs were carried out several months ago. **G.C.**

Matsui 1496R

This set was dead with no power supply operation. There should be a 119V HT output at C119, which is

handy to remember! We found that R108 (220k Ω) was open-circuit: as a result there was no 5V bias at pin 3 of the TDA4605 chopper control chip IC104. R109 (330k Ω) was also going high in value, so this was replaced as well. As the set is still a youngster we uprated both resistors to 1W. **G.C.**

Sanyo CBP2576/2876 (ED0 Chassis)

This set had given up, with a pungent smell of burnt plastic that lingered for days! A hole had been burnt in the PCB at the line scan end of connector K-FF. After the usual clean up and rewiring exercise the set came back to life, but there was no EW correction because ICP R756 (N20) was open-circuit.

Finally there was no sound. We got it back by carrying out the "start NVM" procedure described on page 13 of the service manual: this restores the basic digital set-up of the chassis. Very little further adjustment of the digital settings was required to obtain correct picture geometry. **G.C.**

Hitachi CPT1558/Luxor 18036549

These 15in. Swedish sets are ideal for kitchen use, having a sealed membrane keypad. When a Luxor example came in with a severely mangled keypad we discovered that it's no longer available as a spare part. A repair was possible however, using a keypad from a scrap Hitachi version of the set: it's marked differently but works in the same way.

Our troubles were not over yet, as keyboard operation was intermittent. We eventually traced the cause of this to a cracked joint in a very unexpected place, at one end of RD54, an 820 Ω resistor which is between the base and emitter of TD12 near the keypad ribbon-cable connector. We then knew why the original keypad had been clawed to death!

If you have trouble with the microcontroller or ROM chip (ID01 and ID02) in these sets, get in touch with Chas Hyde (01759 303 068). There were several versions and sources of these chips, and they are not all compatible. **G.C.**

Toshiba 150R6B

This set had been given a new LOPT, a set-up, a soak test and a clean bill of health. The owner brought it back next day with the classic condemnation "it's gone

again – it lasted only fifteen seconds”.

This time there was no 5V output at pin 9 of the power supply board output connector. RS05, a 15Ω, 0.5W fusible resistor, was burnt and open-circuit. It feeds a 5V regulator, QS02. We fitted a new resistor and connected a voltmeter across it to monitor the current. The reading was 0.5V running, as stated in the service manual, and 0.33V in standby. The set ran happily all day and the next. No connection between the two failures could be discerned. **G.C.**

Philips CP110 Chassis

This set was dead except for the display of “F1”. A voice in my mind kept blaming the microcontroller chip, as it was the original one with no metal shield, but voltage checks showed that it was OK. The 1-6A Wickman fuse F1653 was open-circuit, no doubt because of excess voltage, the overvoltage protection board seeing it off. When the fuse and the CNX62A optocoupler had been replaced the set behaved impeccably during a lengthy test run. **D.S.**

ITT Monoprint B Chassis

This set was in the standby mode with the CRT's heaters lit. I found that C722 (470μF, 16V), the reservoir capacitor for the 8V supply, had gone low in value. **D.S.**

Philips G90AE Chassis

There was no focusing at all. When the top of the tube base was unclipped the reason was immediately obvious. The entire focus connector and its spark gap were covered with verdigris. A new tube base cured the fault. **D.S.**

Ferguson TX805 Chassis

This set (Model D14R) didn't do anything. When checks were carried out in the power supply we found that RP41 and RP42 had both gone high in value. The correct value is 68kΩ. **D.S.**

Philips CF1 Chassis

This set was tripping. After checking for obvious shorts I decided to disconnect the crowbar thyristor and power the set via a variac. It worked perfectly, with the HT correct at 95V. To save time (!) I replaced the three series-connected zener diodes and the thyristor, but the set still tripped. I then replaced the only other two components in the trip circuit, a resistor and a capacitor. It still tripped. Time for

some theory. The zener diodes were being switched on not by the DC voltage but by ripple, because the 47μF HT reservoir capacitor C2322 was open-circuit. **G.D.**

Philips 2A Chassis

After repairing a straightforward field fault I noticed a message which said that the set was reluctant to come out of standby when the remote control unit was used. This was true, with the set tripping instead of coming on. The set could be heard ‘plopping’ in standby. I traced the cause of this fault to C2681 (6.8μF, 63V) in the optocoupler circuit. **G.D.**

Bush 1500

This set was stuck on one channel with no response from the front controls. The usual cause is a faulty pushbutton, but not this time. There was a clue: standby couldn't be selected because a leak across the auxiliary contacts of the mains switch locked up the microcontroller chip. The cause was some nasty black glue that was used to anchor the wires. Removing this cured the fault. **G.D.**

Ferguson ICC5 Chassis

EW bowing was the not unusual fault with one of these sets (Model 59P7). After resoldering the obvious dry-joints the fault was still present with the usual suspects blameless. The width and pincushion controls worked, but not enough, while the trapezium control was inoperative. This was the clue. It receives its supply from the 23V line via a resistor and a 6.8V zener diode, DG10. This was leaky. **G.D.**

Salora J Chassis

A fault we are now getting quite often with these sets is variation in raster size and focusing with picture content. The culprit is the EHT tripler. Unfortunately this is rarely mentioned when the set is brought in because of another fault. It can wreak havoc with your estimates, especially as “the set never did that before you fixed it”! **G.D.**

Matsui 209T

This set was dead because C613 (4.7nF, 1kV) had failed, which is not unusual. It's in the HT rectifier circuit. If you don't have a handset, you can't switch the set on from the front as it comes on in standby – which is a good way of selling handsets! To get the set out of standby, short out ‘switch’ SW414 (not fitted) at the front of the PCB

momentarily. The set will then spring to life! **G.D.**

Sony KV2762

Tuning voltage instability was the problem with this set. Colour would sometimes be lost, but only in certain areas of the picture. At other times the sound would be lost, with the picture fluttering. My first check was at the 33V tuning voltage stabiliser D005, where only 30V was present, but a replacement didn't improve matters. The feed comes from the 40V supply, which I found to be low at only about 33V. So not enough current was flowing to operate the regulator. This 40V supply is derived from the chopper transformer, via R651 (1.2Ω) and D652. R651 had risen in value to nearly 70Ω. **C.W.**

Finlux 1000 Series

This was the later version with CTI (colour transient improvement). When these sets are first switched on the screen should remain blank until the TDA3505 video processing chip has checked the grey-scale levels. This set came on with a red raster, then green followed by blue. The cause was Cb38 (10μF, 63V). **C.W.**

Philips CP90 Chassis

The power supply was OK but there was no line drive. A check on the 19V supply produced a reading of only a couple of volts. The 330μF, 35V reservoir capacitor C2691 was the duffer here. **C.W.**

Hitachi CPT2178 (G6P Chassis)

Loss of sync was the trouble with this teletext set, the cause being on the text PCB. When the video signal arrives at this panel it goes to IC2101 and, via Q2104, to pin 3 of the CD4016 chip IC2108. This acts as a sync separator, but there was no output at pins 1 and 4 which are connected together. After making various checks I found that the 5V supply was low at only 2.5V, because the HA17085 regulator IC2110 was faulty. This supply is used by the logic system. Because it was low, the control applied to pins 12/13 of IC2108 was affected. **C.W.**

Bush 1418

If one of these sets is dead with no standby light and 320V is present across the main reservoir capacitor, check R913. This 330kΩ resistor can go open-circuit. **C.W.**

Salora J Chassis

No picture was the complaint with

this set. A scope check on the sand-castle pulse input at pin 7 of the TDA3562A colour decoder chip ICB200 showed that the field component was missing. The field timebase was working all right, the field flyback blanking pulse being lost at the junction of RB424/5 because TB209 (BC237) was short-circuit. N.B.

Toshiba C2225B

The owner insisted on having this set repaired despite its tired tube. There was an arc on sound and vision from cold, but you couldn't instigate it by physical means. It could be heard anywhere around the power supply and line output sections of the chassis. I eventually discovered that the earthing screw from the core of the LOPT to the PCB was corroded. Replacing the screw and retinning the land cured the fault. N.B.

Panasonic Alpha 1W Chassis

This set was dead. Some quick voltage checks showed that the 12V line oscillator supply at pin 7 of IC101 was missing. It comes from

the 12V regulator IC851, which had no input because rectifier diode D855 was open-circuit. N.B.

Salora J Chassis

It's been a long time since we had a new fault with one of these sets. The field scan flickered and rolled intermittently. No amount of fiddling in the field timebase affected the scanning, but twisting the chassis did. The cause of the trouble turned out to be a dry-joint at the odd pin of the Ipsalo transformer – the one in the centre of the diode-split type (so the fault would not be possible with the tripler version of the chassis). N.B.

Sony KVM1421 (BE2A Chassis)

There were jagged verticals when the set had warmed up. The cause of the fault was C814 (4.7µF) in the pincushion correction circuit. R.F.W.

Ferguson ICC7 Chassis

One of these sets had a strange sound fault. To start with the sound was normal, but after a while the volume and mute controls stopped

working – the on-screen graphics were still present. If the set was then put into standby and brought back on there was no sound. I suspected bad joints on the Nicam board and carried out a close examination, resoldering any joints that looked dodgy. To my great relief this cured the fault. R.F.W.

Sanyo CTP6144

A very intermittent hum bar was present only when an aerial was connected. If I touched the aerial socket and an earth at the same time the set would go to standby. The cause of the fault was the optocoupler D331. R.F.W.

Matsui 1492

This set had a peculiar fault after putting right the usual results of failure of C909 and C910 in the power supply (the line output transistor, the 12V zener diode and the field output chip all had to be replaced). When the set was put into the standby mode the sound and picture went but a dark monochrome picture then appeared, with no sound. The cause was Q907 which was short-circuit. R.F.W.

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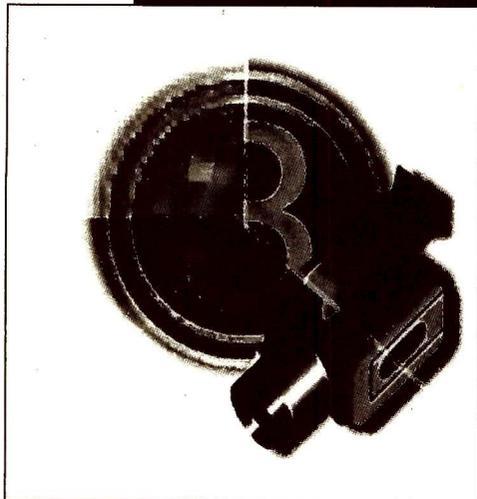


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Reports from
Nick Beer
David C. Woodnott
and **Brian Storm**

Ferguson F801

This unit had a dead camera head: the VCR section was OK. Checks showed that there was an open-circuit track between D903 and pin 8 of connector CN909/PG909. This is the camera on (low) line. The cause of the open-circuit was leakage from adjacent surface-mounted electrolytics, which all had to be replaced. **N.B.**

Panasonic VW-AMC2B (NVMS50B etc)

There was an odd fault with this commonly-used camcorder mains unit/battery charger. Charge LED1 was permanently on, and there was no battery charging in position 2. Transistor Q3 (2SB952P) in the switching section was short-circuit. **N.B.**

Panasonic NVRX1

This is one of the newer 'slimline' models. The fault was ability to focus but not to zoom, which rather restricted use of the camcorder. As a result of the lens design in modern units, with everything internal, the fault condition meant that there was only one point on the focus scale where a reasonably good picture could be obtained. The zoom motor drive was present and correct, but it didn't move. A new motor, part number VEM0451, cured the fault.

We've had similar problems, caused by the gear inside the lens, with various Panasonic models that use this design. The plastic gear

Camcorner

cracks and then slips on its shaft. **N.B.**

Sony CCDTR75E

There was a "no picture" note attached to this Handycam. Chroma only was present at the AV sockets – customers don't count this as much of a signal I suppose! The cause of the fault was C318 (120µF, 6.3V) on board VS67. A replacement capacitor and service restored the unit to good working order. **D.C.W.**

Canon UC16

Playback picture intermittent was the complaint with this fairly recent model. The cause was a detached connector between the mic/jack PCB and the main VTR PCB. It's becoming quite a common failure, usually because of too vigorous fitting/removal of the AV leads. The connector is available from Canon if required – it's CN001, part number VS1-5469-016-000. **D.C.W.**

Panasonic NVRX1

This newish camcorder would neither focus nor zoom – its E-E picture consisted of an unfocused 'blob'. Playback was OK. Error code F52 was displayed in the EVF: the manual tells us that this means "zoom motor lock". When I inspected the motor I found a surplus of hardened grease on the actuating shaft. All was well once this had been removed and new lubricant applied.

To avoid having to reset operating data etc. it's important to refit drive assemblies to current types of lens units very accurately. Although these set-ups are easier than ever now, using automatic programming via a PC interface, life can be very frustrating if you don't have such facilities. **D.C.W.**

Sony CCDV600E

The problem with this nice (I have one!) Hi-8 model was described as "no operation". The only sign of life was a flashing DEW symbol in the camera LC display. As there was no other activity, the dew sensor was clearly not to blame.

The cause of the trouble turned out to be IC201 on the mode control PCB (FD44). Don't confuse this with the more usual syscon mode control functions carried out by PCB SS134. A replacement IC and a general service restored good operation. **D.C.W.**

Canon UC10E

There were no EVF pictures: operation was otherwise normal. The cause of the trouble was failure of C2911 (10µF, 16V) on the EVF PCB. I have since had two more of these camcorders with the same fault. **D.C.W.**

Panasonic NVR50

This VHS-C camcorder would display, very intermittently, coloured lines down the EVF's colour picture. The symptom would often be present only once a day, which made fault finding rather difficult. I have previously had to replace the viewfinder flexi-connector to cure a number of different EVF faults produced by these camcorders. So one was ordered (part number VWJ0739) and fitted, clearing the fault. When the original one was examined, the start of a split across the middle of the connector, where it bends quite sharply beneath the viewfinder, was discovered. **B.S.**

Sanyo VMD6P

These 8mm camcorders tend to have problems with their battery contacts, which are easy enough to replace. But after doing this there seemed to be some intermittent problems with the mechanism. When a cassette was inserted, the tape would sometimes not be loaded around the drum. The cause turned out to be the cassette-down switch, which was loose. There was still a problem when this item had been cleaned and retensioned: the mechanism would sometimes just whirr, then the camcorder would power down and sulk. The cause was a damaged gear in the rather eccentric loading mechanism. Part number is 11915RQ. Once this item had been replaced the camcorder worked normally. **B.S.**

TRANSISTORS/LINEAR ICs

Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	
BC107	8p	BD434	31p	BU126	65p	BUV48AF	325p	MJ4502	300p	4N35	50p	LINEAR ICs					AN6340	600p
BC108	8p	BD435	30p	BU128	125p	BUV48C	250p	MJ10012	300p	RECTIFIER DIODES		AN203	210p	AN6341	200p	BA335	55p	
BC109	8p	BD436	30p	BU133	125p	BUV50	425p	MJ10115	250p	AN210	165p	AN210	165p	AN6342	325p	BA338	80p	
BC109C	10p	BD437	28p	BU137	150p	BUV61	1000p	MJ11016	300p	AN211	150p	AN211	150p	AN6343	440p	BA339	75p	
BC140	20p	BD438	36p	BU180	100p	BUV70	200p	MJ11032	800p	AN214Q	170p	AN214Q	170p	AN6344	440p	BA336	175p	
BC142	20p	BD439	40p	BU184	100p	BUV90	175p	MJ11033	800p	AN215	170p	AN215	170p	AN6345	440p	BA401	60p	
BC143	20p	BD440	40p	BU204	65p	BUV93	375p	MJ15003	250p	AN217P	250p	AN217P	250p	AN6346	350p	BA402	50p	
BC147	8p	BD441	40p	BU205	70p	BUW11A	200p	MJ15004	300p	AN218	280p	AN218	280p	AN6347	350p	BA403	50p	
BC149	8p	BD533	50p	BU206	100p	BUW11AF	225p	MJ15015	250p	AN219	280p	AN219	280p	AN6348	350p	BA404	50p	
BC159	8p	BD534	38p	BU207	150p	BUW12	125p	MJ15016	350p	AN220	280p	AN220	280p	AN6349	350p	BA405	50p	
BC160	30p	BD535	38p	BU208	70p	BUW12A	150p	MJ15022	400p	AN221	280p	AN221	280p	AN6350	500p	BA406	50p	
BC171	10p	BD536	38p	BU208A	75p	BUW12F	250p	MJ15023	400p	AN222	280p	AN222	280p	AN6351	500p	BA407	50p	
BC172	10p	BD537	40p	BU208AT	200p	BUW13A	200p	MJ15024	400p	AN223	280p	AN223	280p	AN6352	450p	BA408	50p	
BC177	14p	BD538	40p	BU208B	200p	BUW13A	200p	MJ15025	700p	AN224	280p	AN224	280p	AN6353	450p	BA409	50p	
BC178	14p	BD539	50p	BU208D	130p	BUW14	550p	MJE340	25p	AN225	280p	AN225	280p	AN6354	450p	BA410	50p	
BC179	14p	BD540	50p	BU209	90p	BUW14F	550p	MJE350	80p	AN226	280p	AN226	280p	AN6355	450p	BA411	50p	
BC182	7p	BD647	50p	BU225	120p	BUW50	400p	MJE520	30p	AN227	280p	AN227	280p	AN6356	450p	BA412	50p	
BC182L	7p	BD649	50p	BU226	120p	BUW81A	150p	MJE2955T	65p	AN228	280p	AN228	280p	AN6357	450p	BA413	50p	
BC183	7p	BD675	90p	BU312	90p	BUW84	75p	MJE3055T	65p	AN229	280p	AN229	280p	AN6358	450p	BA414	50p	
BC183L	7p	BD676	40p	BU325	55p	BUW85	85p	MJE13004	100p	AN230	280p	AN230	280p	AN6359	450p	BA415	50p	
BC184	7p	BD677	38p	BU326A	75p	BUX10	150p	MJ13044	80p	AN231	280p	AN231	280p	AN6360	450p	BA416	50p	
BC184L	7p	BD678	40p	BU406	60p	BUX11	200p	MJE13007	100p	AN232	280p	AN232	280p	AN6361	450p	BA417	50p	
BC212	7p	BD679	40p	BU406D	85p	BUX12	150p	MJE13009	100p	AN233	280p	AN233	280p	AN6362	450p	BA418	50p	
BC212L	7p	BD680	40p	BU407	55p	BUX20	350p	MJE15028	200p	AN234	280p	AN234	280p	AN6363	450p	BA419	50p	
BC213	7p	BD681	45p	BU407D	75p	BUX21	450p	MJE15029	200p	AN235	280p	AN235	280p	AN6364	450p	BA420	50p	
BC213L	7p	BD682	45p	BU408	75p	BUX21	450p	MJE15030	200p	AN236	280p	AN236	280p	AN6365	450p	BA421	50p	
BC214	7p	BD707	50p	BU409	85p	BUX21	450p	MJE15031	400p	AN237	280p	AN237	280p	AN6366	450p	BA422	50p	
BC214L	7p	BD707	50p	BU412	175p	BUX21	450p	MJE15032	400p	AN238	280p	AN238	280p	AN6367	450p	BA423	50p	
BC238	7p	BD711	50p	BU413	175p	BUX40	210p	MJ18204	350p	AN239	280p	AN239	280p	AN6368	450p	BA424	50p	
BC239	7p	BD736	50p	BU414B	250p	BUX41	300p	OC78	250p	AN240	280p	AN240	280p	AN6369	450p	BA425	50p	
BC300	20p	BD828	50p	BU426A	70p	BUX42	200p	OC29	250p	AN241	280p	AN241	280p	AN6370	450p	BA426	50p	
BC302	20p	BD839	55p	BU433	120p	BUX47A	220p	OC35	250p	AN242	280p	AN242	280p	AN6371	450p	BA427	50p	
BC303	20p	BD897	50p	BU500	100p	BUX48A	150p	OC36	250p	AN243	280p	AN243	280p	AN6372	450p	BA428	50p	
BC304	25p	BD899	50p	BU500D	225p	BUX55	800p	S2000A3	175p	AN244	280p	AN244	280p	AN6373	450p	BA429	50p	
BC327	7p	BD977	38p	BU505	90p	BUX80	180p	S2005A	175p	AN245	280p	AN245	280p	AN6374	450p	BA430	50p	
BC328	7p	BDX33	60p	BU505D	90p	BUX81	160p	S2055A	175p	AN246	280p	AN246	280p	AN6375	450p	BA431	50p	
BC337	7p	BDX37	100p	BU505DF	90p	BUX85	50p	S2550A	175p	AN247	280p	AN247	280p	AN6376	450p	BA432	50p	
BC338	7p	BDX44	100p	BU506	100p	BUX86	30p	S2550AF	175p	AN248	280p	AN248	280p	AN6377	450p	BA433	50p	
BC441	28p	BDX44C	60p	BU506D	70p	BUX87	30p	S2550AF	175p	AN249	280p	AN249	280p	AN6378	450p	BA434	50p	
BC446	8p	BDX54C	75p	BU506DF	100p	BUX88	30p	S2550AF	175p	AN250	280p	AN250	280p	AN6379	450p	BA435	50p	
BC477	18p	BDX62C	175p	BU508A	70p	BUX89	30p	S2550AF	175p	AN251	280p	AN251	280p	AN6380	450p	BA436	50p	
BC516	22p	BDX63C	150p	BU508AF	95p	BUZ11	75p	TIP29E	40p	AN252	280p	AN252	280p	AN6381	450p	BA437	50p	
BC537	25p	BDX64C	175p	BU508APH	80p	BUZ12	75p	TIP29E	40p	AN253	280p	AN253	280p	AN6382	450p	BA438	50p	
BC547	8p	BDX66C	175p	BU508B	75p	BUZ12AF	100p	TIP30C	25p	AN254	280p	AN254	280p	AN6383	450p	BA439	50p	
BC548	8p	BDX67C	275p	BU508DF	100p	BUZ13A	150p	TIP31C	25p	AN255	280p	AN255	280p	AN6384	450p	BA440	50p	
BC549	8p	BDX71	70p	BU508V	110p	BUZ13AF	100p	TIP32A	21p	AN256	280p	AN256	280p	AN6385	450p	BA441	50p	
BC550	8p	BDX77	175p	BU508VF	100p	BUZ17A	60p	TIP32A	21p	AN257	280p	AN257	280p	AN6386	450p	BA442	50p	
BC556	8p	BDX87C	175p	BU526	75p	BUZ20AF	200p	TIP32C	28p	AN258	280p	AN258	280p	AN6387	450p	BA443	50p	
BC557	8p	BDX88C	150p	BU526	75p	BUZ21	200p	TIP32C	28p	AN259	280p	AN259	280p	AN6388	450p	BA444	50p	
BC558	8p	BDW24	55p	BU546	125p	BUZ21A	200p	TIP32C	28p	AN260	280p	AN260	280p	AN6389	450p	BA445	50p	
BC559	8p	BDW93	50p	BU603	125p	BUZ29A	260p	TIP34C	65p	AN261	280p	AN261	280p	AN6390	450p	BA446	50p	
BC560	8p	BDW94	50p	BU606D	225p	BUZ30	260p	TIP34C	65p	AN262	280p	AN262	280p	AN6391	450p	BA447	50p	
BC637	20p	BDY29	225p	BU608D	125p	BUZ31	260p	TIP35C	65p	AN263	280p	AN263	280p	AN6392	450p	BA448	50p	
BC639	20p	BDY56	225p	BU626	125p	BUZ31A	260p	TIP35C	65p	AN264	280p	AN264	280p	AN6393	450p	BA449	50p	
BC640	20p	BDY58	50p	BU705	130p	BUZ32	260p	TIP35C	65p	AN265	280p	AN265	280p	AN6394	450p	BA450	50p	
BC643	20p	BDY90	125p	BU706DF	175p	IRF140	550p	TIP41C	22p	AN266	280p	AN266	280p	AN6395	450p	BA451	50p	
BCY34	200p	BDY92	100p	BU706F	150p	IRF230	550p	TIP42C	22p	AN267	280p	AN267	280p	AN6396	450p	BA452	50p	
BCY70	16p	BF137	35p	BU724A	100p	IRF240	425p	TIP47	40p	AN268	280p	AN268	280p	AN6397	450p	BA453	50p	
BCY71	16p	BF167	35p	BU724B	100p	IRF240	425p	TIP47	40p	AN269	280p	AN269	280p	AN6398	450p	BA454	50p	
BD115	30p	BF181	18p	BU806	70p	IRF300	600p	TIP50	80p	AN270	280p	AN270	280p	AN6399	450p	BA455	50p	
BD124P	50p	BF195	7p	BU807F	75p	IRF340	325p	TIP51	80p	AN271	280p	AN271	280p	AN6400	450p	BA456	50p	
BD131	25p	BF199	8p	BU808DF	210p	IRF350	750p	TIP52	80p	AN272	280p	AN272	280p	AN6401	450p	BA457	50p	
BD132	25p	BF200	11p	BU810	110p	IRF450	650p	TIP54	80p	AN273	280p	AN273	280p	AN6402	450p	BA458	50p	
BD135	20p	BF203	30p	BU824	60p	IRF510	110p	TIP102	70p	AN274	280p	AN274	280p	AN6403	450p	BA459	50p	
BD136	20p	BF240	16p	BU826	110p	IRF520	110p	TIP105	65p	AN275	280p	AN275	280p	AN6404	450p	BA460	50p	
BD137	20p	BF245	25p	BU826A	160p	IRF540	120p	TIP107	65p	AN276	280p	AN276	280p	AN6405	450p	BA461	50p	
BD138	20p	BF255	12p	BU903	110p	IRF610	120p	TIP110	65p	AN277	280p	AN277	280p	AN6406	450p	BA462	50p	
BD140	20p	BF259	12p	BU910	110p	IRF611	120p	TIP111	65p	AN278	280p	AN278	280p	AN6407	450p	BA463	50p	
BD144	30p	BF259	12p	BU912	110p	IRF612	120p	TIP112	35p	AN279	280p	AN279	280p	AN6408	450p	BA464	50p	
BD157	38p	BF262	25p	BU920	100p	IRF630	110p	TIP112H	50p	AN280	280p	AN280	280p	AN6409	450p	BA465	50p	
BD166	30p	BF270	18p	BU930	130p	IRF640	300p	TIP115	30p	AN281	280p	AN281	280p	AN6410	450p	BA466	50p	
BD175	30p	BF272	18p	BU932	130p	IRF642	300p	TIP116	30p	AN282	280p	AN282	280p	AN6411	450p	BA467	50p	
BD177	30p	BF311	21p	BU941	250p	IRF650	300p	TIP117	30p	AN283	280p	AN283	280p	AN6412	450p	BA468	50p	
BD179	32p	BF336	20p	BU2505A	10													

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Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price						
HA13001	110p	LA2800	350p	LA7096	200p	LF353	48p	MC3302	50p	SAB3029	525p	STK3102 II	530p	STK5478	380p	STR18006	500p	TA7281	200p
HA13002	200p	LA3120	200p	LA7113	275p	LF355	60p	MC3401	45p	SAB3035	275p	STK3106	2500p	STK5479	300p	STR17005	500p	TA7282	160p
HA13006	400p	LA3150	200p	LA7116	125p	LF357	70p	MC3423P	100p	SAB3036	725p	STK3122 II	725p	STK5481	470p	STR20005	450p	TA7210	200p
HA13108	280p	LA3160	120p	LA7121	150p	LF398	300p	MC3488AP	250p	SAB3037	700p	STK3152 II	900p	STK5482	285p	STR20012	450p	TA7283	200p
HA13117	175p	LA3210	160p	LA7122	150p	LM2426S	600p	MC34063AP	300p	SAB3042	825p	STK3156	500p	STK5483	440p	STR20015	450p	TA7284P	400p
HA13118	140p	LA3226	60p	LA7214	150p	LM301	35p	MC3407	450p	SAB3054	130p	STK4017	480p	STK5486	450p	STR30110	330p	TA7288	220p
HA13119	140p	LA3246	75p	LA7215	150p	LM311	35p	MC3408	450p	SAB3209	150p	STK4019	480p	STK5487	250p	STR30120	400p	TA7291P	200p
HA13127	350p	LA3300	140p	LA7222	110p	LM319	165p	MC3412	600p	SAB3210	250p	STK4021	380p	STK5488	480p	STR30123	450p	TA7292P	325p
HA13128	400p	LA3301	110p	LA7224	150p	LM324	30p	MC3418	70p	SAB3211	130p	STK4024 II	550p	STK5490	450p	STR30125	550p	TA7294P	450p
HA13130	400p	LA3302	100p	LA7225	250p	LM325Z	120p	MC3420	600p	SAB3212	70p	STK4025	530p	STK5632	450p	STR30130	250p	TA7299	200p
HA13135	500p	LA3365	70p	LA7226	275p	LM339	35p	MC3422	2000p	SAB3213	450p	STK4026	480p	STK5720	400p	STR40090	350p	TA7302P	75p
HA13139	600p	LA3370	70p	LA7294	160p	LM348	45p	MC3423	100p	SAB3214	700p	STK4028	550p	STK5725	450p	STR40155	600p	TA7303	100p
HA13150A	1150p	LA3373	70p	LA7295	160p	LM358	45p	MC3424	110p	SAB3215	450p	STK4032 II	510p	STK5730	450p	STR40156	600p	TA7312	120p
HA13151	875p	LA3375	300p	LA7297	120p	LM380	160p	MC3425	110p	SAB3216	450p	STK4036	470p	STK5731	400p	STR40157	600p	TA7312P	120p
HA13152	400p	LA3376	80p	LA7305A	350p	LM382	130p	MC3426	375p	SAB3217	450p	STK4038	680p	STK5732	1200p	STR40158	450p	TA7312P	120p
HA13406W	400p	LA3380	300p	LA7308	70p	LM386	60p	MC3427	950p	SAB3218	450p	STK4040 II	650p	STK5733	800p	STR40159	450p	TA7313	70p
HA13408	350p	LA3390	250p	LA7311	120p	LM387	100p	MC3428	350p	SAB3219	200p	STK4042 II	800p	STK5734	850p	STR40160	450p	TA7313P	100p
HA13412	600p	LA3400	250p	LA7320	100p	LM389N	105p	MC3429	105p	SAB3220	225p	STK4044	800p	STK5735	800p	STR40161	450p	TA7313P	100p
HA13426	500p	LA3401	90p	LA7323	325p	LM393	105p	MC3430	600p	SAB3221	450p	STK4046	925p	STK5736	800p	STR40162	450p	TA7313P	100p
HA13432	400p	LA3410	150p	LA7330	350p	LM431	50p	MC3431	20p	SAB3222	775p	STK4048 II	1280p	STK5737	1000p	STR40163	450p	TA7317P	120p
HA13441	450p	LA3430	135p	LA7331	250p	LM432	45p	MC3432	20p	SAB3223	450p	STK4050 II	1600p	STK5738	1000p	STR40164	450p	TA7320P	200p
HA17524	250p	LA3600	60p	LA7332	225p	LM473	40p	MC3433	80p	SAB3224	450p	STK4060	510p	STK5739	600p	STR40165	450p	TA7322	130p
KA2101	150p	LA3605	125p	LA7340	300p	LM741DIL	18p	MC3434	110p	SAB3225	1450p	STK4065	650p	STK5740	525p	STR40166	450p	TA7323	80p
KA2130	150p	LA3607	125p	LA7341M	300p	LM747	55p	MC3435	290p	SAB3226	450p	STK4101	500p	STK5741	275p	STR40167	450p	TA7324	75p
KA2131	110p	LA4030	180p	LA7350	550p	NE57	110p	MC3436	290p	SAB3227	450p	STK4111	500p	STK5742	400p	STR40168	450p	TA7325	90p
KA2206	150p	LA4031	140p	LA7321	200p	NE592	85p	MC3437	85p	SAB3228	450p	STK4112	500p	STK5743	400p	STR40169	450p	TA7326	200p
KA2209	125p	LA4032	140p	LA7320	200p	NE592	85p	MC3438	140p	SAB3229	450p	STK4121	600p	STK5744	400p	STR40170	450p	TA7326P	110p
KA2210	230p	LA4051	160p	LA7535	175p	LM10103N	350p	MC3439	150p	SAB3230	450p	STK4122	560p	STK5745	400p	STR40171	450p	TA7327	100p
KA2211	60p	LA4100	85p	LA7545	160p	LM1040N	650p	MC3440	140p	SAB3231	450p	STK4131	480p	STK5746	400p	STR40172	450p	TA7327P	80p
KA2212	130p	LA4101	85p	LA7546	160p	LM1203	225p	MC3441	140p	SAB3232	450p	STK4132 II	600p	STK5747	400p	STR40173	450p	TA7328	80p
KA2214	100p	LA4102	100p	LA7555	150p	LM1203AN	225p	MC3442	140p	SAB3233	450p	STK4133 II	750p	STK5748	400p	STR40174	450p	TA7329	100p
KA2224	50p	LA4110	120p	LA7620	500p	LM1575T	330p	MC3443	140p	SAB3234	450p	STK4134 II	420p	STK5749	400p	STR40175	450p	TA7330	100p
KA2244	75p	LA4120	120p	LA7680	675p	LM1881N	375p	MC3444	140p	SAB3235	450p	STK4142	530p	STK5750	400p	STR40176	450p	TA7335	85p
KA2261	100p	LA4138	105p	LA7681	650p	LM1888	250p	MC3445	140p	SAB3236	450p	STK4147 II	1450p	STK5751	400p	STR40177	450p	TA7336	175p
KA2263	100p	LA4140	60p	LA7710	250p	LM1889	300p	MC3446	140p	SAB3237	450p	STK4151	680p	STK5752	400p	STR40178	450p	TA7337P	150p
KA2264	100p	LA4142	60p	LA7800	90p	LM1894N	200p	MC3447	140p	SAB3238	450p	STK4152	650p	STK5753	400p	STR40179	450p	TA7338	100p
KA2284	75p	LA4145	65p	LA7802	300p	LM1895N	275p	MC3448	140p	SAB3239	450p	STK4153	650p	STK5754	400p	STR40180	450p	TA7339	100p
KA2309	175p	LA4160	100p	LA7802	300p	LM1901N	35p	MC3449	140p	SAB3240	450p	STK4154	650p	STK5755	400p	STR40181	450p	TA7340	100p
KA2401	100p	LA4162	110p	LA7806	260p	LM1902N	35p	MC3450	140p	SAB3241	450p	STK4155	650p	STK5756	400p	STR40182	450p	TA7341	100p
KA2412	225p	LA4178	150p	LA7808	250p	LM1903N	40p	MC3451	140p	SAB3242	450p	STK4156	650p	STK5757	400p	STR40183	450p	TA7342	120p
KA2412	125p	LA4180	150p	LA7820	100p	LM1903N	40p	MC3452	140p	SAB3243	450p	STK4157	680p	STK5758	400p	STR40184	450p	TA7343	120p
KA2412	125p	LA4180	150p	LA7820	100p	LM1903N	40p	MC3453	140p	SAB3244	450p	STK4158	680p	STK5759	400p	STR40185	450p	TA7343P	120p
KA2412	125p	LA4180	150p	LA7820	100p	LM1903N	40p	MC3454	140p	SAB3245	450p	STK4159	680p	STK5760	400p	STR40186	450p	TA7344	120p
KA2412	125p	LA4180	150p	LA7820	100p	LM1903N	40p	MC3455	140p	SAB3246	450p	STK4160	680p	STK5761	400p	STR40187	450p	TA7345	120p
KA2412	125p	LA4180	150p	LA7820	100p	LM1903N	40p	MC3456	140p	SAB3247	450p	STK4161	680p	STK5762	400p	STR40188	450p	TA7346	120p
KA2412	125p	LA4180	150p	LA7820	100p	LM1903N	40p	MC3457	140p	SAB3248	450p	STK4162	680p	STK5763	400p	STR40189	450p	TA7347	120p
KA2412	125p	LA4180	150p	LA7820	100p	LM1903N	40p	MC3458	140p	SAB3249	450p	STK4163	680p	STK5764	400p	STR40190	450p	TA7348	120p
KA2412	125p	LA4180	150p	LA7820	100p	LM1903N	40p	MC3459	140p	SAB3250	450p	STK4164	680p	STK5765	400p	STR40191	450p	TA7349	120p
KA2412	125p	LA4180	150p	LA7820	100p	LM1903N	40p	MC3460	140p	SAB3251	450p	STK4165	680p	STK5766	400p	STR40192	450p	TA7350	120p
KA2412	125p	LA4180	150p	LA7820	100p	LM1903N	40p	MC3461	140p	SAB3252	450p	STK4166	680p	STK5767	400p	STR40193	450p	TA7351	120p
KA2412	125p	LA4180	150p	LA7820	100p	LM1903N	40p	MC3462	140p	SAB3253	450p	STK4167	680p	STK5768	400p	STR40194	450p	TA7352	120p
KA2412	125p	LA4180	150p	LA7820	100p	LM1903N	40p	MC3463	140p	SAB3254	450p	STK4168	680p	STK5769	400p	STR40195	450p	TA7353	120p
KA2412	125p	LA4180	150p	LA7820	100p	LM1903N	40p	MC3464	140p	SAB3255	450p	STK4169	680p	STK5770	400p	STR40196	450p	TA7354	120p
KA2412	125p	LA4180	150p	LA7820	100p	LM1903N	40p	MC3465	140p	SAB3256	450p	STK4170	680p	STK5771	400p	STR40197	450p	TA7355	120p
KA2412	125p	LA4180	150p	LA7820	100p	LM1903N	40p	MC3466	140p	SAB3257	450p	STK4171	680p	STK5772	400p	STR40198	450p	TA7356	120p
KA2412	125p	LA4180	150p	LA7820	100p	LM1903N	40p	MC3467	140p	SAB3258	450p	STK4172	680p	STK5773	400p	STR40199	450p	TA7357	120p
KA2412	125p	LA4180	150p	LA7820	100p	LM1903N	40p	MC3468	140p	SAB3259	450p	STK4173	680p	STK5774	400p	STR40200	450p	TA7358	120p
KA2412	125p	LA4180	150p	LA7820	100p	LM1903N	40p	MC3469	140p	SAB3260	450p	STK4174	680p	STK5775	400p	STR40201	450p	TA7359	120p
KA2412	125p	LA4180	150p	LA7820	100p	LM1903N	40p	MC3470	140p	SAB3261	450p	STK4175	680p	STK5776	400p	STR40202	450p	TA7360	120p
KA2412	125p	LA4180	150p	LA7820	100p	LM1903N	40p	MC3471	140p	SAB3262	450p	STK4176	680p	STK5777	400p	STR40203	450p	TA7361	120p
KA2412	125p	LA4180	150p	LA7820	100p	LM1903N	40p	MC3472	140p	SAB3263	450p	STK4177	680p	STK5778	400p	STR40204	450p	TA7362	120p
KA2412	125p	LA4180																	

LINEAR ICs/JAPANESE TRANSISTORS

Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price
TA8164P	100p	TDA1180	120p	TD2780	400p	TD4461	225p	TD48391	675p	UPC1004C	130p	2SA771	80p	2SB561	30p
TA8184P	350p	TDA1185A	120p	TD4670	75p	TD4670	75p	TD48395	360p	UPC1009	950p	2SA773	50p	2SB562	30p
TA8185P	350p	TDA1190	80p	TD4680	350p	TD4680	350p	TD48405	550p	UPC1018	170p	2SA777	35p	2SB564	15p
TA8200AK	325p	TDA1200B	80p	TD47295	150p	TD4685	75p	TD48415	650p	UPC1020	200p	2SA778	30p	2SB566	15p
TA8201AK	300p	TDA1220	50p	TD4822M	60p	TD4A700A	75p	TD48416	625p	UPC1023	60p	2SA781	100p	2SB566	90p
TA8205	220p	TDA1235	300p	TD4824	85p	TD47414C	350p	TD48417	550p	UPC1024H	2	2SA786	25p	2SB566	90p
TA8207K	175p	TDA1236	240p	TD4840	200p	TD47414C	350p	TD48425	500p	UPC1026	230p	2SA789	30p	2SB566	85p
TA8210	200p	TDA1520	275p	TD4847	100p	TD47418A	250p	TD48432	550p	UPC1028	90p	2SA798	30p	2SB566	85p
TA8211AH	200p	TDA1270	150p	TD43048	130p	TD4A725	750p	TD48433	600p	UPC1031H	150p	2SA812	15p	2SB566	85p
TA8214AH	260p	TDA1327	150p	TD43082	200p	TD48400	300p	TD48440	300p	UPC1032	60p	2SA814	60p	2SB566	85p
TA8215	300p	TDA1405	50p	TD43093	200p	TD48410	250p	TD48442	200p	UPC1035C	110p	2SA816	70p	2SB566	85p
TA8216H	300p	TDA1410	220p	TD43190	100p	TD4814A	300p	TD48443	35p	UPC1043C	125p	2SA817	25p	2SB566	85p
TA8217P	120p	TDA1520	35p	TD43301B	400p	TD4850	475p	TD48444	200p	UPC1158H	70p	2SA825	20p	2SB566	85p
TA8220AH	500p	TDA1500	275p	TD43310	120p	TD4851	325p	TD48445	325p	UPC1161	110p	2SA836	200p	2SB566	85p
TA8221AH	600p	TDA1508	175p	TD43410	150p	TD4852	325p	TD48451	325p	UPC1162	125p	2SA837	200p	2SB566	85p
TA8225H	475p	TDA1510	170p	TD43420	200p	TD4860	275p	TD48452	200p	UPC1170	150p	2SA839	110p	2SB566	85p
TA8225L	475p	TDA1512	140p	TD43501	300p	TD4866	275p	TD48453	350p	UPC1175	125p	2SA841	20p	2SB566	85p
TA8227	250p	TDA1514A	325p	TD43502	360p	TD4881	200p	TD48461	950p	UPC1187	150p	2SA842	20p	2SB566	85p
TA8229K	200p	TDA1520	35p	TD43504	30p	TD4895	300p	TD48462	250p	UPC1193	200p	2SA844	20p	2SB566	85p
TA8400P	200p	TDA15180	350p	TD43505	275p	TD4940	200p	TD48463	250p	UPC1176C	120p	2SA847	25p	2SB566	85p
TA8410P	200p	TDA1517	150p	TD43506	250p	TD4942	200p	TD48470	275p	UPC1180C	200p	2SA861	45p	2SB566	85p
TA8410P	200p	TDA1519	200p	TD43507	460p	TD4944	175p	TD48703	500p	UPC1185H	400p	2SA872	25p	2SB566	85p
TA8432	200p	TDA1519A	200p	TD43510	200p	TD4950	100p	TD48708	600p	UPC1188	400p	2SA872A	50p	2SB566	85p
TA8605N	350p	TDA1520	275p	TD43520	250p	TD45030A	100p	TD48730	225p	UPC1191	150p	2SA873	50p	2SB566	85p
TA8606N	350p	TDA1521	210p	TD43540	300p	TD45330T	300p	TD48735	175p	UPC1193	300p	2SA885	35p	2SB566	85p
TA8607P	320p	TDA1522	110p	TD43540	300p	TD45331T	200p	TD48740	625p	UPC1197	140p	2SA886	45p	2SB566	85p
TA8611AN	250p	TDA1524	200p	TD43541	175p	TD45332T	150p	TD48741	550p	UPC1198H	200p	2SA887	20p	2SB566	85p
TA8615N	480p	TDA1526	225p	TD43560	260p	TD45333T	150p	TD48808T	325p	UPC1210	150p	2SA893	15p	2SB566	85p
TA8628N	350p	TDA1534	200p	TD43561	300p	TD45500	400p	TD48809T	350p	UPC1215V	150p	2SA894	20p	2SB566	85p
TA8631	500p	TDA1540	420p	TD43561A	30p	TD45600	450p	TD48810T	350p	UPC1217H	250p	2SA895	25p	2SB566	85p
TA8632N	550p	TDA1542	500p	TD43562TF	300p	TD45700	200p	TD48811T	370p	UPC1225H	220p	2SA899	40p	2SB566	85p
TA8644N	350p	TDA1542	500p	TD43563	350p	TD45701	200p	TD48812T	250p	UPC1227V	225p	2SA904	20p	2SB566	85p
TA8646	175p	TDA1543	200p	TD43564	325p	TD45708	275p	TD48903	130p	UPC1228HA	45p	2SA907	650p	2SB566	85p
TA8653N	350p	TDA1552Q	350p	TD43565	220p	TD45709	375p	TD48950	750p	UPC1230	200p	2SA909	500p	2SB566	85p
TA8659AN	900p	TDA1553AQ	325p	TD43566	280p	TD45800	850p	TD48953	550p	UPC1237HA	200p	2SA912	25p	2SB566	85p
TA8690N	700p	TDA1555Q	375p	TD43566	220p	TD45800	850p	TD48954	550p	UPC1241H	150p	2SA913	100p	2SB566	85p
TA8691AN	450p	TDA1557Q	300p	TD43567	300p	TD45832	125p	TD48980	225p	UPC1241H	150p	2SA914	90p	2SB566	85p
TA8710N	450p	TDA1560Q	350p	TD43569	300p	TD45850	175p	TD48982	250p	UPC1242H	150p	2SA915	30p	2SB566	85p
TA8718N	550p	TDA1600Q	675p	TD43570	375p	TD45930	225p	TD49052	150p	UPC1245V	30p	2SA916	30p	2SB566	85p
TA8720	525p	TDA1571	300p	TD43580	300p	TD46100Q	120p	TD49053	750p	UPC1247V	250p	2SA917	30p	2SB566	85p
TA8739P	450p	TDA1572	175p	TD43586	750p	TD46110Q	120p	TD49054	300p	UPC1277	240p	2SA933	30p	2SB566	85p
TA8872N	450p	TDA1574	125p	TD43590	250p	TD46200	750p	TD49055	300p	UPC1278	240p	2SA934	30p	2SB566	85p
TA8A55	25p	TDA1578	210p	TD43592A	200p	TD46200-2	1100p	TD49056	300p	UPC1282V	250p	2SA935	40p	2SB566	85p
TA8A120S	70p	TDA1578A	210p	TD43592A	200p	TD46600-2	700p	TD49057	120p	UPC1287C	325p	2SA937	20p	2SB566	85p
TA8A396	70p	TDA1579	130p	TD43601Q	375p	TD46612-2	900p	TD49058	110p	UPC1292	320p	2SA939	140p	2SB566	85p
TA8A520	120p	TDA1589	275p	TD43602	225p	TD46612-2	1100p	TD49059	130p	UPC1293A	250p	2SA942	60p	2SB566	85p
TA8A530	100p	TDA1591	275p	TD43611	450p	TD46612-2	900p	TD49060	110p	UPC1298	320p	2SA943	60p	2SB566	85p
TA8A540	90p	TDA1596	200p	TD43640	350p	TD47000	170p	TD49061	130p	UPC1316C	70p	2SA942	60p	2SB566	85p
TA8A540	90p	TDA1596	200p	TD43640	350p	TD47010T	150p	TD49062	175p	UPC1318	300p	2SA949	70p	2SB566	85p
TA8A800	400p	TDA1600	200p	TD43651	200p	TD47020T	175p	TD49063	200p	UPC1320HA	80p	2SA950	18p	2SB566	85p
TA8A10AS	400p	TDA1602A	400p	TD43652	500p	TD47021T	200p	TD49064	150p	UPC1330HA	80p	2SA951	60p	2SB566	85p
TA8A20	55p	TDA1670A	200p	TD43652-TX	800p	TD47050	100p	TD49065	150p	UPC1335V	320p	2SA951	60p	2SB566	85p
TA8A20M	35p	TDA1675	200p	TD43653	850p	TD47052	120p	TD49066	150p	UPC1350	115p	2SA952	30p	2SB566	85p
TA8A20	100p	TDA1701	300p	TD43654	80p	TD47053	200p	TD49067	175p	UPC1352C	450p	2SA953	25p	2SB566	85p
TA8A20	100p	TDA1701	300p	TD43654	80p	TD47056	200p	TD49068	175p	UPC1360C	200p	2SA954	30p	2SB566	85p
TA8A90	60p	TDA1870A	200p	TD43710	300p	TD47057O	225p	TD49069	150p	UPC1362C	250p	2SA957	185p	2SB566	85p
TC5020	200p	TDA1872A	275p	TD43720	175p	TD47072	100p	TD49070	150p	UPC1363	190p	2SA958	60p	2SB566	85p
TC5081AP	80p	TDA1904	80p	TD43724	300p	TD47077	175p	TD49071	150p	UPC1363C	300p	2SA963	120p	2SB566	85p
TC5082P	170p	TDA1905	80p	TD43725	300p	TD47211	100p	TD49072	350p	UPC1364C	350p	2SA965	30p	2SB566	85p
TC5090A	230p	TDA1908A	80p	TD43730	400p	TD47212	100p	TD49073	170p	UPC1365C	450p	2SA966	55p	2SB566	85p
TC91258P	150p	TDA1910	160p	TD43732	400p	TD47213A	80p	TD49074	170p	UPC1366C	130p	2SA968	55p	2SB566	85p
TC9130P	150p	TDA1940	180p	TD43750	400p	TD47230A	150p	TD49075	170p	UPC1370C	300p	2SA970	25p	2SB566	85p
TC9134	750p	TDA1941	180p	TD43755	425p	TD47231A	80p	TD49076	170p	UPC1373	85p	2SA979	35p	2SB566	85p
TC9135P	125p	TDA1950	175p	TD43760	350p	TD47233	60p	TD49077	150p	UPC1377C	200p	2SA984	25p	2SB566	85p
TC9137P	500p	TDA2002	75p	TD43765V	225p	TD47240	175p	TD49078	500p	UPC1378	400p	2SA985	60p	2SB566	85p
TC9138AP	150p	TDA2003	85p	TD43770	460p	TD47241	225p	TD49079	170p	UPC1381	250p	2SA986	70p	2SB566	85p
TC9142	300p	TDA2005	150p	TD43780	400p	TD47245	225p	TD49080	110p	UPC1382	110p	2SA991	30p	2SB566	85p
TC9143	300p	TDA2005	150p	TD43791	200p	TD47250	400p	TD49081	600p	UPC1384	425p	2SA992	30p	2SB566	85p
TC9145	150p	TDA2006	70p	TD43800	250p	TD47255	400p	TD49082	75p	UPC1387C	250p	2SA993	50p	2SB566	85p
TC9148	200p	TDA2007	120p	TD43803A	500p	TD47266	400p	TD49083	325p	UPC1394	120p	2SA995	60p	2SB566	85p
TC9149	225p	TDA2008	100p	TD43810	200p	TD47262	325p	TD49084	375p	UPC1397	350p	2SA999	90p	2SB566	85p
TC9150	425p	TDA2009	160p	TD43825	150p	TD47272	175p	TD49085	170p	UPC1403A	60p	2SA1005	70p	2SB566	85p
TC9151P	425p	TDA2010	160p	TD43830	110p	TD47273	80p	TD49086	170p	UPC1406HA	70p	2SA1006	90p	2SB566	85p
TC9152	425p	TDA2020	120p	TD43840	200p	TD47274	75p	TD49087	125p	UPC1420CA	450p	2SA1008	125p	2SB566	85p
TC9153	300p	TDA2030	80p	TD43842	200p	TD47275	45p	TD49088	200p	UPC1421CA	650p	2SA1009	200p	2SB566	85p
TC9154AP	225p	TDA2030H	100p	TD43843	200p	TD47282	50p	TD49089	200p	UPC1423CA	650p	2SA1010	225p	2SB566	8

VIDEO SERVICE KITS

<p>AMSTRAD VCR700 <i>Contents</i> BELT SET, PINCH ROLLER, REEL IDLER, VIDEO LAMP Order Code: SK41</p> <p style="text-align: right;">£5.50</p>	<p>HITACHI VT11/VT33 <i>Contents</i> BELT SET, PINCH ROLLER, TENSION BAND, IDLER TYRES Order Code: SK08</p> <p style="text-align: right;">£5.00</p>	<p>NV600/NV688 <i>Contents</i> BELT SET, PINCH ROLLER, PLAY IDLER, FF/REW IDLER, TENSION BAND Order Code: SK25</p> <p style="text-align: right;">£12.00</p> <p style="text-align: right;"><i>Economy Kit Contents</i> BELT SET, PINCH ROLLER, PLAY IDLER TYRE, FF/REW IDLER TYRE Order Code: SK26</p> <p style="text-align: right;">£6.00</p>
<p>FERGUSON & JVC 3V42/43 HRD455/HRD725 <i>Contents</i> BELT SET, PINCH ROLLER, CLUTCH MECHANISM, TENSION BAND Order Code: SK37</p> <p style="text-align: right;">£9.00</p> <p style="text-align: right;"><i>Economy Kit Contents</i> BELT SET, PINCH ROLLER, SUPPLY CLUTCH, TAKE UP CLUTCH Order Code: SK38</p> <p style="text-align: right;">£9.00</p>	<p>VT11/VT33 <i>Contents</i> BELT SET, T/UP REEL TABLE TYRE, SUPPLY REEL TABLE TYRE, PINCH ROLLER, FF/REW IDLER, CLUTCH PLATE, TENSION BAND Order Code: SK45</p> <p style="text-align: right;">£13.00</p> <p style="text-align: right;"><i>Economy Kit Contents</i> BELT SET, PINCH ROLLER, FF/REW IDLER TYRE, T/UP REEL TABLE TYRE, SUPPLY REEL TABLE TYRE Order Code: SK46</p> <p style="text-align: right;">£3.75</p>	<p>NV730/NV770 <i>Contents</i> SLOT IN BELT, LOADING BELT, PINCH ROLLER, IDLER UNIT, TENSION BAND Order Code: SK19</p> <p style="text-align: right;">£5.50</p> <p style="text-align: right;"><i>Economy Kit Contents</i> SLOT IN BELT, LOADING BELT, PINCH ROLLER, IDLER TYRE Order Code: SK20</p> <p style="text-align: right;">£3.00</p>
<p>3V58/59/64/65 HRD170/180/210/230/300/320/370/400/430/530/700/750 HR55000 <i>Contents</i> BELT SET, PINCH ROLLER, IDLER ARM, TENSION BAND Order Code: SK44</p> <p style="text-align: right;">£7.00</p>	<p>VT52/61/62/63/64/65/86/640 <i>Contents</i> BELT SET, PINCH ROLLER, FF/REW ARM, CLUTCH PLATE, TENSION BAND Order Code: SK49</p> <p style="text-align: right;">£14.00</p> <p style="text-align: right;"><i>Economy Kit Contents</i> BELT SET, PINCH ROLLER, FF/REW IDLER Order Code: SK50</p> <p style="text-align: right;">£3.00</p>	<p>NV370/NV380/480/630/780/830/850/AG2100PK/AG2200PK <i>Contents</i> BELT SET, PINCH ROLLER, IDLER, TENSION BAND Order Code: SK21</p> <p style="text-align: right;">£5.00</p> <p style="text-align: right;"><i>Economy Kit Contents</i> BELT SET, PINCH ROLLER, IDLER TYRE Order Code: SK22</p> <p style="text-align: right;">£2.75</p>
<p>3V29/3V30 HR7200/7300/7350 <i>Contents</i> BELT SET, PINCH ROLLER, TENSION BAND, IDLER TYRES Order Code: SK05</p> <p style="text-align: right;">£5.00</p>	<p>VT400/405/410/13/14/15/18/420/25/26/28/430/31/35/48/450/498/510/520/25/26/530/35/36/540/545/46/48/570/75/576/580/85/88 <i>Contents</i> TIMING BELT, PINCH ROLLER, FF/REW ARM, CLUTCH BASE, TENSION BAND Order Code: SK52</p> <p style="text-align: right;">£9.75</p>	<p>NV777/NV788 <i>Contents</i> BELT SET, PINCH ROLLER, IDLER UNIT, TENSION BAND Order Code: SK17</p> <p style="text-align: right;">£5.00</p> <p style="text-align: right;"><i>Economy Kit Contents</i> BELT SET, PINCH ROLLER, IDLER TYRE Order Code: SK18</p> <p style="text-align: right;">£4.00</p>
<p>3V35/36, 38/39/49 HRD110/111/120/225 <i>Contents</i> BELT SET, PINCH ROLLER, TENSION BAND, IDLER TYRES Order Code: SK04</p> <p style="text-align: right;">£5.00</p>	<p>VT100/110/111/113/115/118/120/125/128/130/135/138/145/150/175/220/225/250/255/258/260/VTL30 <i>Contents</i> BELT SET, PINCH ROLLER, FF/REW ARM, CLUTCH PLATE, TENSION BAND Order Code: SK51</p> <p style="text-align: right;">£14.00</p>	<p>SHARP VC381 <i>Contents</i> BELT SET, PINCH ROLLER, REEL IDLER, TENSION BAND, VIDEO LAMP Order Code: SK47</p> <p style="text-align: right;">£8.00</p> <p style="text-align: right;"><i>Economy Kit Contents</i> BELT SET, PINCH ROLLER, REEL IDLER TYRE Order Code: SK48</p> <p style="text-align: right;">£3.25</p>
<p>3V31/3V42 HR7600/7610/7650/7655 <i>Contents</i> BELT SET, T/UP REEL TABLE TYRE, PINCH ROLLER, REEL IDLER, T/UP CLUTCH, T/UP IDLER, TENSION BAND, VIDEO LAMP Order Code: SK33</p> <p style="text-align: right;">£11.00</p> <p style="text-align: right;"><i>Economy Kit Contents</i> BELT SET, T/UP REEL TABLE TYRE, PINCH ROLLER, REEL IDLER TYRE, T/UP IDLER TYRE, T/UP CLUTCH Order Code: SK34</p> <p style="text-align: right;">£5.00</p>	<p>PANASONIC NV2000/NV2010N/7000/NV7200/NV7800 <i>Contents</i> BELT SET, PINCH ROLLER, TENSION BAND, IDLER TYRES Order Code: SK03</p> <p style="text-align: right;">£5.00</p> <p style="text-align: right;"><i>Economy Kit Contents</i> BELT SET, PINCH ROLLER, TENSION BAND, IDLER TYRES Order Code: SK02</p> <p style="text-align: right;">£5.00</p>	<p>VC500/VC571/VC581/VC582/VC583/VC584/VC5F3 <i>Contents</i> BELT SET, PINCH ROLLER, REEL IDLER, TENSION BAND Order Code: SK60</p> <p style="text-align: right;">£5.00</p> <p style="text-align: right;"><i>Economy Kit Contents</i> BELT SET, PINCH ROLLER, REEL IDLER Order Code: SK61</p> <p style="text-align: right;">£5.00</p>
<p>3V35/36/38/39/49 HRD110/111/120/121/225 <i>Contents</i> BELT SET, T/UP REEL TABLE TYRE, SUPPLY REEL TABLE TYRE, PINCH ROLLER, T/UP CLUTCH, T/UP IDLER, REEL IDLER, TENSION BAND Order Code: SK35</p> <p style="text-align: right;">£10.00</p> <p style="text-align: right;"><i>Economy Kit Contents</i> BELT SET, T/UP REEL TABLE TYRE, SUPPLY REEL TABLE TYRE, PINCH ROLLER, T/UP CLUTCH, T/UP IDLER TYRE, REEL IDLER TYRE Order Code: SK36</p> <p style="text-align: right;">£5.50</p>	<p>NV300/NV330/NV333/NV340/NV366 <i>Contents</i> BELT SET, PINCH ROLLER, TENSION BAND, IDLER TYRE Order Code: SK01</p> <p style="text-align: right;">£5.00</p> <p style="text-align: right;"><i>Economy Kit Contents</i> BELT SET, PINCH ROLLER, IDLER TYRE, PULLEY TYRE Order Code: SK14</p> <p style="text-align: right;">£3.50</p>	<p>VC781/VC7810/VC7822/VC785/VC786/VC793/VC800/ VCA100/VCA102/VCA104/VCA202 <i>Contents</i> BELT SET, PINCH ROLLER, REEL DRIVE UNIT, TENSION BAND Order Code: SK64</p> <p style="text-align: right;">£13.50</p> <p style="text-align: right;"><i>Economy Kit Contents</i> BELT SET, PINCH ROLLER, REEL DRIVE UNIT TYRE Order Code: SK65</p> <p style="text-align: right;">£3.75</p>
<p>3V29/3V30 HRD7200/7300/7350 <i>Contents</i> BELT SET, T/UP REEL TABLE TYRE, SUPPLY REEL TABLE TYRE, PINCH ROLLER, REEL IDLER, T/UP CLUTCH, T/UP IDLER, TENSION BAND, VIDEO LAMP Order Code: SK31</p> <p style="text-align: right;">£10.00</p> <p style="text-align: right;"><i>Economy Kit Contents</i> BELT SET, T/UP REEL IDLER TYRE, SUPPLY REEL TABLE TYRE, PINCH ROLLER, REEL IDLER TYRE, T/UP IDLER TYRE, T/UP CLUTCH Order Code: SK32</p> <p style="text-align: right;">£5.00</p>	<p>NV2000/NV2010 <i>Contents</i> BELT SET, PINCH ROLLER, FF IDLER, PLAY IDLER, TENSION BAND, VIDEO LAMP Order Code: SK13</p> <p style="text-align: right;">£6.00</p> <p style="text-align: right;"><i>Economy Kit Contents</i> BELT SET, PINCH ROLLER, IDLER TYRE, PULLEY TYRE Order Code: SK14</p> <p style="text-align: right;">£3.50</p>	<p>VC881/VC682/VC684/VC685/VC689/VC689N/VC6F3/VC700 <i>Contents</i> BELT SET, PINCH ROLLER, REEL DRIVE UNIT, TENSION BAND Order Code: SK62</p> <p style="text-align: right;">£13.50</p> <p style="text-align: right;"><i>Economy Kit Contents</i> BELT SET, PINCH ROLLER, REEL DRIVE UNIT TYRE Order Code: SK63</p> <p style="text-align: right;">£5.00</p>
<p>3V44/45/48/53/54/55/57 HRP50/HRD140/150/158/160 HRD250/257/565/566/755 <i>Contents</i> BELT SET, PINCH ROLLER, CLUTCH MECHANISM, TENSION BAND Order Code: SK39</p> <p style="text-align: right;">£15.00</p> <p style="text-align: right;"><i>Economy Kit Contents</i> BELT SET, PINCH ROLLER Order Code: SK40</p> <p style="text-align: right;">£9.50</p>	<p>NV7000/NV7200/NV7800 <i>Contents</i> BELT SET, PINCH ROLLER, IDLER UNIT, PLAY IDLER, TENSION BAND Order Code: SK11</p> <p style="text-align: right;">£8.50</p> <p style="text-align: right;"><i>Economy Kit Contents</i> BELT SET, PINCH ROLLER, IDLER TYRE, CLUTCH TYRE Order Code: SK12</p> <p style="text-align: right;">£3.25</p>	<p>VC881/VC682/VC684/VC685/VC689/VC689N/VC6F3/VC700 <i>Contents</i> BELT SET, PINCH ROLLER, REEL DRIVE UNIT, TENSION BAND Order Code: SK62</p> <p style="text-align: right;">£13.50</p> <p style="text-align: right;"><i>Economy Kit Contents</i> BELT SET, PINCH ROLLER, REEL DRIVE UNIT TYRE Order Code: SK63</p> <p style="text-align: right;">£5.00</p>
<p>FISHER FVHP905/906/907/908/910/911/916/918 <i>Contents</i> BELT SET, PINCH ROLLER, IDLER, GEAR IDLER UNIT, TENSION BAND Order Code: SK57</p> <p style="text-align: right;">£13.00</p> <p style="text-align: right;"><i>Economy Kit Contents</i> BELT SET, PINCH ROLLER, IDLER TYRE Order Code: SK58</p> <p style="text-align: right;">£5.00</p>	<p>NV300/NV330/NV333/NV340/NV366 <i>Contents</i> BELT SET, PINCH ROLLER, IDLER UNIT, PLAY IDLER, TENSION BAND Order Code: SK15</p> <p style="text-align: right;">£7.00</p> <p style="text-align: right;"><i>Economy Kit Contents</i> BELT SET, PINCH ROLLER, IDLER TYRE, PLAY IDLER TYRE Order Code: SK16</p> <p style="text-align: right;">£3.25</p>	<p>VC881/VC682/VC684/VC685/VC689/VC689N/VC6F3/VC700 <i>Contents</i> BELT SET, PINCH ROLLER, REEL DRIVE UNIT, TENSION BAND Order Code: SK62</p> <p style="text-align: right;">£13.50</p> <p style="text-align: right;"><i>Economy Kit Contents</i> BELT SET, PINCH ROLLER, REEL DRIVE UNIT TYRE Order Code: SK63</p> <p style="text-align: right;">£5.00</p>
<p>FVHP815/818/820/822/710/11/715/716/720/721/722/725/ 730/830/840 <i>Contents</i> BELT SET, PINCH ROLLER, IDLER, GEAR IDLER UNIT, TENSION BAND Order Code: SK68</p> <p style="text-align: right;">£11.00</p> <p style="text-align: right;"><i>Economy Kit Contents</i> BELT SET, PINCH ROLLER, IDLER TYRE Order Code: SK69</p> <p style="text-align: right;">£3.00</p>	<p>NV7000/NV7200/NV7800 <i>Contents</i> BELT SET, PINCH ROLLER, IDLER UNIT, PLAY IDLER, TENSION BAND Order Code: SK11</p> <p style="text-align: right;">£8.50</p> <p style="text-align: right;"><i>Economy Kit Contents</i> BELT SET, PINCH ROLLER, IDLER TYRE, CLUTCH TYRE Order Code: SK12</p> <p style="text-align: right;">£3.25</p>	<p>VC881/VC682/VC684/VC685/VC689/VC689N/VC6F3/VC700 <i>Contents</i> BELT SET, PINCH ROLLER, REEL DRIVE UNIT, TENSION BAND Order Code: SK62</p> <p style="text-align: right;">£13.50</p> <p style="text-align: right;"><i>Economy Kit Contents</i> BELT SET, PINCH ROLLER, REEL DRIVE UNIT TYRE Order Code: SK63</p> <p style="text-align: right;">£5.00</p>
<p>NV300/NV330/NV333/NV340/NV366 <i>Contents</i> BELT SET, PINCH ROLLER, IDLER UNIT, PLAY IDLER, TENSION BAND Order Code: SK15</p> <p style="text-align: right;">£7.00</p> <p style="text-align: right;"><i>Economy Kit Contents</i> BELT SET, PINCH ROLLER, IDLER TYRE, PLAY IDLER TYRE Order Code: SK16</p> <p style="text-align: right;">£3.25</p>	<p>NVG7/NVG9/NVG10/NVG11/NVG12/NVG14/NVG15/NVG16/ NVG18/NVG30/NVG120/NVG130/NVG400/NVH65 (PX/AC)/ AG1810 (P/K) <i>Contents</i> LOADING BELT, CAPSTAN BELT, PINCH ROLLER, IDLER TENSION BAND Order Code: SK27</p> <p style="text-align: right;">£6.00</p> <p style="text-align: right;"><i>Economy Kit Contents</i> LOADING BELT, CAPSTAN BELT, PINCH ROLLER, IDLER TYRE Order Code: SK28</p> <p style="text-align: right;">£3.00</p>	<p>VC881/VC682/VC684/VC685/VC689/VC689N/VC6F3/VC700 <i>Contents</i> BELT SET, PINCH ROLLER, REEL DRIVE UNIT, TENSION BAND Order Code: SK62</p> <p style="text-align: right;">£13.50</p> <p style="text-align: right;"><i>Economy Kit Contents</i> BELT SET, PINCH ROLLER, REEL DRIVE UNIT TYRE Order Code: SK63</p> <p style="text-align: right;">£5.00</p>
<p>NV332 <i>Contents</i> BELT SET, PINCH ROLLER, PLAY IDLER, FF/REW IDLER, TENSION BAND, FF/REW TYRE Order Code: SK29</p> <p style="text-align: right;">£12.00</p> <p style="text-align: right;"><i>Economy Kit Contents</i> BELT SET, PINCH ROLLER, PLAY IDLER TYRE, FF/REW IDLER TYRE Order Code: SK30</p> <p style="text-align: right;">£5.10</p>	<p>NV230/250/260/280/430/450/460/470/650/810/890/ AG1200PK/AG1500PK <i>Contents</i> BELT SET, PINCH ROLLER, IDLER, TENSION BAND Order Code: SK23</p> <p style="text-align: right;">£6.00</p> <p style="text-align: right;"><i>Economy Kit Contents</i> BELT SET, PINCH ROLLER, IDLER TYRE Order Code: SK24</p> <p style="text-align: right;">£3.25</p>	<p>VC881/VC682/VC684/VC685/VC689/VC689N/VC6F3/VC700 <i>Contents</i> BELT SET, PINCH ROLLER, REEL DRIVE UNIT, TENSION BAND Order Code: SK62</p> <p style="text-align: right;">£13.50</p> <p style="text-align: right;"><i>Economy Kit Contents</i> BELT SET, PINCH ROLLER, REEL DRIVE UNIT TYRE Order Code: SK63</p> <p style="text-align: right;">£5.00</p>

**FOR MORE DETAILS OF OVER 500
TYPES OF SERVICE KITS...
PLEASE RING US!**

NEW UNIVERSAL REMOTES

See Page 350

JUST ARRIVED!!!!

REPLACEMENT VIDEO CASSETTE HOUSINGS

Name	Models	Code	Price	Name	Models	Code	Price
AKAI	VS35, VS53, VS55, VS56, VS75	CH18	3200p	FV31R		CH19	4300p
GRANADA	VHS0P1, VHSYJ2	CH05	1100p	HRD515, 520, 527, 540, 550, 580, 600, 610, 620, 660, 670, HRD830, 840, 850, 860, 4050, 6600, FV37H		CH20	2200p
GOLDSTAR	GHV1290P, 1291P, 1295P, 9400, 73401, GSE1295P, GSE1891P, 20001Q, 20051Q, VCP4200, 4300, 4301, 4305, VCP4306, 4311, 4315, 4316, 4320, 4321, 4325	CH25	2000p	HRD540, 580, 830, 860, 910, 950, HRD970, HRD20, FV57H		CH27	2400p
FERGUSON & J.V.C.	3V38, 3V39, 8943, 8944, 8951, 3V35, 3V36, 3V49, HRD 110, 111, 120, 121, 225	CH01	2800p	VR3605, VR3905		CH01	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
	8948, 8950, FV10B, 12L, 13H, 14T, 20B, 21R, 22L, 26, 395, HRD230, 430, 530	CH03	2800p	VR3916, 3926, 3946, 3948, 3976, 3986, 3995, 3997, 6948		CH02	2800p
	3V58, 3V59, 3V64, 3V65, FV11R, 8950, 8951, HRD170, HRD180, HRD370	CH04	2800p	NATIONAL PANASONIC N.E.C.		CH06	4300p
				NR30EG, NR31EG, NR31EG, NR32, NR33EG		CH01	2800p
				NR895		CH02	2800p
				PHILIPS CASSETTE LIFT ASSEMBLY (69120366)			
				DV186, 190, 286, 471, 582, 761, VR6180, 6182, 6185, 6285, VR6290, 6291, 6293, 6362, 6367, 6393, 6467, 6468, 6470, VR6561, 6670, 6760, 6761, 6870, 6970		CH05	1100p
				VR6443		CH22	2900p
				VR6448		CH23	2500p
				48SBB		CH24	2500p
				SHARP VCA100, VCH851, VCH852		CH22	2900p
				VCA103, 103GV, 106, 106GVM, 254GVM		CH23	2500p
				VCS211, 244, 5055, 605, VCB230, VCD806G, 810G, VCT212, 310, 410G, 610		CH24	2500p
				VR2970		CH02	2800p
				THOMSON V320, 321, 323, 326, 4200, 4300		CH01	2800p
				V342, 343, 352, 353, 360, 364, 368, 4210, 4230, 4260, 4400, V5500, 6000, 8540		CH02	2800p
				TOSHIBA V55, V57		CH01	2800p
				V65, V66		CH02	2800p
<p>☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆</p> <p>☆☆ AMSTRAD MOD KIT ☆☆☆</p> <p>☆☆ FITS : ☆☆☆</p> <p>☆☆ VCR 4500, 4600, 4700, 5200, TVR 1,2,3 ☆☆☆</p> <p>☆☆ PRICE : £2.25 + VAT each ☆☆☆</p> <p>☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆</p>							

MODE SWITCH

NV2000, 2010, 7000, 7200, 7800 (VS50048)	
NV230, 260, 430, 810, 870, 2300, 4300 (VSS0110)	£3.50
NV830 (VSS0091)	£2.25
NV300, 333, 340, 366, 688, 777, 778 (VSS0060)	£2.10
NVG21, 25, NVH65, NVD80 (VSS0175A)	£3.75
	£2.00

AUDIO CONTROL HEADS

AMSTRAD ORIGINAL NO: 150751
 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

AMSTRAD ORIGINAL NO: 153134
 Used on: AMSTRAD DD8900, 8904, VCR2000, 6000, 6100, 8600, 8602, 8603, VCR8604, 8700, 8704, 8714, 8800, 9005, 8244
 Also fits: ANTECH, BONDSTEC, CASIO, CROWN, FIDELITY, GOLD-HAND, GRANADA, HINARI, MARQUANT, OMEGA, PROFEX, SCHNEIDER, SEG, SENTRA, SHINTOM, TASHIKO, TATUNG, TOWADA, UNIVERSUM
ORDER CODE: AH02 PRICE: 1450p

Replacement Audio Control Video Sound Head for National Panasonic

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

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VIDEO CLEANING STICKS

Price 17p each 15p each pack of 10pcs
 13p each pack of 25pcs
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 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
 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 90mA
 Order Code: BB01
 Part Nos: 138 - 10229, 2.4v 100mA
 Order Code: BB02

Price: 75p

Price: 135p

FERGUSON

Part No: 00E6 - 067 - 001 1.2V 100mA
 Order Code: BB03
 Part Nos: 00E6 - 606 - 8001 2.4V 100mA
 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

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

TIME LAG (20mm)			QUICK BLOW (20mm)		
CURRENT RATING	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

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 1997/8

Listing more than 31,600 Semiconductors with suitable alternative complete with descriptions and base information.

Price: £15.50 - No VAT. Order Code: BOOK04

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

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

SERVICE AIDS

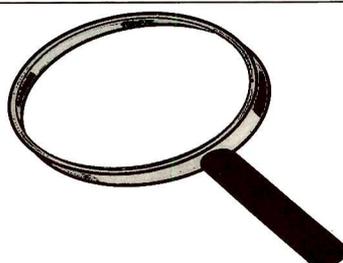
DESCRIPTION	VOLUME	CODE	PRICE
VIDEO HEAD CLEANER	75ML	SP01	125p
SWITCH CLEANER	176ML	SP02	140p
SILICONE GREASE	200ML	SP03	170p
FREEZE IT	170ML	SP04	280p
FREEZE IT	400ML	SP16	570p
FOAM CLEANER	400ML	SP05	155p
ANTI-STATIC	150ML	SP06	155p
AEROKLEANE	135ML	SP07	185p
AERO DUSTER	150ML	SP08	290p
AERO DUSTER	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 REMOVER 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

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

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



I.C. PROTECTORS

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

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12V CW MOTOR	170p
12V CCW MOTOR	170p
13.2V MOTOR	290p

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MONO HEAD	90p
STEREO HEAD	110p
MINI HEAD	150p
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CD PICK UPS

Models & Description	Order Code	Price
IWA		
C007	KSS151A	1900p
X-990A, DX-DIA	KSS152A	1600p
KL60, CXL66G, CXL80, CXN3100, CXN320, CXN3300, CXN360, CXN400, CXN430, CXN540, KN550G, CXN990, CXN999, CXNV20, CXSL70, DXZ9100M, FDN636, FDN6636, FDN939, IX60, LCK66G, LCK70M, LCK80, M7400, M75, NSX320, NSX360, NSX400, NSX430, NS990, NSX992, NSX999, NSX999, NSX999, NSX999, NSX999, SXFN550, SXFN520, XC300, X550, XCT790, XC900, XC950, XC992, XC920, XG360, XG400, XG950, ZD3000M, ZD3100M (AP1, CXL17, CXL18G, CXL18G, CXL250P, CXZ250, DXM740, DXM75, DXM76, DXM77, LCX50, LCK7, X8G, LCKAP1, XC002, XC004, XC005, XCT777	KSS152A	1600p
81, XP93, XP95, XP80G	KSS210B	2000p
	KSS220A	2600p
	KSS331A	3400p
IAI		
73, DC93	KSS151A	1900p
25, CD26, CD27, CD32, CD36, CD37, CD52, CD55, CD57, CD650, CD670, CD69, CD750, CD79, M480, CDPM600, CDPM670, CDEM770, CDM959, MX950, MX570, MX650, MX670, MX750, MX950	KSS210A	1800p
NON		
15000L, DCD1520, DCE03520	KSS151A	1900p
11400, DCD600, DCD600	KSS152A	1600p
11420, DCD520, DCD610, DCD620, DCD660, DCD610, DCD620, DCD860, DCD910, DCD920	KSS210A	1800p
11015, DCD1290, DCD2060, DCD2060G, DCD315, DCD480, DCD580, DCD615, DCD715, 1825, DCD980, DCD995, DN2000F	KSS240A	3000p
NDSTAR		
52A, CD952AJ, CD952LJ, CD952SJ, FFH101KL, FFH101WL, FFH222AL, FFH272L, 133L, FFH373K, FJ606, FR606L	KSS210A	1800p
10AL, CD630SL, FFH121AL, FFH212E	KSS210B	2000p
NING		
19, CD435	HOPM3	2150p
100, CD101MCD90A, MC10, NEW ORLEANS CD	KSS210A	1800p
1100, RR1900CD, RR3100CD, RR4000CD, RR610CD, RR7000CD	KSS210B	2000p
9, CDP90	KSS220A	2600p
5	KSS331A	3400p
5	OPTIMA5	3000p
CHI		
60	HOPM3	2150p
	KSS210A	1800p
	KSS210B	2000p
992, LATE 1987-1988 - XLE300BK, XLE31BK, XLE51BK, XLE900BK, XLE91BK, XLV101BK, BK, XLV22BK, XLV31BK, XLV33BK, XZ1010TN, XZ141BK, XZ144BK, XZ155BK, XZ161BK, 10 CASSETTE, MINI SYSTEMS - MODELS 1990-1992	OPTIMA3	4000p
1, CA-MX30BK, CA-MX39BK, UX-A5, UX-A6, XL-M308, XL-M403BK, XL-M408, XL-M409, 4BK, XL-M505TN, XL-M508, XL-M509, XL-M705TN, XL-V131BK, XL-V151TN, XL-V221BK, 1TN, XL-242BK, XL-V251TN, XL-V252BK, XL-V253BK, XL-V254BK, XL-V255BK, OPTIMA5	3000p	
WARDARS - CAE48BK, CAMCG7, CAMXG9, CAS20BK, CAS30BK, VAS50, CAS60BK, MXS30, MXS60, PCX105, PCX130, PCX95, RCX230, RCX320, RCX520, RCX620, 1, UXAA4, UXAA5, UXAA5, UXC7, UXT1, XLV115, XLV116, XLV215, XLV216, 10M, XLMXG7, XLMXG9, XLV163TN, XLV164BK, XLV174, XLV263TN, XLV264BK, 3K, XLZ463TN, XLZ464BK, XLZ474, XTMXG7, XTMXG9, XTS60	OPTIMA6S	3300p
ID		
P660SG, DP8020, DP87, L10000	KSS152A	1600p
DP1510, DP2010, DP2030, DP3010, DP3030, DP3050, DP4030, DP491, DP5010, DP5030, DP520, DP7030, DP7040, DP7050, DP730, DP920, DP930, DP950, DPM650, DPM6630, 1, DPM850, DPM891, DX6520, M225, M25, M450, M850, PD3030, PDM991, RDX25, 1, XDC3L, UD202, UD302	KSS210A	1800p
PC72, DPC77, DPC80, DPC92	KSS220A	2600p
DP2050, DP3060, DP501, DP5060, DP722, DP76, DP85, DP89, M77A, PD3060, 10, UD701, UD90, XE5	KSS240A	3000p
DPC521, DPC531, DPC631K, DPC721, DPC731	KSS331A	3400p
1P2060, PART No: RCTRHB136AFZZ	RH8136A	4500p
INIC		
SLP202A, SLP212A, SLP222A, SLP277A, SLP377A, SLP477AK, SLP477A, 1, SLP200A, SLP6400A, SLP6500AK, SLP6500AS, SLPJ24A, SLPJ26A, SLPJ28A, SLPJ325A, SLPJ325A, SLPJ37A, SLPJ38A, SLPJ46A	691-30209	6500p

Models & Description	Order Code	Price
SAD30, SLC49, SLP150, SLP170, SLP200, SLP222, SLP230, SLP250, SLP333, SLP370G, SLP400C, SLP555, SLP777, SLP999, SLP1A10, SLP2C20, SLP2J25, SLPJ25, SLPJ26, SLPJ27, SLPJ37, SLPJ45, SLPK25, SLPK26, SLP550, SLP570, SLP5700, SLP5840, SLP5900	SOAAD70A	2350p
PHILIPS		
AZ830A, CD070, CD080, 890, 910, 920. PART No. 4822-691-20768	4822-691	3100p
CD100, CD130, CD1380, CD1482, CD200, CD204, CD210, CD300, CD303, CD304, CD380, CD480, CD482, CD500, CD502, CD582, CD583, CD584, CD610, CD620, CD630, CD780, CD781, CD782, CD840, CD883, CD980, CDF104, CDM419, FCD185	691-30209	6500p
AS440, AS445, AS540, AS640, AZ8048, AZ8640, CD070, CD080, CD091, CD163, CD165, CD890, CD710, CD720, CD732, CD740, CD750, CD910, CD920, CD935, FW17, FW21, FW26, FW330, FW36, FW360, FW380L, FW40, FW41, FW46, FW56, FW66, FW68	CDM12.1	1800p
CD1210V0	CDM12.4	2200p
AZ800G	KSS210B	2000p
FW11	OPTIMA6S	3300p
PIONEER		
PDM400, PDM410, PDM500, PDM510, PDM600, PDM610, PDM700, PDM710, PDM730, PDT303, PDT403, PDT503, PDX940M, PDX950M, PDZ560T, PDZ72T, PDZ73T, PDZ81M, PDZ82M, PDZ83M, PDZ960M, XDZ53T, XDZ54T	KSS151A	1900p
N32, N90M, PD101, PD201, PD32, PD41, PD4500, PD4700, PD52PD5700, PD65J, PD6500, PD6700, PD700, PD700, PD970, PDCP420, PDCP520M, PDCP520T, PDJ400T, PDJ500T, PDJ800M, PDJ900M, PDM430, PDM450, PDM550, PDM630, PDM650, PDM750, PDM901, PDF710T, PDF720T, PDF910M, PDF920M, PDS501, PDS601, PDS701, PDS701G, PDS901, PDT310, PFT510, PDZ, PDZ570T, PDZ74T, PDZ84M, PDZ970M, PXA1349, S125CDT, S125CDT, S303CDM, S303CDT, S905DM, S905DT, S707DM, S707DTM, S905DM, S905DT, XCP410M, XCP410T, XDZ54T, XDZ55T, XDZ64M, XDZ84T, XRP310, XRP320	PEA1030	4400p
PDM400, PDM410, PDM500, PDM510, PDM600, PDM610, PDM700, PDM710, PDM730, PDT303, PDT403, PDX940M, PDX950M, PDZ560T, PDZ72T, PDZ73T, PDZ81M, PDZ82M, PDZ83M, PDZ960M, XDZ53T, XDZ54T, XDZ55T, XDZ62, XDZ62M, XDZ830, XZ822	FWY1009	4800p
SAMSUNG		
CD20	HOPM3	2150p
CD1200, CD1310, SCM-6000, SCM6900	KSS210A	1800p
RCD1200, RCD1300, RCD1350, RCD1600, RCD2600, RCD990, RCD995, SCM6900	SOH90T4N	3600p
SANYO		
DCFS3, DCT55, DCX502, DCX701, DCX702, DCX802, DCX891, DCX891N, MCDZ10. PART No. 6142186855	614218	2300p
DCFS5, MCD450K, 660K, MCDZ30L, 60F. PART No. 6142205006	614220	5600p
DCX1000MD, DCX1003, DCX900MD, DCX903, DCX915	KSS210A	1800p
DCD10, DCD11U, DCD20, DCD30, DCD30AT, DCD6, DCD8U, DCMS1, DCX110, DCX12L, DCX210, DCX220, DCX993, DCX994, MCDMS40L, MCDMS50L, MCDMS60L, MCDZ1L, MCDZ2L, MCDZ3L. PART No. 6142391303	614239	3300p
DCD15, PART No. 645005386	645005	3700p
MCDZ3L, MCDZ4L, MCDZ6L, MCDZ7L	KSS210B	2000p
SHARP		
CD-111, CD-301, CD-302, CD-304, CD-310, CD-C3, CD-L700, CD-L800, CD-U-1, CD-U10, CD-X10, CD-X12, CD-X15, CD-X16, CD-X17, CD-X20, CD-X9, CKL560, CMS85CD, DX-150, DX-160, DX-450, DX-460, DX-461, DX-650, DX-660, DX-690, DX-A3, DX-N45, DX-R54, DX-R7, DX-R75, DX-R750, DX-R77, DX-R770, DX-R820, DX-R840, DX-Z100, DX-Z1000, DX-Z1500, GFCD55, QT-300C, QT-33CD, QT-350CD, QT-37CD, QT-38CD, QT-CD20, QT-CD33, RS95, SC-77CD, SC-99CD, SC-R95, SG-A1, SG-W1CD, SG-W2CD, SYS302, ZCD7CD. PART No. RCTRHB122AFZZ	RH8122A	5750p
QT-50CD, QT-60CD, QT80CD. PART No. RCTRHB124AFZZ	RH8124AF	2900p
DXR-840B. PART No. RCTRHB130AFZZ	RH8130AF	2900p
CDS360E, 360H, 370, 450HE, CMS150CDH, CMSR400CDH, CP150, CPR400, CPS360, 370. PART No. RCTRHB136AFZZ	RH8136AF	4500p
SONY		
KSS240A	KSS240A	3000p
KSS121A	KSS121A	3500p
KSS151A	KSS151A	1900p
KSS210A	KSS210A	1800p
KSS210B	KSS210B	2000p
KSS220A	KSS220A	2600p
KSS331A	KSS331A	3400p
KSS360A	KSS360A	2600p
TECHNICS		
SLP200, SLP230, SLP250, SLP333, SLP555, SLP777, SLP999, SLP1A10, SLP2C20, SLPJ25, SLPJ45, SLP5700, SLP5900	SOAD70A	2350p

REMOTE CONTROLS

Model	Code	Price	Description	Code	Price	Description	Code	Price	Description	Code	Price
	RC876	650p	A512120/230	RC900	650p	PANASONIC			SONY		
	RC891	650p	A514790	RC901	650p	EUR51200	RC200	650p	RM604, RM605, RM606	RC140	650p
	RC896	650p	A5088470	RC902	650p	TC2200	RC204	650p	32 CHANNEL	RC140	650p
			A518612	RC903	650p	VSQ0357/NV730	RC202	650p	RM613	RC141	650p
			SC1002	RC904	650p	TN01621	RC203	650p	RM632, RM636	RC160	600p
	RC894	650p	C2096	RC905	650p	PHILIPS			TATUNG		
			A511940	RC906	650p	RC5002,5154	RC134	650p	FXA	RC877	650p
			655602H	RC1920	650p	KT3 NON TEXT	RC135	650p	RC70	RC883	650p
			ITT			69117032	RC178	650p	FX70 FASTTEXT	RC894	650p
			IFB13, 14, 15	RC143	650p	69117194	RC180	650p	TELEFUNKEN		
			FS4	RC148	650p	RC5991-UNIV	RC300	550p	FB632	RC632ST	650p
			RG305	RC305	650p	RC38	RC301	650p	FB639	RC639	650p
			RG306	RC306	650p	KT3 TEXT	RC5301	650p	THORN/FERGUSON		
			FS9/1-10/1	RC307	650p	RC5375	RC5352	650p	3V35-42	RC342	600p
			VS5 RUK	RC308	650p	RC5375	RC300	550p	3V31-32	RC344	650p
			VS4-1	RC308	650p	RC5903	RC5903	650p	3V57-58	RC628	650p
			MULTICONTROL (17C20)	RC311	650p	SALORA			TX10 TEXT	RC732	575p
			LOEWE			SERIES L	RC190	650p	TX10 STEREO TEXT	RC738	575p
			DC11	RC146	650p	86173	RC882	650p	TC90-100	RC740	600p
			MATSUI			SANYO			3V55, FV11	RC783	650p
			010270601	RC889	650p	RC218, RC222, RC228, RC238	RC140	650p	TX100 FASTTEXT	RC789	650p
			VX770	RC892	650p	JXGE	RC878	650p	TX100 ST, FASTTEXT	RC789	650p
			NOKIA			JXDE	RC884	650p	PROFESSIONAL	RC790	650p
			SATELLITE	RC950	650p	VHR2300	RC890	650p	TOSHIBA		
			ORION			RC628	RC865	650p	CT937	RC950	650p
			RC53	RC892	650p	SHARP			CT9117	RC951	650p
						G0121CESA, 123CESA, 204, 251	RC140	650p			

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Code: 8 WAY

PRICE: 1450p + VAT

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Replaces up to 2 remotes (TV/Satellite) • Simple key arrangement • Set-up by library review

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PRICE: 925p

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: New or good used LOPT (type FEA214) for a 17in. CTX monitor, CPS-1760 Proscan. Colin McCormick. Please call 01752 405 201 evenings or e-mail colin-mc@mail.eurobell.co.uk

Wanted: Service manual or circuit diagram (photocopy OK) for the Sharp PA-W1410 word processor. Bill Young, Foxgloves, Church Lane, Redmire, Leyburn, N. Yorkshire DL8 4EQ. 01969 622 598.

Wanted: Mullard DG7-5 CRT for a Mullard valve tester, and a Cossor 807 valve (or Air Ministry A/M II0E/8) for a Cossor 339 oscilloscope. H. Fenn, 111 North Walsham Road, Norwich, Norfolk NR6 7QG. 01603 425 557.

Wanted: Circuit diagram (photocopy OK) for the Ayr Viewdata/teletext add-on unit Model T1, or any service information. R.E. Holt, 46 Osborne Parc, Helston, Cornwall TR13 8NZ.

Wanted: MB88536 IC for the Sanyo TV Model CTP6135-00. Alfred Moores, 14 Edward Street, Norwich, Cheshire CW9 7DQ. 01606 331 006.

Wanted: Philips/Pye Model 24CE3270/05B Fastext set for spares. Will pay cash and collect. A. Watt, Bryn Gelli, Unch Y Maes, Dolgellau, Gwynedd. 01341 423 096.

Wanted: Complete upper and lower drum assembly for the Mitsubishi HSM34, or alternatively a complete scrap machine. James Burch, 9 Groveland Road, Beckenham, Kent BR3 3PU. 0410 626 002.

For disposal: Many copies of *Television* going back over the last 25 years. Please send for list. R.W. Moxon-Groves, 22 High Tree Close, Ongar Hill, Addlestone, Surrey KY15 1BT. 01932 854 122.

Wanted: Service manuals or circuit diagrams for the JVC KS-

RT404 car radio-cassette unit and the Murphy CD200 stereo compact disc player. Photocopies OK. W. Craig, 15 Windsor Crescent, Rothwell, Leeds LS26 0LN. 0113 282 4743.

Wanted: LOPT for the Goodmans Compact 100 PCTV. Michael Pope, 76 Barkby Thorpe Lane, Thurmaston, Leicester LE4 8GS. 01162 602 270.

Wanted: Instruction manual (photocopy OK) for a Grundig VPS550 VCR. Also a Maplin UHF tuner kit (code no. LP09K) built or not. David Roberts, No. 5 Pendower, Lloyd Street West, Llandudno, N. Wales LL30 2BE. 01492 877 952.

Vintage Equipment: I repair vintage wireless sets and associated equipment and also collect old radio receivers. I would be happy to hear from anyone who wishes to dispose of any old sets or has a service/spares requirement. Steve Farley, 128 Hawthorn Road, Kingstanding, Birmingham B44 8QA. 0121 382 1312, fax 0121 382 1558.

Wanted: SDA2011 microcontroller chip or complete front panel for the Grundig CUC2410 chassis, and an MAB8441P front-panel microcontroller chip for the CD player in a Philips FCD565/35 hi-fi system. Owen O'Reilly, Belfield, Gay-brook, Mullingar, Co. Wexmeath, Ireland.

Wanted: Fairly up-to-date set-up chart for the B & K 467 CRT tester (my one, 497-022-0-586, 1986, is out of date). Loan or sale, photocopies OK. Also 510ABC22P tube for the Mitsubishi Model 2027; circuits or an IC list for the SAFT fast-charge Mk II; and a colour tube data/equivalents book. Michael J. Levy, 19 Totternhoe Close, Kenton, Harrow, Middx HA3 0HS. 0181 907 3620.

Request: Because of a mail deliv-

ery problem while I was away, some replies to my request for valve radio/TV spares (January issue, page 186) may have gone astray. Could anyone who didn't receive a reply from me please write again? Steve Taylor, 11 Charnborough Road, Coalville LE67 4SF.

Wanted: Working power supply for the Panasonic NVL28 VCR. M. Shafiq, 4 Leighton Road, Old Trafford, Manchester M16 9NX. 01706 621 015 or 0956 668 524.

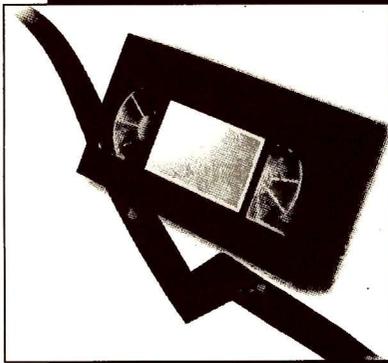
For disposal: Copies of *Radio and Television Servicing* from 1953-62 for sale at £5 per volume plus postage or collect. Phone Nick Hunter on 01162 872 397.

Wanted: Any information - circuit diagram, service manual, instructions, parts list - for the floor-mounted Pye studio video projector dating from about 1980. Thanks to all who contacted me about TDA chips - I now have plenty. Richard Gifford, 4 Gipsy Lane, Needham Market, Suffolk IP6 8DY. 01449 723 009.

Wanted: VPT PCB, working or not, for the Salora SV9900 VCR. I have for disposal service manuals, counting tubes, semiconductors (including older US types), video and TV parts, some 200 ICs in original packs and other electronic goodies, all at a reasonable price. Please fax Greg Strange, I.Eng., G81WJ on 0151 327 5971.

Wanted: Line hold control, circuit reference L404, for the JVC Model 3040UKC 5in. portable mono TV/FM radio receiver. David Parkinson, 84 Abbotsbury Road, Broadstone, Poole, Dorset BH18 9DD. 01202 255 103.

For disposal: CD-ROM edition (PC) of Electrotech's *Service and Repair Encyclopaedia of Domestic Electronic Equipment*. Send SAE for details to Mrs R.A. Thomas, 52 Forge Close, Caerleon, Gwent.



VCR Clinic

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Richard Flowerday
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Goodmans VN6000

If one of these machines comes in dead with no blown fuses, check the E 5-8V line at plug P801 in the power supply – the PCB has the voltages marked on it. If the voltage is low, check C822 (330µF) by replacement. **P.B.**

Philips VR268

This machine was faulty from new. When a recording was made then played back, the picture would fade to snow – as if the heads were becoming dirty. The picture would return when the tape was rewound.

All became clear when an LP recording was tried. The machine didn't sense that it was an LP recording, playback being in the SP mode. A problem with the control track? Yes, the machine was intermittently failing to record the control track. Link 9604, which is by the threading belt pulley, was broken. A new wire link restored normal operation. **P.B.**

JVC HRJ610EK

For a dead power supply with no blown fuses, check C12 (2.2µF) by replacement. **P.B.**

Grundig GV540

This machine worked all right mechanically, but with playback and E-E operation there was no sound or video (just a blank screen) from the modulator. Scope checks showed that the TDA8540 video switching chip IC7770 was

not switching the signal to the modulator.

A look through the on-screen menus and the special features revealed no reason for this, so a new TDA8540 was fitted. It made no difference. Fortunately by this time we had a new GV540 in stock, so comparisons could be made. By using both traces of a double-beam scope, I found that the I2C bus signals to IC7770 differed between the two machines. But why? I was about to swap the main boards over when I spotted an IC with a socket. Replacing it restored the signals. The chip was IC7250, the operating system EPROM. **P.B.**

JVC HRD580EK

The only thing this machine would do was to display a flashing clock and a hyphen where the channel indicator should be. Checks showed that the standby voltages were all present, correct and clean. Scope checks on the clock oscillators proved that they were all working normally. With this in mind I decided to replace the memory chip IC602, which cured the problem.

Note that the machine will play without IC602 being present – a useful test if you suspect it. **R.F.**

Daewoo V21 (V215, V415)

'Extreme tiredness' would best sum up the trouble with this machine. The cassette was stuck inside because there was not enough 'urge' to eject it. Tape threading was very slow. Unthreading was equally slow, after which the deck would go back to sleep. This was all because the voltage on the ever-14V line had fallen to 7V. The 14V supply reservoir capacitor C818 in the

power supply section was

Panasonic NVL28

We've had two cases receiv- ing the fluorescent display pair- im- ing or extinguishing inter- tent- ly. The cause was traced to /- the joints, in one case at pin 7 he id in chopper transformer T110 the e jointing of the links connect- to pins 12 and 13 of P1001 c e main PCB. **E.T.**

JVC HRJ200

At random times in the E- d record modes the picture a ound would be lost, with a coar- nistle on sound and patterning of vision. Playback was OK. times. Prolonged scope ch- - because of the intermittent are of the fault – proved that 7 module TNR2 was going 1 ble. A new module cured the p em. **E.T.**

Philips VR813

The intermittent fault with 2 of these machines took the f of cassette ejection, deck sh wn, clock readout pulsing and ny between the symptoms a ring would sometimes be sev days. Someone had apparently ady replaced the microcontroller chip. We traced the cause to dry-joints between P1 and the power supply PCB. The mode switch on the Panasonic G deck used in this machine was also changed. **E.T.**

Hitachi VTF860E

There had been a mains power fail- ure: when the power was restored this machine remained dead. Replacing C6 (1µF, 250V, 105°C) restored normal operation. To ensure reliability we also replaced

the 180k Ω start-up resistors R3 and R4. **D.S.**

Mitsubishi HSB27

When this machine was powered it worked perfectly except for the fact that in the play mode loops of tape were left. There was no take-up. Once I'd got the tape out I noticed that the felt pad had fallen off the half-loading arm. Don't be tempted to refix it without removing the arm, as the rubber washer beneath it may be decomposed, leaving a sticky mess – I've had this with the last two of these machines that came in.

Once the gunge had been removed, a little grease applied, a new washer fitted and everything reassembled the machine produced immaculate pictures. **D.S.**

Aiwa FX2500/FX3500

These two machines both had clock update problems. The time could be set correctly in the evening. The next day it would be one hour fast or slow.

While observing one machine in the workshop I noticed that at 12:00 noon there was no change but at 12:01 the PDC flashed off and on and the time changed to 13:01. By 12:02 it was at 13:03.

The microcontroller chip uses teletext data to set the clock at certain times during the day and night. The PDC and time signals are decoded by the SDA5649 chip IC106. Replacing this item in both machines cured the timer problems. **M.K.**

Soundwave VCR961

This machine is identical to the **Alba VCR7310** and the **Orion D1096**. Very low playback audio was the symptom. As a buzz could be induced in the speaker by touching the back of the ACE head, a new head was fitted. This failed to cure the fault. Neither did replacing the LA7286 chip IC5001. After much checking the culprit turned out to be C5028 (1 μ F, 50V), which was very low in value and leaky. It's connected to pin 8 of IC5001. A replacement restored the sound level. **M.K.**

Aiwa HVF3500

There was a tape stuck in this machine, but it would still lace up. To sort out the cause of the problem I had to dismantle the machine to get at the underside of the main PCB – you have to do this with machines from more and more manufacturers nowadays. A careful

examination of the power supply area then revealed a bad dry-joint at the emitter of Q601. Once this and other suspect joints had been resoldered and the machine had been reassembled it worked perfectly.

We've had intermittent mechanical and electrical faults, such as no drum rotation, because of poor contact with the flexible PCB links that connect the drum and capstan motors to the base PCB. Modified parts are available from Aiwa: DM lead CB part no. 58 065 130 120 and CM lead CB part no. 58 065 130 111.

I also clean the base PCB spring contact pads with a pencil eraser and the spring contact on the main board, finishing off with alcohol. This mechanism (TN6500) is used by other manufacturers. **M.K.**

Toshiba V209

The symptoms were as follows: the carriage would shuffle in and out; the cassette symbol was permanently lit; and no functions would operate though the correct symbols would light up in the display. The cause of all this was the front loading switch S122, which was permanently closed. It should open when eject is completed. The lever that operates it moved correctly, but the clear plastic cover-cum-operating block was missing. A new switch restored correct operation. **R.B.**

Ferguson 3V48

A quickie on this machine: the cause of intermittent drum rotation was found to be a dry-joint at the 2SB1052 transistor Q1. **R.B.**

Sony SLV625

Rewind and fast forward were particularly noisy, and there was a slight but noticeable rhythmic knock during playback. When I watched the toothed drive belt in the play mode it was obvious that the tension was varying. The machine was considerably quieter in all modes when the belt has been removed and cleaned, also the drive gear on the capstan shaft.

There's a temptation to strip out the reel drive gears and look for problems here when the fault is more fundamental and easier to cure. **R.B.**

Goodmans VP2300

This machine uses the Philips Turbo deck. It was unable to load a cassette – and for good measure a coin was rattling around inside it.

There was only 1.2V at the loading/mode motor, also at its drive chip IC7402. R3483, a 2.2 Ω safety resistor which is connected to the 15V rail and is next to the chip, was open-circuit. A replacement cured the fault. **P.G.**

Amstrad TVR3

There was no take-up. The usual belts, also the soft brake on the take-up reel, had fallen off. In addition, this time the take-up brake rubber had decomposed and coated the reel turntable with a ring of sticky gum which had eventually seized up the whole assembly. A new take-up reel table and brake assembly restored normal operation.

Another of these machines came to us from a local dealer. It would shut down after six seconds of play. The machine had been stripped and cleaned, after which the present fault had appeared. My first thought was the take-up rotation sensor, as the counter was erratic to say the least – when it worked at all. But I was told that it had already been replaced. After a lot of head scratching I discovered that the spacer washer had been left off the take-up spool. As a result the sensor was almost saturated. A replacement washer cured the fault – it had obviously fallen off when the machine had been stripped. **P.G.**

Goodmans GVR4500

I've had a number of these machines, which use a Daewoo deck, with no tape take-up because of a bent idler unit. This time the idler unit was straight, the cause of the problem being the cassette tray which was bent down slightly. As a result the idler couldn't move. Straightening the tray cured the fault. **P.G.**

Goodmans PD1700

Patterning on the playback picture, more noticeable with a dark background, is a problem I've had with several of these machines. It seems to affect only some of them however. If the screws are left out of the rear of the upper case, or the upper case is removed, there's no earth connection to the bottom cover plate. This picks up radiation from the power supply and transfers it to the lower drum and head amplifier. To prove the point, remove the plate. My cure is to add a soldered lead between the power supply can and the plate instead of relying on multiple screws to make good contact. **P.G.**

Thomson TX805 Technology

In this concluding instalment J. LeJeune describes the combined chopper/line output stage, which is known as the Wessel circuit, also the drive and protection arrangements

Last month we covered most of the circuitry used in the Thomson TX805 small-screen TV chassis. We left for separate consideration this month the combined chopper/line output stage, which uses an arrangement called the Wessel circuit.

It's not the first time that this circuit has appeared in TV sets in the UK. The TX80E chassis, predecessor to the TX805, used it. Older readers will recall the Ferguson 9000 series chassis, which was introduced in 1975. It used the same basic circuit, which Ferguson referred to at the time as the Syclops (synchronous chopper and line output stage) circuit. Shortly after that, in 1978, Rank Radio International imported a small-screen Saba chassis that featured the circuit. This chassis was used in the Bush BC6004 and one or two other RRI models.

The basic idea is to use a single switching transistor, in the TX805 an S2000AF, as both the chopper and line output transistor, with separate chopper and line output transformers in its collector circuit. An isolating diode separates the driven end of the two transformers' primary windings. There are advantages to operating the chopper circuit at the line frequency, including the fact that a single drive system is required.

The chopper transformer is used solely to generate the HT supply for the line output side of the circuit. With the exception of the supplies required for standby operation, all the other supplies are derived from the line output transformer.

Basic Circuit

Fig. 1 shows the basic elements of the Wessel circuit with component reference numbers that relate to the TX805 chassis. TP10 is the single chopper/line output

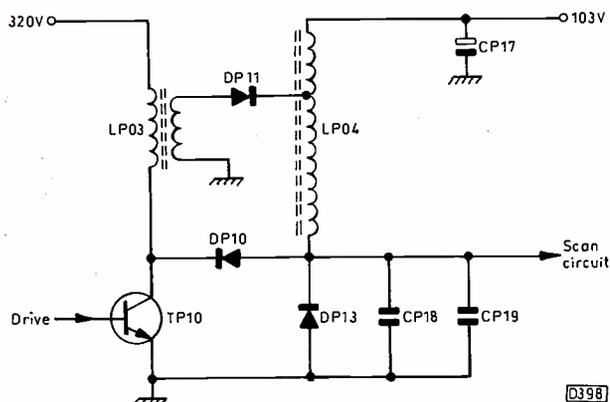


Fig. 1: Basic elements of the Wessel circuit as used in the TX805 chassis.

transistor and LP03 the chopper transformer. This transformer's primary winding is fed with some 320V which is produced by the mains bridge rectifier circuit.

TP10 is switched on about half way through the line scan. Current then flows through the chopper transformer's primary winding and also, via the isolating diode DP10, the line output transformer's primary winding (LP04). When TP10 is switched off, rectifier diode DP11 switches on, charging CP17 to produce an HT supply of some 103V to power the line output circuit.

When TP10 is switched off DP10 also switches off. The line output side of the circuit then operates in the conventional manner to produce the flyback followed by the first half of the line scan. To recap on this, tuning capacitors CP18/CP19 produce, with LP04, a positive half-cycle of oscillation during which the scanning beam is returned to the left-hand side of the screen. When the oscillation tries to swing negatively, the efficiency diode DP13 conducts and the first half or so of the forward scan is produced. TP10 is then switched on to complete the forward scan and drive the chopper transformer.

The squarewave drive at the base of TP10 is timed to meet the requirements of the chopper action and the line output stage operation.

Drive Circuitry

Fig. 2 shows the mains rectifier, standby switching and Wessel drive circuitry. Bridge rectifier DP26-29 produces some 320V across its reservoir capacitor CP31. This is the feed to the primary winding (pin 12) of the chopper transformer. In addition, RP44/42/41/DP02 bias the base of the 12V regulator transistor TP15, which supplies the standby switching transistors TP11/12 and also, via LED DK01, the microcontroller circuitry (see Fig. 8 last month). When TP12 is switched on by the microcontroller circuit - its emitter is controlled by pin 20 of IR01 while its base is connected to the 'start' line - TP11 in turn switches on and the Wessel drive circuit comes into operation.

For regulation, we need a variable mark-space ratio pulse waveform to drive the base of the chopper/line output transistor TP10. The origin of this is the charging circuit RP12/CP03 - both are close-tolerance components. CP03 is charged via RP12 from the voltage at the junction of RP12/RP03. This voltage is controlled by the conduction of the error sensing transistor TP03,

□399

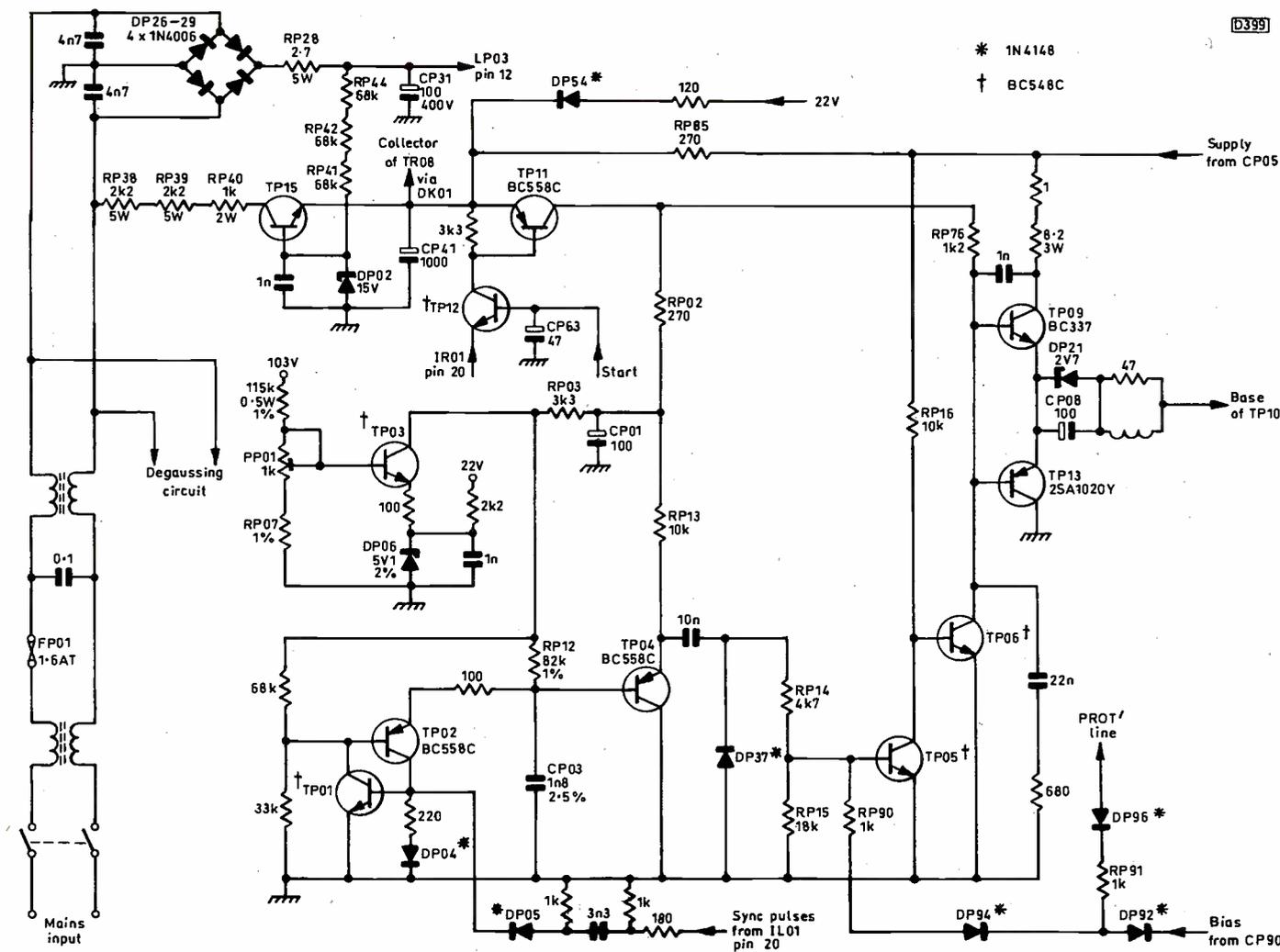


Fig. 2: The mains bridge rectifier, standby switching and Wessel drive circuitry. TP15 is type BUT11AX or ON4843, part no. 16004610. RP07 is 6.8kΩ in 14in. sets, 6.19kΩ in 20in. sets.

whose emitter voltage is stabilised by the 2% tolerance zener diode DP06 while its base is fed via a potential divider network that's connected across the line output stage's 103V supply (see Fig. 1). Should the latter vary, the voltage at the junction of RP03/RP12 will vary, altering CP03's charging time. PP01 enables the HT and the voltages derived from the line output transformer to be set up.

CP03 is discharged at line frequency intervals by TP02/TP01. When the amplitude of the voltage developed across CP03 as it charges, and thus the voltage at the emitter of TP02, exceeds the voltage at the base of this transistor it will switch on. TP01 in turn switches on, and CP03 is discharged. These transistors then switch off, since TP02 is once more reverse biased. The free-running frequency is slightly lower than the line frequency. So positive-going line sync pulses from pin 20 of IL01 (see last month) are fed to the base of TP01 to switch the discharge transistors on.

The net result of all this is a sawtooth waveform, whose rise time is controlled by TP03, at the base of TP04. The output from this buffer transistor is AC coupled (to provide a DC block) to the base of TP05, with DC restoration by DP37. RP14/15 attenuate the sawtooth waveform. TP05 acts as a pulse-width modulator - Fig. 3 illustrates its action. It switches on when the sawtooth voltage waveform at its base rises to 0.7V. TP06, which had previously been forward biased via

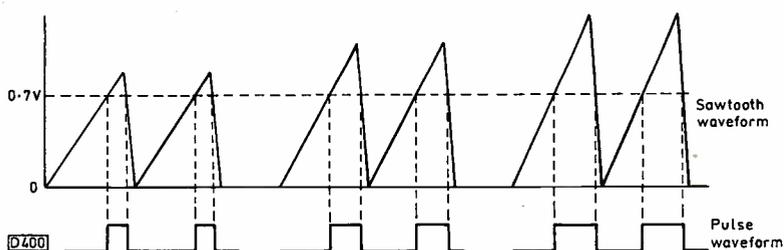


Fig. 3: How the pulse-width modulator transistor TP05 generates a variable mark-space ratio pulse waveform at its collector. The ratio depends on the amplitude of the sawtooth waveform applied to its base.

RP16, then switches off. TP09 in the line driver circuit is now forward biased via RP76, while TP13 is reverse biased. TP10 is then switched on.

When TP05 switches off, TP06 switches on, TP09 switches off, TP13 switches on and TP10 switches off. TP10's base drive network is interesting. When TP09 is on and TP13 off (TP10 is then forward biased and thus on), CP08 is charged to a maximum of 2.7V (set by zener diode DP21). When TP09 is switched off and TP13 switches on, CP08's positive plate is effectively earthed. The base of TP10 is thus driven negatively as CP08 discharges. This ensures a rapid turn off for TP10.

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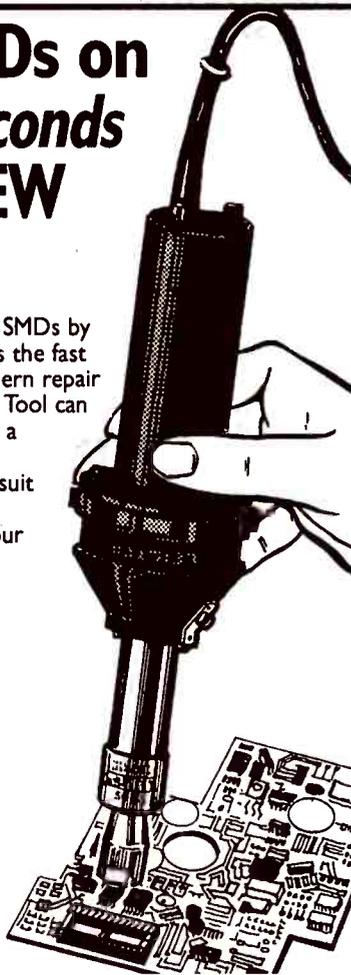
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Servicing

The Toshiba 2505/2805DBT

John Coombes provides a fault-finding guide for these complex receivers, which helped start the 'home cinema' market

The Toshiba Model 2805DBT came on the market some eight years ago. It was one of the first 'home cinema' receivers. There are numerous features including a large, 28in. CRT with a special lavender coating, Fastext and Nicam. The thick plastic cabinet has a slim double baffle to give powerful (20W per channel), good quality stereo sound. Frequency-synthesis tuning provides selection of a hundred stations. With the aid of two external speakers you can have Dolby Surround Sound. A 25in. version, Model 2505DBT, was also marketed.

Power Supply Faults

The chopper power supply is quite complex, with two control chips, master and slave. The master chip is on the secondary side of the circuit, the slave on the primary side. Fig. 1 shows the basic arrangement in greatly simplified form. On the secondary side of the full circuit there are two 5V regulators and a 12V regulator. The L78MR05 regulator Q806 provides the supply for the microcontroller circuit.

Fortunately these sets have proved to be very reliable. There is one misleading condition that can occur in the power supply, giving the no results symptom, when several faulty components have been replaced. Under certain fault conditions C828, which is connected to pin 3 of Q803, will charge to some 3.8V: the receiver will not come to life until this voltage has been discharged – assuming that the fault has been cleared.

If the set is dead, check the voltage across the mains bridge rectifier's reservoir capacitor C818. No voltage here could mean that the surge limiter resistor R805 or the mains fuse F801 is open-circuit. In this case the chopper transistor Q804 (2SC4288A) could be short-circuit. If so, the two chopper control chips Q803 (TEA2164) and Q807 (TEA5170) should also be replaced. These chips can be ruined when Q804 is dry-jointed. Set failure because of a fault in this area can also occur when D817 (RU4A) in the snubber network is short-circuit.

If the voltage across C818 is OK at some 320V, check the start-up resistor R810 (82k Ω , 3W). It may be open-circuit or could have gone high in value, though the latter is a rare occurrence. If there has been an excessive overload you might find that resistors R822 and R824

(both 0.39 Ω , 1W) are open-circuit.

Sometimes the receiver will go into the trip mode when switched on. In this case check R816 (12k Ω) whose value may have changed. If the power supply is tripping in the standby mode, check the switching transistor Q817 (2SC2120Y). If this is OK, check the voltage across the 13.7V supply reservoir capacitor C824. The items to check if this voltage is low or missing are D810 (BYD33J) which could be short-circuit, R814 (0.33 Ω) which could be open-circuit and C424 itself which could be short-circuit or leaky. If all these items are OK, the slave chip Q803 is suspect.

The master control chip Q807 (TEA5170) can be powered by a 9V battery to check its operation. If it is OK when so powered its output waveform at pin 3 will be in the maximum on-time state. Check whether the supply is in the burst mode. If so, check the standby control circuit (Q809, Q810, Q811, Q814 and associated components).

If there is no drive output at pin 14 of the slave control chip Q803 (TEA2164) but the LT supply is present at pin 16 (13.7V across C824), check whether C828 is charged which may indicate that there's an excess current fault.

On the secondary side of the circuit, the first item to check is the HT rectifier D818 (RU4AM) which may be short- or open-circuit. If necessary check for shorts across the LT lines provided by diodes D819, D826, D828 and D829 (all type RU4Z). The chopper transformer T803 could have shorted turns, in which case the audio output chips Q608 and Q609 (type TDA2030A) could have blown up – D828 will probably have suffered.

An item to check on the primary side of the circuit is D809 (BYD33J) which sometimes goes open-circuit.

If the HT voltage developed across C833 is low at about 65V, check for a fault in the line output stage.

If necessary, check the operation of the L78MR05 5V regulator Q806. There should be 20V at pin 1. If this voltage is missing, check D826 (RU4Z) and R861 (0.22 Ω , 1W). If the 20V supply is very low, check whether the 12.5V regulator transistor Q813 (2SD717Y) is short-circuit – also whether zener diode D827 (04AZ13X) is short-circuit.

If everything seems to be OK so far, suspect the chop-

either case the remedy is to replace the tuner.
Tuning drift can be caused by the tuner unit but is more often caused by the µPC574JL 33V stabiliser D108. If there is no tuning voltage, R829 (10kΩ, 2W) in the power supply is probably open-circuit.

Video Faults

If there is a blank raster with no sound, check whether the back terminal cover plate is pressing on QV22 – remove and resolder all connections if necessary.

For RGB problems, check the voltages at the RGB output pins of IC501 (TA8783N), 41/2/3 respectively. There should be about 3.75V here. If these voltages are incorrect and the voltage at pin 53 is more than 0.5V, replace IC501.

On a few occasions we have found that there is a blank raster, the remote control unit works but there's no on-screen display. The cause of this has been the TDA8170 field output chip Q303: check at pin 3, where the voltage should be 0.7V.

No picture could mean trouble with the voltage regulation transistors Q514 (BC327) and/or Q516 (BC547A) on the tube base panel: check the DC conditions here carefully.

We've traced the cause of dark lines across the screen to dry-joints at C319 (0.22µF) in the field output circuit.

Sound Faults

The sound section does not give much trouble – most of the problems occurred in the early years, before modifications were introduced. A motorboating noise from all speakers with the set in the standby mode was caused by a poor earth connection to the heatsink for

ICs Q609 and Q610. This was a very intermittent fault. For further details, refer to Toshiba Technical Bulletin CDH41 (March 1992), which also deals with the problem of a ticking noise from the right-hand Surround speaker, present only when using Dolby Surround and noticeable when the Surround speakers go quiet with no signal. To overcome this problem, remove R610 and jumper link J109 which is under the heatsink for ICs Q608/Q611. Fit R610 in the J109 position and fit a link in the R610 position.

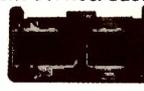
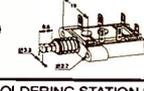
A third problem covered by bulletin CDH41 is a low-level hum from the left-hand Surround speaker in all modes, more noticeable at minimum volume. The cause is earth loops induced in the Surround sound chip Q610. Check the bulletin for the correct position of the green wire and cutting the earth print.

If there is motorboating in standby that's not caused by the problem mentioned above, check for a short between pins 4 and 5 of IC Q608 (TDA2030A).

For no sound from either or both main channels, check that the 30V supply is present at pin 5 of the relevant chip(s), IC Q608 and Q609. If the supply is present, suspect the chip(s). If the supply is missing, check D828 (RU4Z) in the power supply.

If the main channels are OK but the Surround channels are not, check the 24V supply at pin 5 of ICs Q610 and Q611. If the supply is correct, check the chip(s) by replacement. If the supply is missing or incorrect, check D829 (RU4Z) and pin 15 of the chopper transformer where there may be a dry-joint.

If there's a Nicam problem, such as Nicam dropout or crackle on sound, it's usually best to replace the Nicam PCB complete. Repair can be very expensive, in terms of both time and component costs.

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<tr><td>JVC</td><td>1435E4W</td><td>LA7832</td><td>3.99</td><td>STRD6108</td><td>7.99</td><td>TEA2200</td><td>2.99</td></tr> <tr><td>C21E1E</td><td>145R7BZ</td><td>LA7833</td><td>3.99</td><td>STRD6202</td><td>7.99</td><td>TEA2251</td><td>1.99</td></tr> <tr><td>LOEWE</td><td>155T98W</td><td>LA7835</td><td>1.99</td><td>TA8210</td><td>3.50</td><td>UPC1298V</td><td>3.99</td></tr> <tr><td>ART 1</td><td>175T98T</td><td>LA7836</td><td>2.99</td><td>TA8211</td><td>3.50</td><td>UPC1310V</td><td>7.99</td></tr> <tr><td>CLASSIC M16.99</td><td>2100T85</td><td>LA7837</td><td>2.99</td><td>TA8212</td><td>3.50</td><td>UPC1335V</td><td>6.99</td></tr> <tr><td>PROFI S 2816.99</td><td>215T88</td><td>LA7838</td><td>6.99</td><td>TA8213</td><td>3.50</td><td>UPC1379C</td><td>2.25</td></tr> <tr><td>MATSUB</td><td>221T4B</td><td>M5454L</td><td>2.99</td><td>TA8214</td><td>3.50</td><td>UPC1394</td><td>1.99</td></tr> <tr><td>1440A</td><td>2812D8T</td><td>TA8691AN</td><td>8.50</td><td>TA8215</td><td>2.80</td><td>UPC1488</td><td>2.80</td></tr> <tr><td>209R/T</td><td>AT2078/25</td><td>TA8701AN</td><td>5.99</td><td>TA8216</td><td>2.80</td><td></td><td></td></tr> <tr><td>MITSUBISHI</td><td>AT2079/15</td><td>TA8718</td><td>2.99</td><td></td><td></td><td></td><td></td></tr> <tr><td>CT2145EPM16.99</td><td>AT2079/23</td><td>TDA1515</td><td>2.99</td><td></td><td></td><td></td><td></td></tr> <tr><td>CT2146LM</td><td>AT2079/40</td><td>TDA1552Q</td><td>6.50</td><td></td><td></td><td></td><td></td></tr> </table>	AKAI	NEI	AN5512	1.99	TDA1553Q	6.99	TA7270	2.50	CT2569E	1451R	AN5515	1.99	TDA1514Q	6.99	TA7271	2.50	TM9292E	NIKKAJ	AN5521	1.99	TDA1557C	3.99	TA7279	3.99	AKURA	BABY 10	BA3910	12.99	BA3910	12.99	TDA1558Q	2.78	CX10	NT14	BA3918	12.99	BA3918	12.99	TA7283	3.00	BEKO	NT20	BA3920	4.99	BA3920	4.99	TA7288	4.29	16328NX	PANASONIC	BA5408	4.99	BA5408	4.99	TA7299	3.99	16228NX	TLF14567	BA5410	3.50	BA5410	3.50	TA8214	3.50	BUSH	TLF14568	BA5412	3.50	BA5412	3.50	TA8215	3.50	2114T	TLF14585	BA6122	3.99	TDA2579A	2.60	TA8216	4.25	3114T	TLF14586	BA6209	2.60	TDA2579A	2.60	TA8217	2.99	DECCA	TLF14592	BA6229	1.99	MS4545L	3.40	TA8218	7.80	DN8652	TLF15505	BA6229	2.99	M54549L	4.50	TA8220	5.99	DT9476	TLF15506	BA6229	1.99	M54648L	3.99	TA8221	5.99	DV9499	TLF15534	BA6229	2.99	MC13306T3	3.99	TA8227P	3.99	TM9422	PHILIPS	BA6239	2.50	MC13309T3	3.99	TA8427K	3.99	FERGUSON	2A3A	BA6247	3.50	PAL030A	20.00	TA8599AN	12.99	TX85/86	CTXE/S	CNX62A	1.99	PAL030B	14.99	TA8690AN	12.99	TX90	GR1AX	CNX82A	1.99	STK463	10.00	TA3560	3.25	TX100	GR2.2AA	CNX82A	1.99	STK463	10.00	TA3561A	3.80	517P	CP50	CNX83	1.99	STK3082 II	8.80	TA3562A	3.99	59K7	CP110	CN775	1.99	STK4121 II	8.50	TA3565	2.99	59M3	SAISHO	CN765	4.99	STK4121 II	8.50	TA35640	3.99	AS1F	CT14R	HA11423	2.25	STK4131 II	6.50	TA3654	1.70	FINLUX	CT142RX	HA13001	1.99	STK4132 II	7.00	TA3653B	1.99	2482	CT149TXA	HA13108	3.50	STK4141 V	8.00	TA3651	1.99	GOLDSTAR	SAMSUNG	HA13117	2.99	STK4142 II	2.50	TA4500	3.99	CBT2162E	CB514E	HA13118	2.99	STK4151 II	8.00	TA4503	6.25	CTF508	CTF51ZG	HA13119	2.99	STK4152 II	8.00	TA4505E	4.99	GOODMANS	SANYO	HA13128	4.99	STK4152 II	9.00	TA4505M	12.99	CTV14R	CBP2146	HA13130	16.99	STK4162 II	8.00	TA4600	1.99	CTV2180	CTP6265	HA13150	14.99	STK4171 II	8.50	TA4601	1.99	TV20RC	SHARP	HA13151A	14.99	STK4172 II	8.00	TA4605	2.99	GRUNDIG	C1411S	LA4270	2.99	STK4192 II	10.00	TA4950	1.99	CUC2401	DV5401S	LA4280	3.99	STK434	7.00	TA8137	3.99	CUC3400	SV2387S	LA4282	5.99	STK5481	6.00	TA8138	3.99	HINARI	SONY	LA4440	2.25	STK5481	6.00	TA8139	3.99	CT14	KV2052UB	LA4445	2.60	STK5490	5.50	TA8170	2.99	CT20R	KV2096UB	LA4446	2.99	STK7226	8.00	TA8171	7.99	TV1A	KV21XRTU	LA4460	1.60	STK7253	6.50	TA8172	3.99	HITACHI	KV211XMTU	LA4461	1.60	STK7348	4.50	TA8177	3.50	C2114T	KV2252UB	LA4465	2.99	STR0006	6.00	TA8177F	3.50	C2118T	KVM21TU	LA4466	2.99	STR41090	8.00	TA878FS	9.25	C21P226	KV27XRTU	LA4475	2.99	STR50020	6.50	TA8179S	7.99	C2558T	KV2766UB	LA4476	2.99	STR50105	4.99	TA8305	10.00	CPT2036	KVA2121D	LA4485	2.99	STR54041	5.50	TA83500	3.99	CPT2158	KVDX21TU	LA4495	3.99	STR58041	5.50	TA8380	2.80	CPT2178	KVM21TU	LA4496	3.99	STR5941	5.50	TA8380	2.80	CPT2478	KX32121U	LA4508	2.99	STR6405	10.00	TEA1039	1.99	ITT	KX2542U	LA4597	2.99	STRD1706	7.99	TEA2018A	1.99	COMP 80R	KVX2932U	LA4700	3.99	STRD1806	6.99	TEA2019	1.99	CT3425	KVX2941U	LA4705	10.00	STRD1816	5.99	TEA2029C	3.99	DIGI 3 110	TOSHIBA	LA7800	1.80	STRD5441	6.00	TEA2031A	1.80	ST3876	140R4W	LA7801	1.99	STRD5441	6.00	TEA2164	2.99	TK3537	1400TBT	LA7830	2.99	STRD5541	7.99	TEA2165	3.99	JVC	1435E4W	LA7832	3.99	STRD6108	7.99	TEA2200	2.99	C21E1E	145R7BZ	LA7833	3.99	STRD6202	7.99	TEA2251	1.99	LOEWE	155T98W	LA7835	1.99	TA8210	3.50	UPC1298V	3.99	ART 1	175T98T	LA7836	2.99	TA8211	3.50	UPC1310V	7.99	CLASSIC M16.99	2100T85	LA7837	2.99	TA8212	3.50	UPC1335V	6.99	PROFI S 2816.99	215T88	LA7838	6.99	TA8213	3.50	UPC1379C	2.25	MATSUB	221T4B	M5454L	2.99	TA8214	3.50	UPC1394	1.99	1440A	2812D8T	TA8691AN	8.50	TA8215	2.80	UPC1488	2.80	209R/T	AT2078/25	TA8701AN	5.99	TA8216	2.80			MITSUBISHI	AT2079/15	TA8718	2.99					CT2145EPM16.99	AT2079/23	TDA1515	2.99					CT2146LM	AT2079/40	TDA1552Q	6.50					<p>VIDEO HEADS FROM £6.99 OVER 200 MODELS</p>	<p>NIKKAI BABY 10 REGULATORS £11.00</p>	<p>VHS ALIGNMENT TAPE BAND TRACKING, TAPE TRANSPORT, FM PICTU CURVE, AUDIO SYNC HEAD AZIMUTH TRACKING PLAYBACK SWITCHING POINT £39.99</p>	<p>PATTERN GENERATOR Colour bar, Cross hatch, Staircase. COMPACT PORTABLE £84.99 only</p>	<p>Capacitance Meters Capacitance Meter PG015</p>  <p>An accurate, capacitance meter providing measurements over a very wide range.</p> <p>OTO 2000UF ACCURACY 0.5% £29.99</p>	<p>Transparent Service/Cassette</p> <p>£6.50</p> 	<p>Hitachi/Salora Mains Switch</p> <p>£1.99</p> 
AKAI	NEI	AN5512	1.99	TDA1553Q	6.99	TA7270	2.50																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
CT2569E	1451R	AN5515	1.99	TDA1514Q	6.99	TA7271	2.50																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
TM9292E	NIKKAJ	AN5521	1.99	TDA1557C	3.99	TA7279	3.99																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
AKURA	BABY 10	BA3910	12.99	BA3910	12.99	TDA1558Q	2.78																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
CX10	NT14	BA3918	12.99	BA3918	12.99	TA7283	3.00																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
BEKO	NT20	BA3920	4.99	BA3920	4.99	TA7288	4.29																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
16328NX	PANASONIC	BA5408	4.99	BA5408	4.99	TA7299	3.99																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
16228NX	TLF14567	BA5410	3.50	BA5410	3.50	TA8214	3.50																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
BUSH	TLF14568	BA5412	3.50	BA5412	3.50	TA8215	3.50																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
2114T	TLF14585	BA6122	3.99	TDA2579A	2.60	TA8216	4.25																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
3114T	TLF14586	BA6209	2.60	TDA2579A	2.60	TA8217	2.99																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
DECCA	TLF14592	BA6229	1.99	MS4545L	3.40	TA8218	7.80																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
DN8652	TLF15505	BA6229	2.99	M54549L	4.50	TA8220	5.99																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
DT9476	TLF15506	BA6229	1.99	M54648L	3.99	TA8221	5.99																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
DV9499	TLF15534	BA6229	2.99	MC13306T3	3.99	TA8227P	3.99																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
TM9422	PHILIPS	BA6239	2.50	MC13309T3	3.99	TA8427K	3.99																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
FERGUSON	2A3A	BA6247	3.50	PAL030A	20.00	TA8599AN	12.99																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
TX85/86	CTXE/S	CNX62A	1.99	PAL030B	14.99	TA8690AN	12.99																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
TX90	GR1AX	CNX82A	1.99	STK463	10.00	TA3560	3.25																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
TX100	GR2.2AA	CNX82A	1.99	STK463	10.00	TA3561A	3.80																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
517P	CP50	CNX83	1.99	STK3082 II	8.80	TA3562A	3.99																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
59K7	CP110	CN775	1.99	STK4121 II	8.50	TA3565	2.99																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
59M3	SAISHO	CN765	4.99	STK4121 II	8.50	TA35640	3.99																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
AS1F	CT14R	HA11423	2.25	STK4131 II	6.50	TA3654	1.70																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
FINLUX	CT142RX	HA13001	1.99	STK4132 II	7.00	TA3653B	1.99																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
2482	CT149TXA	HA13108	3.50	STK4141 V	8.00	TA3651	1.99																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
GOLDSTAR	SAMSUNG	HA13117	2.99	STK4142 II	2.50	TA4500	3.99																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
CBT2162E	CB514E	HA13118	2.99	STK4151 II	8.00	TA4503	6.25																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
CTF508	CTF51ZG	HA13119	2.99	STK4152 II	8.00	TA4505E	4.99																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
GOODMANS	SANYO	HA13128	4.99	STK4152 II	9.00	TA4505M	12.99																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
CTV14R	CBP2146	HA13130	16.99	STK4162 II	8.00	TA4600	1.99																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
CTV2180	CTP6265	HA13150	14.99	STK4171 II	8.50	TA4601	1.99																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
TV20RC	SHARP	HA13151A	14.99	STK4172 II	8.00	TA4605	2.99																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
GRUNDIG	C1411S	LA4270	2.99	STK4192 II	10.00	TA4950	1.99																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
CUC2401	DV5401S	LA4280	3.99	STK434	7.00	TA8137	3.99																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
CUC3400	SV2387S	LA4282	5.99	STK5481	6.00	TA8138	3.99																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
HINARI	SONY	LA4440	2.25	STK5481	6.00	TA8139	3.99																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
CT14	KV2052UB	LA4445	2.60	STK5490	5.50	TA8170	2.99																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
CT20R	KV2096UB	LA4446	2.99	STK7226	8.00	TA8171	7.99																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
TV1A	KV21XRTU	LA4460	1.60	STK7253	6.50	TA8172	3.99																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
HITACHI	KV211XMTU	LA4461	1.60	STK7348	4.50	TA8177	3.50																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
C2114T	KV2252UB	LA4465	2.99	STR0006	6.00	TA8177F	3.50																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
C2118T	KVM21TU	LA4466	2.99	STR41090	8.00	TA878FS	9.25																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
C21P226	KV27XRTU	LA4475	2.99	STR50020	6.50	TA8179S	7.99																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
C2558T	KV2766UB	LA4476	2.99	STR50105	4.99	TA8305	10.00																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
CPT2036	KVA2121D	LA4485	2.99	STR54041	5.50	TA83500	3.99																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
CPT2158	KVDX21TU	LA4495	3.99	STR58041	5.50	TA8380	2.80																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
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CPT2478	KX32121U	LA4508	2.99	STR6405	10.00	TEA1039	1.99																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
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<p>ELC EAST LONDON COMPONENTS 63 PLASHET GROVE, EAST HAM, LONDON E6 1AD. TEL: 0181-472 4871 two minutes walk from Upton Park Tube Station</p> <p>VISIT OUR SHOP OPEN MON-SAT 9AM-6PM 100's OF TOOLS, COMPONENTS INSTRUMENTS, REPAIR KITS, BOOKS & CABLES TO CHOOSE FROM ADD £1.50 P/P + 17.5% VAT ALL GOODS DESPATCHED SAME DAY PRICES SUBJECT TO CHANGE WITHOUT NOTICE VISA ACCESS ACCEPTED. MIN ORDER £5.00</p>	<p>TDA8178S REPLACEMENT £7.99</p>	<p>REMOTE TESTER £14.99 LOPT TESTER £29.99 FREQUENCY COUNTER £99 SOLDERING STATION £50.00 SATELLITE FINDER KIT £29.99 MICROWAVE LEAK DETECTOR £14.99 DIGITAL MULTIMETER FROM £9.99</p>																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														

2.5GHz frequency meter for under £100?

Hand-held and battery-powered, the FC2500 costs just **£99** exclusively to *Television* readers.

Normally, the FC2500 2.5GHz frequency meter retails at £116.33 including VAT. But for a limited period *Television*, in conjunction with Vann Draper Electronics, is making this instrument available exclusively to readers at the special price of **£99** – including VAT and postage – representing a discount of £17 on an already low price. Simply fill in the coupon and post it to Vann Draper at Unit 5, Premier Works, Canal Street, South Wigston, Leicester LE18 2PL. Tel. 0116 2771400, fax 0116 2773945.

Specifications

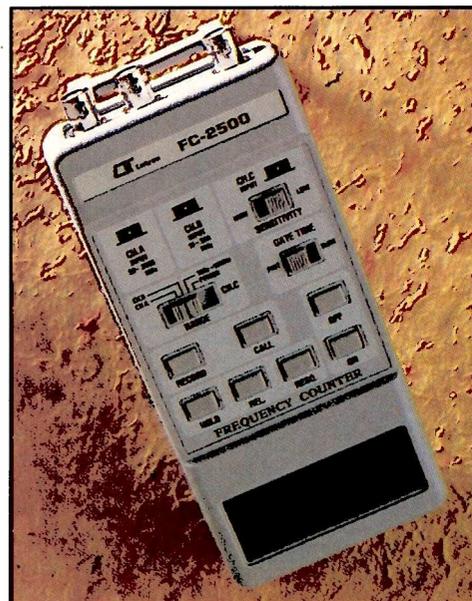
Range 1	2.5GHz
Span	50MHz-2.5GHz
Sensitivity	≤100mV, 50-75MHz ≤50mV, 76MHz-2.5GHz
Gating	2.75s sample, 100Hz resolution 1.5s sample, 200Hz resolution 0.75s sample, 500Hz resolution 0.5s sample, 1000Hz resolution
Range 2	500MHz
Span	10MHz-500MHz
Sensitivity	≤120mV, 10-35MHz ≤50mV, 35-350MHz ≤120mV, 351-450MHz
Gating	0.75s sample, 100Hz resolution 1.5s sample, 50Hz resolution 5s sample, 20Hz resolution 6s sample, 10Hz resolution
Range 3	10MHz
Span	10Hz-10MHz
Sensitivity	≤50mV
Gating	0.5s sample, 10Hz resolution 1.25s sample, 1Hz resolution 6s sample, 0.2Hz resolution 11s sample, 0.1Hz resolution
Range 4	Period
Span	10Hz-10MHz
Sensitivity	≤50mV

Basic accuracy ±4ppm, +1d

I/p limit 5V pk-pk 2.5GHz and 500MHz ranges
250V pk-pk 10MHz and period ranges

Features of the FC2500

- High sensitivity at VHF and UHF
- Battery operated
- Hand-held and fits in the pocket
- 0.1Hz resolution on 10MHz range
- Measures frequency and period
- Data hold
- Relative measurement feature
- Records min., max. and average readings
- Auto power down
- High-contrast 13mm, 8-digit LCD
- Precision timebase
- Optional antenna for checking



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Make cheques payable to Vann Draper Electronics Ltd.
Or, please debit my Master, Visa or Access card.

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*Overseas readers can also obtain this discount but details vary according to country. Please ring, write or fax to Vann Draper Electronics.

Long-distance Television

Terrestrial DX and satellite TV reception and news, UK restricted TV broadcasting licences to be awarded, co-channel interference filtering techniques for Bands I/II. Roger Bunney reports

As this column is being written during the first week in January, it is time to reflect on the past year's TV-DXing. There was an improvement in Sporadic E activity compared with 1996, also in autumn tropospheric openings. The mid-November Leonids meteor shower period was an active one. With the rapidly increasing sunspot count we can look forward to some early evening TE (transequatorial skip) reception, while next winter could bring the first signs of F2 layer propagation for some years. It has also been suggested that the Leonids meteor shower next November could bring record activity.

Unfortunately there has been a decline in the number of active DX-TV enthusiasts. There are several probable reasons for this. First, conditions have not been very good in recent years. Secondly the number of low-band VHF TV transmitters in Europe has declined as services have moved to UHF, while interference levels across Band I have increased. Then there is the lure of satellite

reception. There's always something to be seen from the Clarke belt, and dishes can sit at ground level. The number of those interested in multi-satellite reception has grown, more than offsetting the decrease of interest in terrestrial DX-TV reception.

The future lies with digital TV – the technology has already taken a firm hold in the satellite field. Fortunately there are still many analogue signals available from the satellite belt but, looking to the future, we need to grasp the digits!

Sadly there was little terrestrial DX-TV activity during the last month of 1997. Low-level SpE signals were received on the 7th, 14th and 27th of December, all in chs E3 and E4. The signals were all unidentified and were present during the mid to late morning period.

Now back to TE reception. Robert Copeman in Victoria, Australia reports mid-evening reception from China (ch. C1, 49.75MHz vision carrier) on several occasions. During late November he received Malaysian signals in chs. E2 and 3 (at 2105-2200 local time), and on two occasions during the month he received ch. A2 (55.25MHz vision carrier) signals from American Samoa. This is encouraging news.

Satellite Sightings

Dean Rogers (Abbeywood, London SE2) mentions in his report that he's a satellite sports enthusiast. Checking through his log, I am struck by the fact that certain satellites seem to carry predominantly sporting feeds. Eutelsat II F4 (7°E) is a favourite, with clear PAL. Eutelsats II F2 (10°E) and II F3 (16°E) are frequently used. With signals that originate in

the UK/Ireland, Telecom 2C (3°E) is most popular. East-bound sports programmes from the USA are commonly found via PAS-3R (43°W), Orion (37.5°W) and the Intelsat birds at 27.5 and 21.5°W.

I have previously commented on the lack of signals from Eutelsat I F5, an elderly bird at 25.5°E in a heavily inclined orbit. This had been the favourite for UK horse racing (cheaply leased) and GMTV breakfast TV feeds. The horses seem to have gone digital, as there have been no reports for months. Breakfast TV has reappeared via Intelsat K (21.5°W).

The snow falls on December 17th resulted in a flurry of SNG activity. GMTV used UKI-264 (SISlink 27) atop an M3 motorway bridge and its own OB Unit no. 1 (UKI-149), the feed being at 11.497GHz (horizontal). UKI-264 was also used for a horse racing programme insert at 0730 on the 16th, signing as "G00065G-OB FEED-XMAS". It's well worth checking Intelsat K in the early morning period – there's a lot of analogue TV here.

Later that morning (17th) something seemed to be afoot in Russia. From 0900 there appeared, via an Intelsat K Brightstar lease (11.532GHz), shots of a space control room with orbital tracks on the monitor screens. One screen displayed the familiar 0167 test pattern. Subsequently there were shots of TV cameras etc. being set up, white balance adjustments, mic tests etc. Then the feed cut to Brightstar colour bars. We shall never know what was up.

A reader asks what the "Pegasus Test" via Intelsat K (11.4985GHz horizontal) was on December 11th at 1830GMT. Anyone know?

Signals from Iran are now available via Hot Bird 3 at 13°E.

U.T.C. اوقات البث من ٢١ الى ٢٣ الى

الاثنين : ٢٨ شعبان

نشرة الأخبار

الفن الخالد (٢)

المسابقات القرآنية (٢)

الأردن (٢)

بثت المجهر

٢١:٠٠:٠٠

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٢٢:٤٠:٠٠

More sport. While checking Orion 1 (37.5°W) at 1700 GMT one day I came across "UKI-77 TEST" alternating with "BT TES 9 + 00044 802852221" via the 12.668GHz vertical transponder. At 1705 the caption "ITV Sport Turin" appeared followed by several two-way interviews. The caption then returned until 1930, when a Manchester United v. Juventus match started. Low-level audio subcarriers were present at the usual 7, 7.2 and 7.4MHz.

I'd not seen the NTSC "US TV Pool Sarajevo" test pattern since the end of hostilities in the former Yugoslavia. But there it was, on December 22nd at 0835, via the 12.584GHz vertical transponder aboard Orion. Later "US TV Pool TUSLA" came up. The reason for this activity then became clear: President Clinton was meeting the US troops and extending Christmas greetings to them. A camera shot of the camp notice board proclaimed "Eagle Base Tuzla, Tuzla, Bosnia".

Roy Carman (Sandown, Isle of Wight) also watched this but feels it's high time he went digital "as analogue feeds are drying up". He's considering the Nokia 9600. Nevertheless his log for December 19th lists six active analogue feeds via Kopernikus 2 (28.5°E) at 1730.

Cyril Willis (King's Lynn) saw the BBC South West SNG truck (UKI-231) providing Christmas programme inserts from Chadford, Devon at 1830 onwards on December 23rd. The truck usually transmits via Orion 1 but on this occasion the feed was via the Intelsat bird at 27.5°W.

Finally, I've found the new Iran TV service via Hot Bird 3 at 13°E (12.434GHz horizontal) of interest. Material seems to consist of video offerings from the state broadcaster IRIB and, for much of the evening, the University of Sahar. It's certainly different, and I've seen some beautiful video sequences.

Terrestrial TV News

Spain: Deregulation of the TV broadcasting system is to take place on January 1st 1999. Two further national TV networks will be added to the present ones (two from RTVE, Antena 3, Canal Plus and Tele 5). Retevision will distribute and transmit the two new networks. Future plans envisage numerous channels in large towns, the limiting factor being channel availability.

Ireland: CanWest Global Communications has signed an agreement with the government to set up and run the TV3 network. Services are due to

start this autumn. The government has insisted on a complex ownership arrangement.

USA: A new network, Pax-Net, is to open this summer with 73 TV stations across the country. There will initially be three hours of "family orientated" programmes a day.

France: The start of the Canal Plus news channel has been postponed indefinitely. Canal Plus is urging the EU to impose a common European digital decoder standard. The company believes that this would ensure the stable development of satellite and terrestrial digital services.

New Zealand: Satellite dishes are being used in Auckland for terrestrial reception of internet data from the Sky Tower. The transmissions are at 12.366GHz, power being 4W.

It's common to see normal 45cm offset dishes mounted upside down, i.e. with the LNB uppermost, for reception from the tower. The LNB's output is connected to either a conventional receiver or a custom-made, PC-slotting receiver card, thence in either case to a PC. Once the required information is located, it's sent via the PAS-2 satellite to the Sky Tower then to the customer.

The wide bandwidth means that information which would take nearly two hours to be received via a telephone line can be downloaded in five-ten minutes. Other satellites now have internet hook-up capability, e.g. Zak-Net via AsiaSat-2 at 3.940GHz vertical.

Transmitter News

A 600kW ERP, ch. E59 transmitter at Jihlava near Javorice is now being used by Prima TV in the Czech Republic.

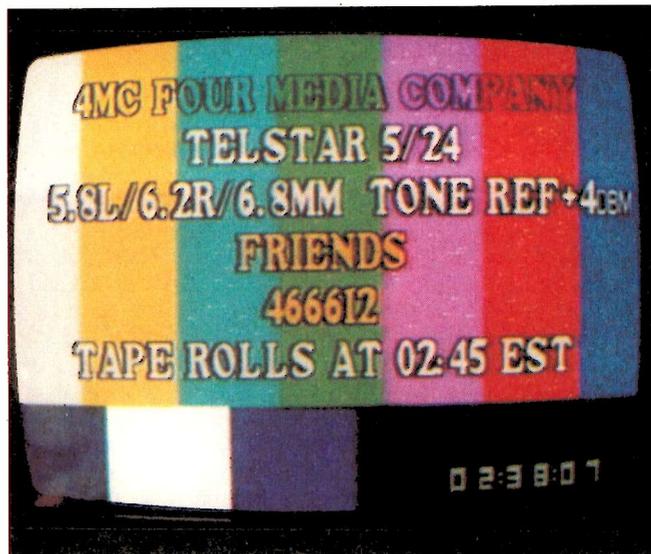
To make provision for DAB expansion, the 100W transmitter at Flensburg, Germany, is now using ch. E10 instead of E12 for the NDR-1 service. The local Rugen-TV service at Garz is on ch. E26 at 5kW ERP: programmes are transmitted from 1730-0530 local time, text pages being transmitted at other times.

The Hungarian MTV-2 service has moved to satellite transmission. The TV-2 network has taken over the transmitters previously used for MTV-2.

Lublin-3 TV is now in operation on ch. R39, with 100kW ERP. The mast is 200m high.

Noord TV in the Netherlands is transmitted on ch. E36 with 100kW.

RTP (Portugal) has been given financial assistance by the EU to experiment with 16:9 transmissions.



RSL-TV

The ITC has received applications for Restricted Service TV Licences (RSL-TV) in the following areas: Birmingham, Greater London, West London, Oxford, Isle of Wight, Derry, Stirling, Bristol, Coventry, Edinburgh, Dundee, Perth, Leeds (one applicant each), Manchester

Comedy material is often sent to European networks via Intelsat K at 21.5°W.

Aerial Techniques

NICAM Stereo 14"

New Thomson Multi-standard TVs with Teletext

- 14" Screen Multi-standard
- PAL-SECAM
- NTSC (via Scart)
- VHF-UHF Hyperband tuner
- S-VHS (via Scart)
- 59 channel memory
- Fasttext Teletext
- Headphone socket
- Infra-red remote control
- 240V AC operation

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- Professional quality, full digital processing
- Accommodates input systems of NTSC 3.58, PAL and SECAM (optional 4.43 available)
- Output systems NTSC 3.58, NTSC 4.43 and PAL
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- Accommodates two inputs and two outputs
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- Line conversion: 525 to 625 lines, 625 to 525 lines
- Field conversion: 60 to 50 and 50 to 60 fields
- AC mains powered

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NEW 'BROADCAST QUALITY' MODEL NOW AVAILABLE WITH 8M BIT FIELD MEMORY AND S-VIDEO TERMINALS £699 (SAE for details)

10" Screen Multi-standard

- PAL-SECAM
- NTSC (via Scart)
- VHF-UHF Hyperband tuner
- 59 channel memory
- Fasttext Teletext
- S-VHS (via Scart)
- 12-24V DC operation
- Infra-red remote control
- 240V AC operation

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NEW NICAM MULTISYSTEM VCR

Thomson VPH6790 with VideoPlus+

- Covers PAL 1 (for UK); PAL B/G (for Europe); SECAM B/G (for Middle East etc.) SECAM D/K (for Eastern Bloc); SECAM L (for France); NTSC 3.58 playback & record
- Hyperband Tuner
- 2 Scart sockets
- 99 programmes
- NICAM Hi-Fi stereo
- 4-head
- Long play
- VideoPlus+
- 8 event 1 year timer
- Infra-red remote control

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AC/DC 10"

Both above TVs cover the following systems: all VHF/UHF frequencies and cables channels, PAL system 1 (for UK); PAL systems B/G (for Europe); SECAM system B/G (for Middle East etc.); SECAM system L (for France)

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(three applicants) and Leicester (two applicants).

Final licence approvals are expected in the spring, with the services likely to start this summer. The licences will last for two years.

Because no suitable channel is available, the ITC has decided not to offer licences in Glasgow, Nottingham, Tyneside, Liverpool, Cardiff, Cambridge, Motherwell and Newcastle.

Co-channel Interference Filtering

In the January column (page 212) I mentioned a co-channel interference filter marketed by the New Zealand company Tennatron. Since then I have received from Steve Fogerty of Tennatron detailed information on the subject. Interesting that he is a long-time reader of *Television* – and remembers when Charles Rafarel wrote the DX-TV column back in the Sixties!

Steve points out that when TV transmitters in adjacent areas use the same channel there is usually a line offset to minimise visual interference effects. These offsets are at typically one third, one sixth or one half the line frequency.

The one-third line offset is used where there are three stations (two possible sources of interference). A typical offset frequency would be 10.425kHz, giving offsets of -10.425kHz, 0kHz and 10.425kHz. The interference pattern is three lines wide.

The half-line offset is used with two stations. Offsets should be 23.4kHz (one and a half lines), i.e. 0/-23.4kHz or 0/23.4kHz. The interference pattern is two lines wide.

The one-sixth line offset (13kHz) is used between stations with one-third line offsets. The interference pattern is six lines wide and is quite noticeable with large-screen TV sets.

Any multiple of one twelfth of a line can be used as an offset frequency, a half-line offset (± 7.8 kHz) for example.

At the transmitter, the frequency tolerance with non-precision offsets is ± 500 Hz. For improved results, precision offset tolerance should be used, typically ± 1 Hz. The latter, with a one third or one sixth offset, locks the line structure within the picture.

Precision locking implies a very stable transmitter, i.e. one whose oscillator is locked to a high-stability source such as a GPS frequency standard or a rubidium oscillator.

Broadcasters suffer co-channel interference because of frequency sharing and congestion. With small

transmitters that use the RBR (off-air rebroadcast) technique, using high receiving aerials, the potential for interference is considerable – even when stacked and screened aerials are used. The problems can increase during high-pressure weather conditions, when tropospheric propagation enhances weak, distant signals.

The electronic co-channel filter provides superior and more versatile cancellation. The broadcaster uses the filter at IF rather than the RF input frequency, so that the filter can be used with any channel – assuming that the transmitters involved are precision stable. Domestic receivers are far from stable, and are thus not suitable for IF precision offset operation.

Tennatron have an RF input version however (for connection in series with the aerial feeder) for Bands I/II, for both domestic and professional use. The price of the former in New Zealand is the equivalent of about £120UK. A baseband video input model is to be introduced later this year at roughly the same price. It's essential to quote the wanted and unwanted frequencies, RF or IF, or with the video baseband unit the unwanted offset frequency (10.425kHz, 23.4kHz etc). The ITC or BBC can provide information on nominal and offset frequencies for UK transmitters.

My thanks to Steve for all this information. Trade/cable enquiries about these co-channel filters should be sent to Tennatron Industries (NZ) Ltd., 283 High Street, PO Box 218, Motueka, New Zealand – phone/fax 03 528 8707 (international +64 3 528 8707).

Satellite News

Bad news for SE Asia: the AsiaSat-3 launch on December 25th was a failure. The second firing came to an end after one second, with the result that the satellite is now in an elliptical orbit with no possibility of being recovered. This could delay the launch of the Astra 2A satellite – and the start of BSKyB's digital services – since the same type of Russian rocket is to be used. Incidentally SES-Astra has bypassed Eutelsat's claim to the 28°E slot by doing a deal with Deutsch Telecom for about 250MHz of the little-used Kopernikus (28.5°E) spectrum – in effect Astra 2A will replace DFS-2 at 28.5°E.

Kirch and Bertelsmann have agreed to an EU demand to cease marketing the Kirch D-box decoder for Premiere subscribers – about 100,000 have been sold. Premiere

will now await an EU decision on an all-Europe digital standard.

The Australian digital TV group Optus-Vision expects to have its pay-per-view/video-on-demand services in operation across Australia by the end of the year and might then enter the UK market.

Two pan-African TV services are being downlinked by Intelsat at 27.5°W. Minaj Africa Network has been on test recently and hopes to have services in operation this summer. African Independent Television International has been transmitted to Nigeria and neighbouring countries since last autumn. These are all C-band services.

MTV is to start its M2 European music channel this summer. Existing services will become "regionalised", with separate feeds to Scandinavia/Eastern Europe and the Netherlands.

Ango-Dutch Shell has put out for tender an order for 11,000 VSATs (Very Small Aperture Terminals) – these are transmit/receive terminals intended for commercial use. They would link the company's retail and administrative operations across Europe, forming by far the largest such network.

Intelsat 704 (66°E) is now being used full time for video/TV traffic across Asia – a new satellite at 64°E has taken over telecoms/data distribution. Intelsat's APR-1 craft is to be launched in July, providing high-level (up to 39dBW) C-band links at 83°E for single-hop Europe/Asia hook-ups. K-TV will be launched in spring 1999, providing Ku-band signals at up to 55dBW across India/SE Asia. 605's telemetry problems have been sorted out and the satellite has been moved to 27.5°E. 806 is to be launched in March, to orbit at 40.5°W. 804 was launched on December 21st at 64°E for Indian Ocean service. Intelsat has confirmed with Ariane launches for future IX series satellites – 902/3/4. Columbia is to take over the ancient 515 craft at 37.5°W and lease several transponders back to Intelsat: use of the C-band TDRS-4 craft at 41°W will cease.

Echostar has introduced a new digital receiver, Model DSB9800, which offers free-air/conditional access operation and is claimed to be an "enthusiast's receiver". The specification has many useful features, but the m/symbol rate coverage is only 18.5-30 – there are many signals that run at lower ms rates.

Future frequency bands being discussed are K 18-27GHz, Ka 27-40GHz, Q 36-46GHz and V 46-56GHz.

Answer to Test Case 423

- see page 325 -

To start with we need to clarify the set's field scanning. With an ordinary picture the lines of alternate fields are interlaced, i.e. the lines of any given field occupy screen positions midway between the lines of the immediately preceding and succeeding fields. This is normal practice. The result is good picture resolution with a relatively fast large-area flicker rate of 50Hz. With a text display the line and field scan rates are the same as with an ordinary picture, but to prevent interline flicker (25Hz) while maintaining the same display-repetition rate (50Hz) the lines of successive fields are overlaid. The result is a coarser display - which is no disadvantage with the large elements in a text display - that sits steady on the screen.

In this particular chassis design text de-interlacing is carried out not by changing the start time of successive fields but by passing a switched vertical shift current through the scan coils on alternate fields. This current is just sufficient to move the raster by one line width. Hence the 25Hz feed to inverter transistor Q009 and the resistive link between its collector and the scan coils. The vital clue was right at the end this time: the waveform at the collector of Q009 should have been at 25Hz.

Transistor Q009 wasn't working because the PC land at its emitter was not connected to chassis. A wire link had been omitted during production.

NEXT MONTH IN TELEVISION

TV/VCR Spares Guide

This essential reference material is included free with our next issue. The updated, 8-page pull-out 1998 Television TV/video Spares Guide provides addresses and ordering phone/fax numbers for brands, manufacturers and spares distributors in the consumer electronics field.

Servicing the Panasonic NVJ35/J35/F65/F70

These VCRs are now some years old but are still capable of providing superb picture quality and performance, and are thus worth servicing and maintaining. Brian Storm provides an authoritative fault-finding guide.

Las Vegas CES Report

The Las Vegas winter Consumer Electronics Show is an important international event for introducing the latest in CE equipment. This year is particularly significant, with digital TV to the fore. George Cole reports on the latest products and developments.

What's Cooking?

The microwave oven is a common enough domestic item which is partly electronic, partly an appliance. Repairs are often required, and this is something you should be able to handle. J. LeJeune describes the basic operation and features of microwave ovens and the relevant servicing procedures.

Service Notebook

John Edwards on tackling various types of TV and video repairs.

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INDEX DISC

Version 6 of the computerised index to TELEVISION magazine covers Volumes 38 to 47 (1988-1997). It has thousands of references to TV/VCR fault reports and articles, with synopses. A TV/VCR spares guide, an advertisers list and a directory of trade and professional organisations are included. The software is easy to use and very quick. It runs on any IBM or compatible PC with 640K RAM and a hard disc. Price £35 (3.5" HD, alternatively 3.5" DD) Those with previous versions can obtain an upgraded version for £15. Please quote the serial number of the original disc.

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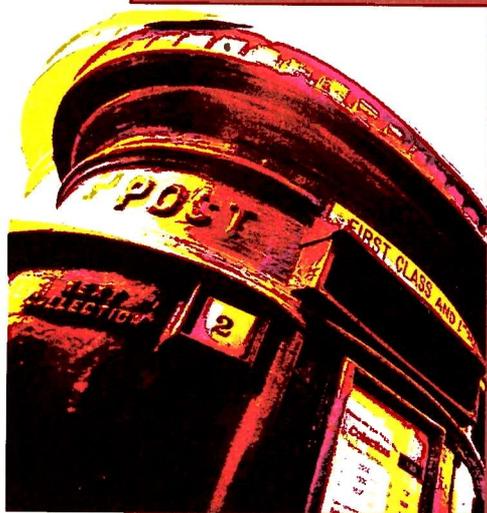
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We welcome letters from our readers and try to publish as many as we can. You can send them typed, handwritten, or on disc. Address them to the Letters Editor, Room L302, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS.

Electrical Safety

Colin McCormick's letter (January, page 175) continues the discussion started by C.N. Cory in the November issue. In such a serious matter as electrical safety we need to stick to facts: these are in the British Standard (European and, with a few differences, international) BS EN60065:1994.

First, 'double insulated'. The standard calls for two or more layers of insulation, 'basic' and 'supplementary', that meet specific requirements, or 'reinforced insulation' which is a single layer that meets more stringent requirements. Either basic or supplementary insulation may be provided by means of an air gap of specified minimum dimensions.

The CD player mentioned by Colin McCormick seems to have only one layer, the air gap. So the question is whether an air gap can provide 'reinforced insulation'? Clause 9.3.4 b) in the standard specifies the width of an air gap in this situation. For reinforced insulation, with mains voltage, the minimum width is 6mm, which must not be reduced to less than 4mm when an external force of 50N (Newtons – 50N is about 5kg force) is applied simultaneously with an internal force of 2N applied to wiring or any live part. The product is expected to meet

Letters

these requirements. If it doesn't, maybe there should have been a cover over the live parts or an insulator fixed to the inside surface of the cover – either of which might not have survived previous work carried out by an unskilled or careless person.

Next, 'floating' circuitry. The values used in a resistor and capacitor combination that bridges a mains isolation barrier are determined by the requirements laid down in clause 9.1.1 of the standard. In effect, the impedance of the parallel RC combination must be not less than 415k Ω , which allows a maximum current of 0.7mA peak (0.5mA RMS with a sine wave current). The voltage, with respect to earth, at which the circuitry sits depends on the capacitance of the whole product to earth. There is nothing to say that it will be 110V or any other value less than 230V. It doesn't matter, because to most people 0.7mA is only just perceptible as a 'touch current' and is not dangerous even if it can be felt.

The requirements are stricter for aerial terminals. The impedance must exceed 463k Ω , and the stored charge must be less than 4.5 μ C (microcoulombs). At 325V peak, i.e. a 230V AC mains supply, this represents a capacitance limit ($Q = CV$) of 13.9nF.

I am surprised to hear that there was a problem with the brand of receiver mentioned: once upon a time I supplied the company with radio receivers, and its technical surveillance was exacting. But 13.9nF (if the actual capacitance was anywhere near the maximum value, I would be surprised) charged to 325V does produce a fat spark.

The current and the stored energy values that are permitted were determined by experience and have not been changed for a very long time. They are certainly in

BS415:1967, and I don't think they were new even then.

What is new is that many more items of Class II equipment are nowadays being connected together. Each of them has a capacitance, intentional or more often just stray, between the live mains and the isolated circuitry. When several pieces of equipment are connected together, the total capacitance can create a 'touch current' that's far from comfortable, though such currents are a long way from being dangerous in themselves.

Aerial riggers should be aware of the problem however, and should take extra safety precautions – the use of insulating boots and, if possible, gloves. The problem has been recognised, and an international team of experts is attempting to draw up measures to control the effect. Unfortunately there is no easy solution.

*John Woodgate, B.Sc.(Eng.),
C.Eng., M.I.E.E., F.A.E.S.,
F.Inst.S.C.E.,
Rayleigh, Essex.*

Back Injury

Readers may recall my back injury case, which started in 1981. In 1990 I won £20,000 in court from Radio Rentals/Thorn EMI (liability). But I was advised to "settle in order to get our (Radio Rentals') personal injury insurance from Sun Alliance". It didn't work out like that, and I've had to continue the battle ever since.

Now, after all these years, a new judge has reviewed the case and the truth of the matter is likely to emerge – he has called for a full enquiry this year at higher legal level. Wish us luck, and our thanks to all of you who have written to us about your injuries and lifting experiences.

Incidentally I find that Radio Rentals (now Homeserve) still relies on one-man TV set lifting. If

readers in other areas can confirm this and let us know, it will add to our evidence.

*Harry Todd and Family,
c/o 12 Oakhurst Close,
Snaresbrook, London E17 3PZ.*

A Tale of Two Tellys

How about this? Set A required a remote control unit, a front flap and a Nicam crystal. By strange coincidence, set B required the same.

Not being an account holder with manufacturer A, a major multinational which won't even speak to us, a call was made to the company's distributor to place the order. "Special Parts Order, it'll take seven to ten days" the distributor said.

We don't have an account with manufacturer B either. This is a much less well known brand, but the company was most helpful when we phoned to ask about spares. A cheque was sent with the order, in the post on Tuesday night. Bright and early on Thursday morning the parts arrived. Brilliant. They were fitted and, within 48 hours of our first parts enquiry, a delighted customer paid his £60.91 bill and collected his set.

Set B is still awaiting parts. In due course we expect that it will be returned to the customer with an anticipated bill for £142.36.

OK, let's not be mealy-mouthed about it. Manufacturer A is Sony, manufacturer B Beko and the difference for the same job is over £80. There seems to be something wrong somewhere.

*Adrian Spriddell,
Diss, Norfolk.*

Pace Apollo Upgrade

My father has a Pace Apollo satellite receiver which, though a very good performer, has only 120-channel capability. As it is part of a motorised system this limited its usefulness. The Pace Apollo and MSS200/300 series receivers all have a 24C32 EEPROM and all use the same PCB, but the MSS300 has 250-channel capability. So I decided to make a copy of the contents of the 24C32 EEPROM in a Pace MSS300 receiver.

I have built myself a serial EEPROM programmer, but instead of using one of these you can tackle the problem in the following way. Remove the EEPROM from the Apollo receiver and put it aside. Then install a socket and a new EEPROM in an MSS300 receiver: at power up, the microcontroller chip will download its ROM programme to the new memory chip. Fit this chip in the Apollo model and it will now have 250 channels, as if it was an MSS300, making it a very useful receiver. Finally put your old chip back so that the customer settings are retained. A point to note however: if for any reason you do a factory reset, the Apollo receiver will revert to 120 channels. So it's best to fit the chip in a socket.

If you wish to have the same information in both receivers, fit the original EEPROM from the MSS300 in the Apollo receiver then use the download facility to clone the MSS300 with the new chip.

*K.E. Prior,
Weymouth, Dorset.*

Regulator Decoupling

While reading the interesting article on null-method dish alignment by John Pitt-Francis (January 1998 issue) I noticed that the 7812 regulator shown in Fig. 2 has no decoupling capacitors.

78 and 79 series regulators are industry-standard devices that are available from various manufacturers. They all look much the same. Their internal arrangements are not identical however, and some become horribly unstable when operated without decoupling.

I guess that John used a tolerant one. But to guarantee successful results every time it's best to connect an 0.1µF capacitor to ground at the input and a 1µF capacitor to ground at the output. They should be mounted as close to the regulator as possible.

*Keith Cummins,
Chale Green, Isle of Wight.*

Panasonic TX25AD1DP

In my fault report on one of these sets (Euro 2 chassis) in the

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December issue I suggested that R668 on panel E should also be replaced when there has been trouble with relay RL6101. In fact R668 should be removed, not replaced. This is important. The CRT could again be damaged if there was further relay sticking.

*Brian Storm,
Harpenden, Herts.*

Beat This!

A customer came in and asked whether we could provide a non-working modern TV set free. He wanted to make a false insurance claim "because my set is too old". This was openly said in the shop. Words fail me.

*Rex Webb, KTV Electronics,
Camborne, Cornwall.*

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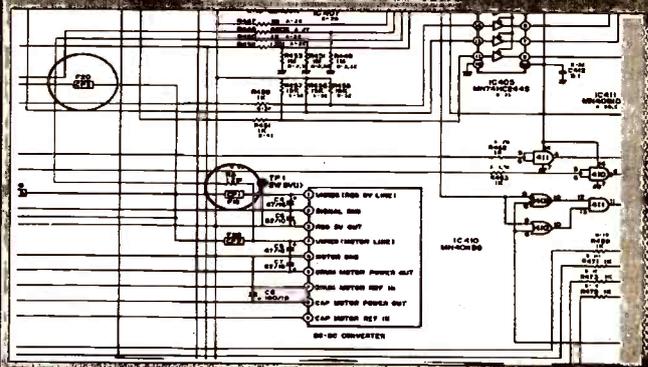
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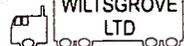
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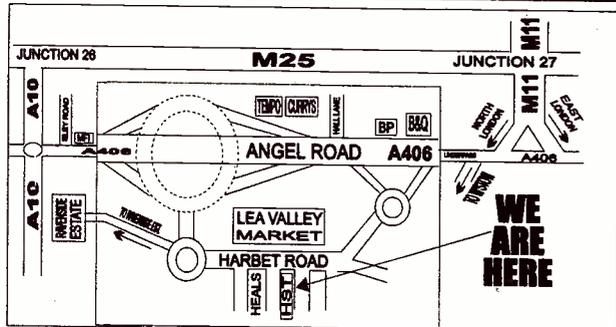
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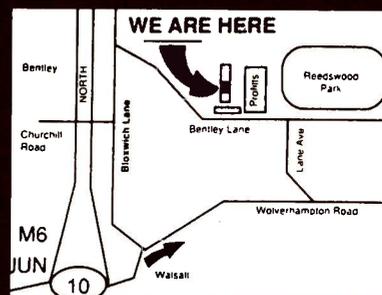
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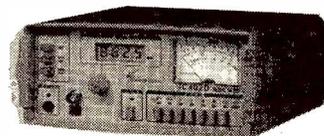
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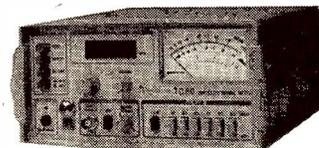
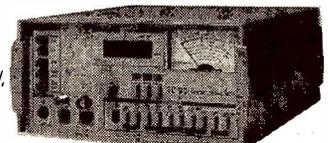
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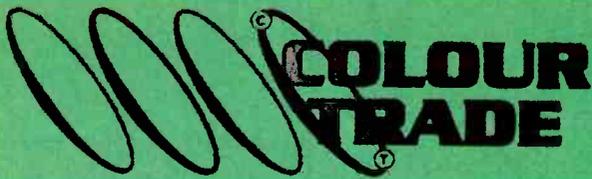
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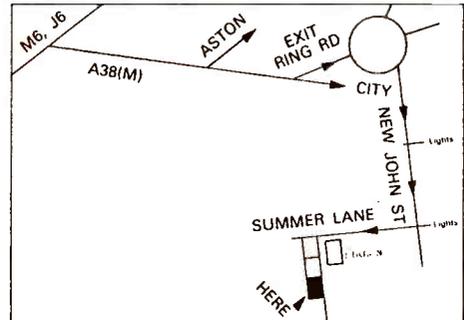
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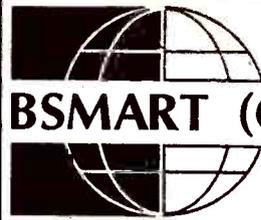
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Teletext from £20.00
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TELEVISION March 1998

RECRUITMENT

 **Rockwell** Avionics & Communications

Collins

Rockwell Collins Inc., a CAA JAR 145 approved in-flight audio and video repair base located near London Heathrow Airport, requires Bench Repair Technicians to support a further expansion.

Candidates should have minimum 10 yrs experience in the repair of LCD and CRT video monitors, with proven repair of VCRs. Suitable for experienced domestic TV/VCR bench engineers.

In order to support our customers' requirements, this position is subject to a shift rota which may include weekend work.

To apply, please send your CV to the address below.

Geoff Drewe
Rockwell Collins Inc.
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tv + audio

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require for our Norwich, Bury St Edmunds & Kings Lynn areas

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- ◆ Experienced in bench & field servicing of TV's & Videos.
- ◆ Willing to service products in customers homes.
- ◆ Of friendly personality.
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- ◆ Physically fit for lifting.

We offer:

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Personnel Manager
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Mobbs Way Lowestoft
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RECRUITMENT



QUADRANT VIDEO SYSTEMS PLC REQUIRE A FURTHER VIDEO ENGINEER

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Candidates must possess a minimum of 5 years experience maintaining VTRs, cameras, video projectors and associated equipment. Good customer liaison skills are also a requirement for this challenging and interesting post.
Salary package commensurate with experience.

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Quadrant Video Systems PLC
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London. NW2 2DT

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Keens Service Limited
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TRIPLER BG 2087-642-1005	£4.00
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36482, 36761, 36831, 36832, 36922	EACH	£10.00
36943, 36962	EACH	£10.00
243221, 2432351, 2432491, 2432851	EACH	£10.00
2432871, 2432981, 2432984, 2433752	EACH	£10.00
2433952, 2434002, 2434141, 2434393	EACH	£10.00
2434451, 2434492, 2434494,	EACH	£10.00
2435016, 2435062	EACH	£10.00
2435064, 2435085, 2435121	EACH	£10.00
2435372, 2435701, 2436773	EACH	£10.00
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AT207678, AT207688, AT207825	EACH	£10.00
AT207781	£15.00	
DST81N243/472591-00	EACH	£10.00
DST85B235/47328700 & /40153200	EACH	£10.00
DST88N234/40086AD, & /47805200L	EACH	£10.00
DST88N234/47120041, & /47317590	EACH	£10.00
DST186N243/473058-00	EACH	£10.00
TFB3035D, TFB3069D, TFB4023AD	EACH	£10.00
TFB4039AD, TFB4066AD	EACH	£10.00
FERGUSON TX10		£4.00
TX85, TX86	EACH	£8.00
TX89, TX98, TX99	EACH	£12.00
Y260781		£8.00
FSTY260482		£5.00
LOPT BLUE SPOT		£10.00
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PANASONIC TC2203, TLF 1456B	EACH	£15.00
TLF1457B, TLF7016	EACH	£15.00
TOHIBA TFB 3035D, TFB 4023AD, TFB 4032BD	EACH	£10.00
TFB 4038AD, TFB 4110AD	EACH	£10.00
TFB 3089D, TFB 4088AD	EACH	£8.00

7805	20p	2SD1432	£1.00	BU208A	£1.50	BUW94	60p	BYX38/200	25p	HGA1124A	50p
7806	20p	2SD1453	£1.00	BU208B	90p	BUW99	£1.00	BYX55/250	10p	HMG26A	£3.50
7809	20p	2SD1576	£1.00	BU222	£1.00	BU254	50p	BYX55/600	10p	IK15	£3.50
7812	20p	2SD1577	£2.00	BU326	£1.00	BUX84AF	50p	BYX71/60	20p	IKT5T	
2SC240	20p	2SD181T03	£3.00	BU407	40p	BUV40	20p	BYZ116	10p	6391 B1	£3.00
2SC275	£1.00	2SD1878	£1.00	BU508A	£1.00	BY187	50p	BZM-C110	5p	IR106A	£4.00
2SC3375	£1.00	AN5521	£1.00	BU508AF	£1.00	BY268-800	5p	BZM-WC20	5p	LR28N	30p
2SC3973B	£1.00	AN5551	£1.00	BU508D	80p	BY228	15p	CA3123Q	5p	M78AB1	£1.50
2SC4313	£5.00	AN5831									

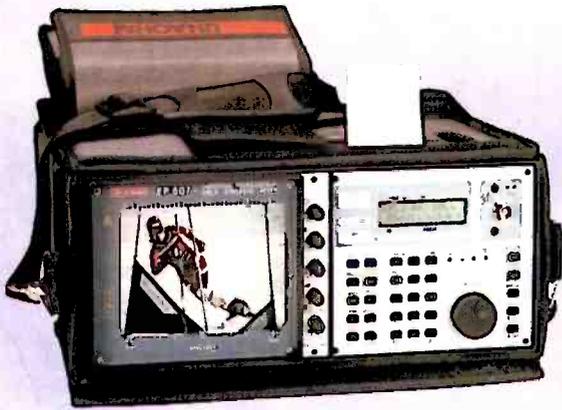
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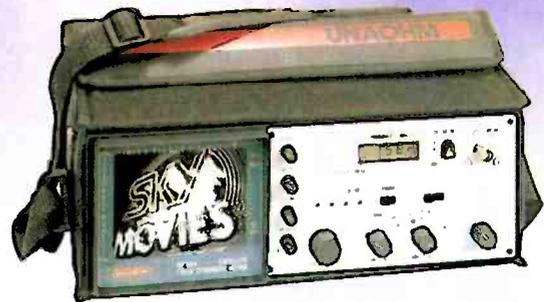
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