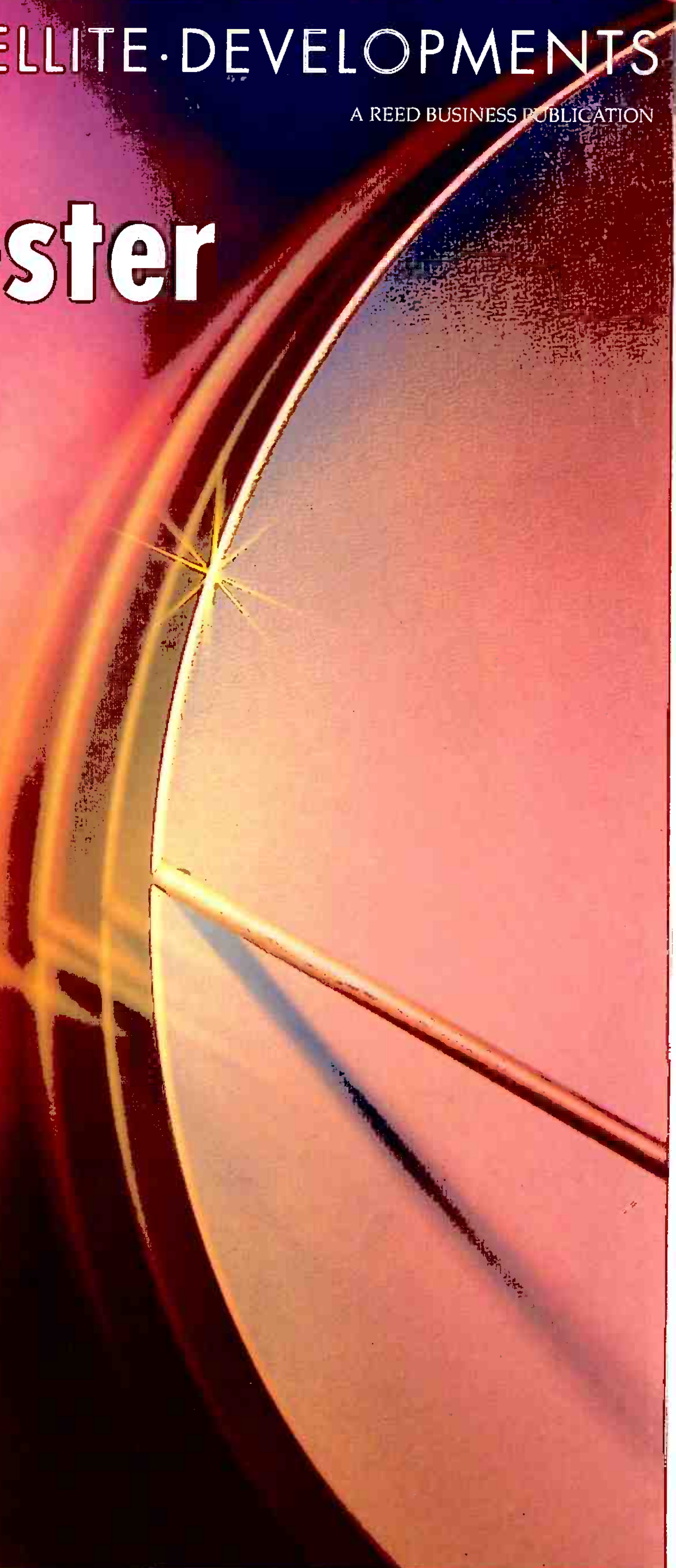
THE LEADING UK CONSUMER ELECTRONICS TECHNOLOGY MAGAZINE

TELEVISION

SERVICING·VIDEO·SATELLITE·DEVELOPMENTS

AUGUST 1997 £2.35

A REED BUSINESS PUBLICATION



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Fault Reports *TVs, VCRs, Camcorders and Satellite*

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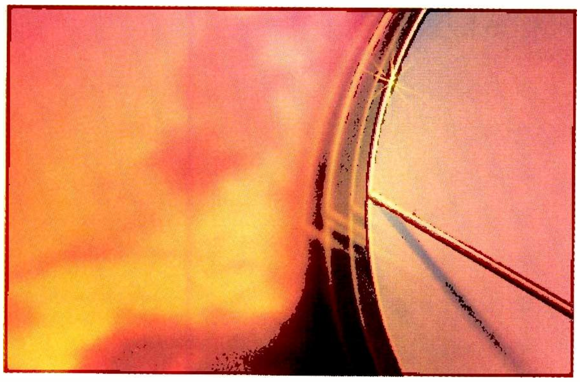

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SPECIAL OFFER

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Has the BBC a Future?

For a very long time the BBC *was* broadcasting in the UK. At an early stage it came to see its role as being a public service, there to be a fair and independent source of news and information, with an educational role, and – almost as an afterthought – to provide entertainment. In all this it was highly successful, becoming an important part of our culture in the UK. Auntie may have been slightly stuffy and slow to respond to changing tastes and interests, but the value of an independent source of news and information has never been in doubt – except when, on occasions, the government of the day has tried to suppress it.

The first challenge to the BBC's predominance came with an increase in the number of radio transmissions available, then with commercial TV. As the technology of broadcasting advanced, so additional new services could be provided. But what we have today is a virtual explosion in the airwave facilities available for broadcasting of one sort or another. Digital technology is vastly increasing the use to which channel space can be put – terrestrial, satellite and cable. Now there's the prospect that the Internet can be put to broadcasting use.

So the public is to be offered hundreds of channels and services. Bravo, we can see what we want when we want. Click, click on the remote control unit and you're there. In this totally changed situation, what role is there for the public service broadcaster? Are the BBC and similar organisations elsewhere headed for the scrap heap, no longer relevant in a world where commercial organisations can in one way or another fill hundreds of channels to serve our needs? Do we need the BBC and its likes when there are all those satellite transmissions and we can surf the web to find what we want?

In fact there are powerful reasons why public service broadcasting, provided it is truly independent and relevant to people's needs, is as important today as ever. One is the fact that a vast multitude of channels does not necessarily mean a vast number of viable providers of independent services. The cost of filling air time has to be considered. It is expensive to produce quality programming. Much too expensive to be able to fill all those channels that modern technology is making available. So we could well find these hundreds of channels full of trash and repeat material: nothing much new, and certainly nothing much that's expensive to produce. And it could be provided by fewer broadcasters – those able to purchase exclusive rights to programme material.

It could well be that the multitude of channels will actually encourage monopoly tendencies in the broadcasting field rather than the reverse. This powerful argument is just one presented in a recent publication, *Broadcasting, Society and Policy in the Multimedia Age*, written by economists Andrew Graham and Gavyn Davies, published by the University of Luton Press. The study was funded by the BBC, but reached convincing independent conclusions.

Those who have witnessed the increasing trivialisation of the press and the broadcasting world know that standards are difficult to maintain. Those who bankroll private services mainly want to see a quick return. This is obviously not good enough, and in broadcasting the only way of ensuring that standards are maintained is to ensure that public services which can set them are available.

We now come to the key question, how? The BBC has its licence fee, which is essential for the continuation of public service broadcasting in the UK. But the private sector tends to be unhappy about what it perceives as a public subsidy it does not itself receive. This notion has to be resisted, especially as curtailment of funding for public service broadcasting could lead to it becoming a sort of impoverished ghetto. We need flourishing public sector broadcasting services to complement the commercial ones.

The report referred to above suggests that there should be a £45 a year licence fee supplement for those with digital receiving equipment. It's an idea, though implementing it would be likely to lead to an almighty political battle.

At any rate the European Union has seen the need for public sector broadcasting support: at the recent Amsterdam summit, the heads of state unanimously adopted a protocol that formally recognises the position of public service broadcasting within the Union and its need for public funding.

COVER PRICE INCREASE

The cover price of *Television* has been held at £2.35 for almost two years now, during which time our costs have increased. We regret that to maintain our service and meet our commitments an increase has now become essential. From the next, September issue the cover price will be £2.50.

CORRESPONDENCE

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INDEXES AND BINDERS

Indexes for Vols. 38 to 46 are available at £3.50 each from SoftCopy Ltd., who can also supply an eight-year consolidated index on computer disc. For further details see page 755.

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

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RGP15G	0.33	TDA1520B	4.50	TEA2029C	7.04
RGP15J	0.17	TDA1524A	7.52	TEA2031A	4.26
RGP15M	0.44	TDA1553Q	4.79	TEA2164	3.40
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S2000A	2.57	TDA1557Q	4.23	TEA2261	3.68
S2000A3	3.59	TDA1558Q	7.69	TEA5101A	6.48
S2000AF	1.46	TDA1670A	2.98	TIC106D	0.82
S2055AF	3.74	TDA1675A	3.85	TIC246D	1.54
SAA129302	10.37	TDA1904	1.63	TICP106D	0.60
SAB3035	1.71	TDA1908A	5.61	TIP110	0.35
SG264A	12.88	TDA2002	1.12	TIP112H	0.77
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SN74141N	0.17	TDA2030V	1.46	TIP29E	0.77
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T9064V	1.87	TDA3653B	1.54	ZTX650	0.51
TA7120P	0.66	TDA3653C	2.82		
TA7280P	2.74	TDA3653CQ	2.57		
		TDA3654	1.44		

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TEA2018A	X 5	£5.75
BUT11AF	X 5	£2.75
BUT11A	X 5	£1.75
CNX62A	X 5	£3.00
UC3842	X 5	£2.95
STK5481	X 2	£10.00
STR50103	X 2	£5.90
S2000AF	X 5	£5.25
TDA3653B	X 2	£1.80
TDA3654	X 2	£1.80
Philips type 1.2 volt Back up battery	X 5	£4.50
Philips type 2.4 volt Back up battery	X 5	£8.75
Scart - Scart lead 1.5m Fully wired	X 2	£2.90
Standard video sensor lamp	X10	£2.50
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
Positor PT37,TH98009 (White)	X 5	£4.75
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KIT2 £6.95 Pace - SS900,9200,9210,MRD920, Ferguson SRV1, Grundig GIRD2000,3000, Philips STU801, Network 900,9200, Bush IRD150, Nokia SAT1500, Maspro SRE250S,350S,450S,Alba SAT6600, Finlux SR5700, Thompson SRS4
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KIT10 £13.11 Pace MSS500,1000
KIT11 £5.95 Ferguson SRD4
KIT12 £16.45 Echostar SR5500(early PSU with adjuster)
KIT13 £29.71 Echostar SR6500,7700,8700
KIT14 £23.95 Amstrad SRD600
KIT15 £7.36 Minitec (Sorenson PSU type only)
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"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-0 binding so that the book lies flat on the bench.

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Economic Devices

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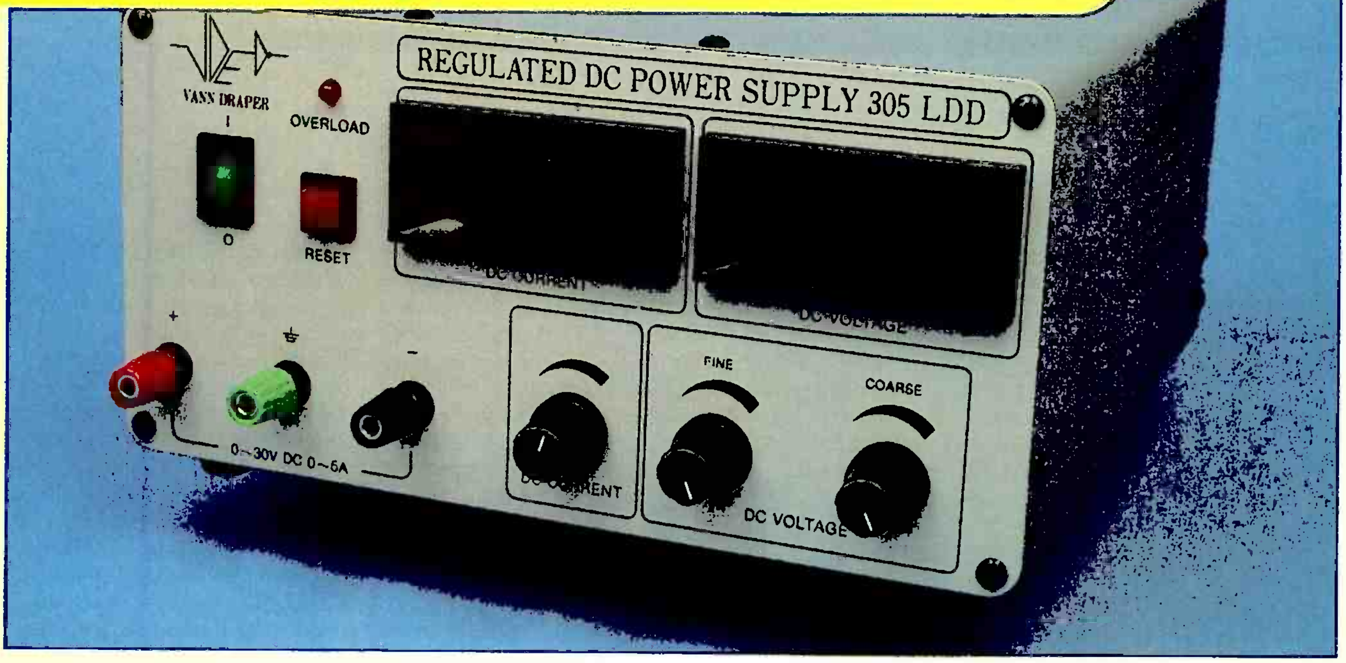
Television – reader offer



30V, 5A bench power supply with dual displays – 25% discount

For a limited period, Vann Draper is offering over 25% discount on the 305 LDD – a bench power supply featuring digital display of both voltage and current. Normally, the 305 retails at £186.82 including VAT but it is available to *Television* readers filling in the adjacent coupon at the 25% discount price of £139 – fully inclusive of VAT *and* delivery.

Infinitely variable between 0 and 30V – with coarse and fine controls – and adjustable between 0 and 5A, the 305 LDD has a ripple figure of typically 10mV. Its load regulation is also excellent, at typically ±0.2%.

Accuracy of the supply's dual 3.5-digit liquid crystal displays is 0.1 decimal digit. The output can handle a continuous short-circuit, overloading at 5.5A ±0.5A. When the overload circuit is activated, it causes both audible and visual alarms, resettable via a push-button on the front panel.

Dimensions of the 305 LDD are 310 by 260 by 120mm and its weight is 5.5kg. Housed in a light-grey steel enclosure, the unit is built to comply with UL, CSA and TUV safety standards.

Please address orders and all correspondence relating to this offer to Vann Draper Electronics at Unit 5, Premier Works, Canal Street, South Wigston, Leicester LE l 8 2PL, telephone on 0116 2771400, or fax 0116 2773945.

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TELETOPICS

DTT Licences Awarded

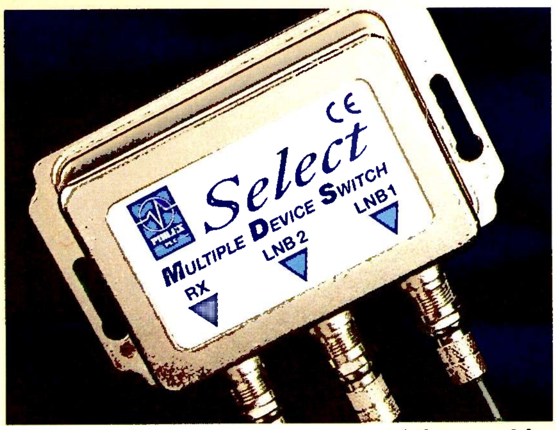
The Independent Television Commission has awarded licences to British Digital Broadcasting to use all three of the digital terrestrial TV (DTT) multiplexes (blocks of frequencies). Since the withdrawal of BSkyB from the BDB consortium, at the insistance of the ITC, the consortium consists of Carlton Communications and Granada – the two largest ITV companies. BSkyB is to be paid £75m compensation by Carlton and Granada for relinquishing its one-third stake in BDB: it will also be the main programme supplier. The other contender for the licences, Digital Television Network, which is owned by the US cable and broadcast services group NTL, is considering an appeal against the ITC decision.

The DTT service, which will provide about thirty channels using conventional transmitters and receiving aerials, is due to start next summer (1998). There will be twelve free channels including BBC-1, BBC-2, ITV, Ch. 4, Ch. 5, ITV-2, BBC Choice and a 24-hour news service, fifteen or so pay-TV chanels including Sky Movies, Sky Sports, Granada Plus and BBC Style, and interactive services such as shopping, banking and Internet access. Digital set-top decoders are expected to go on sale at around £200 – the actual manufacturing cost initially has been estimated at some £400.

A number of companies, including Motorola, SGS-Thomson Microelectronics and Hyundai, have been developing decoder chip sets. A three-chip set from Motorola is expected to be in full production by November. The company is aiming to produce a single-chip decoder by next March. SGS-Thomson Microelectronics hopes to have a two-chip decoder available by next summer, following an initial four-chip set.

LSI Logic has reached an agreement with the BBC to develop a single-chip decoder which is expected to be available by next summer. LSI Logic will be transferring decoder circuitry developed by the BBC, when it was helping to set up the European Digital Video Broadcasting – Terrestrial (DVB-T) standard, on to a chip which has been given the designation L64780.

The DVB-T transmission standard uses a coding and modulation scheme known as coded orthogonal frequency-division multiplex (COFDM). The transmitted bit stream is divided amongst a large number of carriers (2,000 in the UK) within the channel, with each carrier individually modulated using the quadrature-amplitude modulation technique, i.e. each carrier is both phase and amplitude modulated. A fast Fourier transform processor is used to generate and modulate the carriers simultaneously.



The Multiple Device Switch from Philex enables satellite TV viewers to select the output from either of two dual-polarised LNBs electronically, using the satellite remote control unit. It remembers the last LNB selected, and is thus also suitable for timed recordings. Suggested retail price is £25 including VAT.

The unit passes a 22kHz control signal, and its internal relay provides operation with both analogue and digital systems. For further details contact Philex plc at Philex House, 110-124 The Broadway, West Hendon, London NW9 7PP (0181 202 1717, fax 0181 202 0014).

Digital TV Developments

First samples of the Eurobox, a common European digital cable TV decoder, were shown at the Montreux Television Festival in June. The Eurobox standard has been set by members of the European Cable Communications Association. A joint HDTV demonstration by the Digital Video Broadcasting Project (Europe) and the US Advanced Television System was also held at Montreux. Both groups showed a mixture of live and recorded material: the DVB demonstration included HDTV and standard-definition signals multiplexed on a 19·6Mbits/ sec data stream.

BBC Prime and BBC World are to use Eutelsat's simulcasting technique to broadcast in analogue and digital form using a single transponder aboard the Eutelsat II F1 satellite at 13°E. The new services are to start this month.

TV and the Web

Hitachi and Mitsubishi are to launch set-top boxes that conform to the WebTV system in the USA. The system gives TV viewers access to the Internet by using their remote control handsets. WebTV was acquired by Microsoft in April. Philips and Sony currently market WebTV decoders. In the UK, Pace is planning to launch a WebTV trial later this year.

Eutelsat and the Italian company Com.net have announced the first European service that gives access to the Internet via satellite – at speeds of up to 40Mbits/sec per transponder. The technique used is based on the DVB open standard for digital TV. A DVB/MPEG-2 card for a PC and a 60cm dish are required to receive the service: for transmission, a normal modem and telephone line are all that are required.

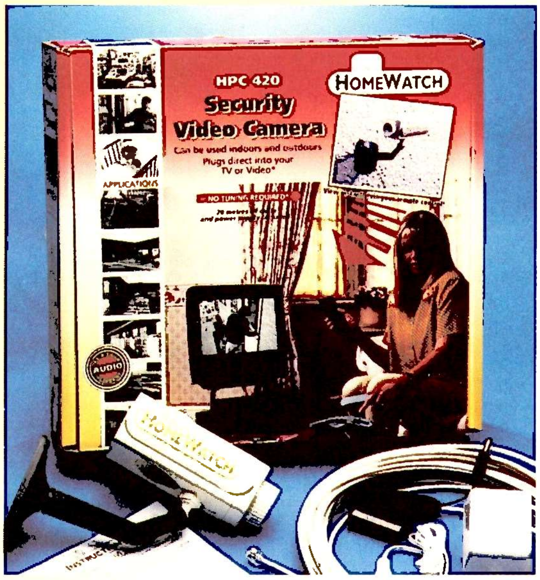
ITU Sets Global Standards

The International Telecommunications Union (ITU) has announced a new global standard for digital terrestrial TV broadcasting (DTTB) and convergence towards a single HDTV production standard based on the High Definition Common Image Format (HD-CIF). The DTTB standard will provide high-definition quality and unify TV broadcasting systems worldwide. TV manufacturers will thus be able to deliver sets anywhere in the world, and will benefit from economies in production scale. The resolution provided by the new standard, about twice that of present colour TV systems, is equal to or better than 35mm film. In addition there's high-quality 16-channel sound.

The ITU notes that there are at present more than forty different, non-compatible systems in use in the world. Its new "umbrella" recommendation unifies the US-favoured ATSC standard and the European DVB standard. Under the recommendation, the two systems will form a single compatible system that can be implemented globally within the practical limitations of current channel assignments. Mr O.P. Khushu, chairman of the Inter-Union Technical Committee of the World Broadcasting Union, commented that "we would have liked to see the Recommendation specify a unique transmission format, but we don't live in a perfect world!" The aim was to produce a digital architecture that could accommodate both high-definition and conventional TV services for terrestrial transmission, with compatibility with cable and satellite delivery and recording technology.

The HD-CIF format is based on a single matrix of samples (1,080 x 1,920) irrespective of the field and frame rate: the matrix thus forms a unique method of HD image capture for any application. Further work will study the use of the HD-CIF format as a building block for SHD (Super High Definition) TV systems.

The ITU points out that there are at present 1,288 billion TV sets in use worldwide. With the advent of digital TV they will have to be replaced, representing a huge market. 26 per cent of the sets are in Europe, 44 per cent in Asia and another 26 per cent in the Americas.



Security Vision Ltd., The Duchy Buildings, North Street, Stoke sub Hamdon, Somerset TA14 6QR (01935 826 464, fax 01935 825 233) has launched a CCTV security system that can be used at home, in the office or in any situation where a TV set is available to act as a monitor. The Homewatch HPC420 CCTV camera retails at £149.95 and is easy to set up, requiring no special equipment. The system simply clicks or pushes together. Sound, power and video are linked via a single, slim cable. The bird's-eye view is available instantly by pressing the TV or VCR remote control unit's AV button. If the camera is connected to the TV set via a VCR, its pictures can be recorded.

At 420 lines the resolution is much higher than that of a standard TV screen (252 lines). The wide-angle lens covers an area of 50 sq. metres. An acoustic chamber gathers low-level sound. At night the camera switches electronically to a light-intensifier mode, producing usable images at down to 0·1lux (bright starlight). The camera will also work well with infra-red lighting. A weatherproof case provides protection. There is also an electronic bright-light compensation feature, which enables the camera to relay clear pictures even when it sees bright sunlight.

The camera is available from electrical and hardware stores.

Nokia Group Spares

Following a company rearrangement at Nokia, spares for Nokia, Nokia-ITT, Salora, Finlux and Luxor TV, video and audio products are no longer being handled by NCS (Nokia Central Stores) at Swindon. The supply of these spares to current account holders has been taken over by Akai UK Ltd., Haslemere Heathrow Estate, 12 Silver Jubilee Way, Parkway, Hounslow, Middx TW4 6NQ. The direct line for Nokia spares is 0181 759 2367.

Nokia now trades in the UK as Nokia General Communications Ltd. and continues to supply satellite equipment spares and mobile phone accessories from Bridgemead Close, Westmead Industrial Estate, Westmead, Swindon, Wilts SN5 7TS (01793 556 002, fax 01793 556 015). Willow Vale Electronics has been appointed an approved supplier of satellite and mobile phone spares.

CHS, Prospect House, Barmby Road, Pocklington, Yorks YO4 2DP (01759 303 068, fax 01759 303 620) has been appointed an official agent for TV, video and audio spares for Nokia and its associated brands. TV, video and audio spares continue to be available from CPC, Willow Vale Electronics and Wizard Distributors.

There seem to have been considerable spares supply problems recently as a result of changes at Nokia's central warehouse in Belgium.

Widescreen TV

A report on the European widescreen TV market by the 1250 Vision Group reveals that about 600,000 sets were sold last year. Sales in the UK were 18,000. The largest markets were Germany (150,000 sets), France (130,000 sets) and the Benelux countries (163,000 sets). During the year 1996, 16:9 aspect ratio TV transmissions in the EU reached a total of 23,700 hours. France transmitted a total of 10,200 hours (the highest) while the UK total was 700 hours.

DVDs

Philips is offering a DVD verification service to ensure that discs are interchangeable between all players. Panasonic plans to launch its first DVD player in the UK this summer, with a suggested price of around £600: the company forecasts worldwide DV disc sales of 1bn a year by 2000. An independent research consultancy forecasts that sales of DVD players in the USA will pass the ten million mark in the year 2000. Samsung is also to launch a European DVD player this summer.

Intel has developed software that enables DVDs to be played via a PC without the need for specialised DVD hardware. According to Intel its software, run with a Pentium II processor, can display MPEG-2 video from a DVD at a quality equal to that achieved with DVD-specific hardware.

Camcorner

Reports from David C. Woodnott and Nick Beer

Canon E60/110/230 etc

A common problem with many camcorders in this range, which uses infra-red autofocusing, is inability to focus correctly at infinity. Things are usually OK at lesser distances, but at infinity the malfunctioning occurs.

The problem can often be overcome by carefully washing the infra-red optical unit in an ultrasonic cleaning tank. It seems that fogging of the lens occurs with age. It's best not to dismantle the unit and clean it manually, as doing this disturbs the set-up integrity. It's a much cheaper option than a replacement at around £60 trade. **D.C.W.**

Sharp VLC73H

No operation was the complaint. This camcorder didn't even power up then down, as some of them do. The cause was soon found to be failure of the ceramic fuse link F901. Replacing it didn't restore full operation however, as IC802 (the loading motor drive chip) was also faulty. Once this item had been replaced all was well. **D.C.W.**

Samsung VPU10

No camera E-E picture, all playback functions being OK, is a common problem with this model. The cause is usually failure of the autofocus or zoom motor.

If the microcontroller chip detects a problem with the lens unit during the switch-on initialisation, the result is no E-E pictures. The lens position sensors can cause similar faults, but this is less common.

The faulty motor(s) stick because of insufficient torque. Replace them and carry out autofocus setting up as laid down in the manual. **D.C.W.**

Sony CCDF150E

After a short period of use there would be no E-E or playback sound. When the camcorder was switched on the sound was OK: the sound gradually faded off. Pictures were OK.

The cause of the trouble was a leaky capacitor (C420, 1µF) in the audio mute circuit. We've had failure of this capacitor in several other Sony models that use the same or similar circuitry.

Note also that failure of the HIC audio chip (SBX-1505-2) is becoming very common in any model that uses it. The chip usually becomes temperature sensitive, and can be made to fail or work at will by the application of heat or freezer. **D.C.W.**

Sony CCDV7AF

This old timer was inoperative mechanically. Normal operation was restored by replacement of PS601 (N20) and the mode motor. It's a common failure with models of this period, and also with the contemporary EV series VTR units.

As with all units that use the K mechanism, it's likely that both reel turntables and possibly the pinch roller will require replacement. Also check the idler assembly for a loose and incorrectly positioned pivot. **D.C.W.**

Sony CCDTR505E

This newish Handycam had two seemingly unconnected faults with a common cause. The symptoms were no autofocusing and no trigger (record/pause) button operation. All other functions were OK.

If the RM95 remote control unit was used, recordings could be made but the autofocusing remained inoperative.

The cause of the trouble was an internal failure in the switch block control (camera operation unit, ref. 59). This type of failure is often difficult to pinpoint quickly – there are usually several other items to eliminate first. The unit is expensive if ordered in error – yes, we have done it! **D.C.W.**

Hitachi VMC1E

This camcorder was brought to us because it was dead. Except for failed circuit protectors, it's an uncommon symptom with this model. The cause of the trouble was capacitor leakage, which again is unusual in this model (shall I live to regret saying that?!).

The culprit was C824 (22µF, 6·3V) on the main PCB. It had corroded the print, thereby disconnecting the 5·3V supply from regulator IC804 to pin 8 of the syscon chip IC802. A replacement capacitor, PCB clean up and a wire link restored normal operation. **D.C.W.**

Panasonic NVS5B

This camcorder was dead – there was just a flash of red LED when an attempt was made to power it. The cause of the problem was traced to the tiny, 1kΩ surface-mounted resistor R6028, which was open-circuit. It's in the battery-level circuit, connected to pin 102 of the system microcontroller chip IC6001. **N.B.**

Sony CCDTR75E

There was no playback luminance, just very dark, almost non-existent vision. A check through the luminance playback signal processing path brought me to the CCD comb filter circuitry on board VS67. There was an input here but no output. The reference level at pin 12 of IC202 was found to be very low, and a resistance check to chassis produced a reading of 800Ω. C237, a 1µF surface-mounted capacitor (part no. 1-162-638-11), was leaky. **N.B.**

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BYD33D=0.15	LB1645=2.00	STK5488=4.75	TDA1060=3.25	2SA747=4.95	2SD836=0.75
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RGP15K=30	M58658P=6.99	STK73410=2.85	TDA155Q=3.65	2SA1062=1.00	2SD1453=4.40
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AN5265=0.95	NE544N=4.50	STR451=19.50	TDA2148=3.25	2SB524=0.65	2SD2125=4.15
AN5512=1.35	PA3029N=24.99	STR1195=7.99	TDA2541Q=3.10	2SB618=3.05	2SK193=030
AN5521=1.35	SAA1043P=6.50	STR4090=11.15	TDA2577=P.O.A.	2SB648=0.50	2SK176=8.00
AN5620=2.50	SAA1251=6.99	STR11006=3.50	TDA2578A=2.25	2SB817=2.25	AF200=0.80
AN5790=2.40	SAA1293-3=5.15	STR16006=3.99	TDA2653A=2.40	2SB883=1.40	BC303=0.20
AN6250=2.99	SAA3004P=3.15	STR30115=2.75	TDA3030B=5.50	2SB1156=0.79	BC877=0.50
AN6652=1.00	SAA3027P=5.05	STR30125=5.99	TDA3330=11.85	2SC372=0.30	BC880=0.40
AN6878=2.50	SAA5000=4.15	STR44115=5.99	TDA4503=3.00	2SC461=0.10	BD142=1.50
AN7110=1.00	SAA5230=12.50	STR50092=5.50	TDA6200=10.50	2SC536=0.20	BD226=0.30
AN7169=2.00	SAA7000=8.99	STR50103A=3.85	TDA8214B=3.45	2SC741=3.00	BD677=0.50
APU2400T=9.45	SAB3021=3.99	STR50115=4.50	TDA8372=7.25	2SC840=3.15	BD791=0.60
BA340=1.40	SAB3035P=5.45	STR50213=4.50	TDA8380=2.50	2SC901A=3.50	BDT64C=2.10
BA536=1.50	SAB3210=2.99	STR53041=4.50	TDA8405=8.00	2SC1123=0.45	BDT65C=2.10
BA3920L=2.50	SAJ210=3.15	STR54041=3.50	TDA8732=5.95	2SC1185=2.25	BDX670=1.67
BA5102A=1.10	SDA2516=3.00	STR56041=4.50	TEA2018A=1.50	2SC1317=0.15	BF337=0.30
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BA6209=1.00	SDA5243=10.15	STR80145=5.50	TEA2031A=1.80	2SC1756=0.35	BF760=0.40
BA6247=2.00	SL1454=18.95	STRD1816=3.99	TEA2164=3.25	2SC1819=0.78	BF872=0.25
BA7766=2.80	STA451C=3.95	STRD6001=5.15	TEA2260=2.99	2SC1904=3.10	BFR96=1.00
CNX36=90	STK032=8.75	STRD6108=7.00	TEA5170=1.40	2SC2200=2.50	BFX89=2.50
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HA1350=2.00	STK435=3.50	TA7230=1.00	TPU2732=19.99	2SC2580=2.35	BU2525=4.10
HA1457=8.99	STK439=3.99	TA7245=2.00	U2829B=1.70	2SC2671=1.20	BUT13=2.25
HA11223=1.35	STK1040=6.35	TA7256=3.99	UAA1008=300	2SC2706=3.50	BUTD6A=1.05
HA11244=2.99	STK2029=4.75	TA7722=8.99	UAA4009=7.00	2SC2753=0.40	BUW41B=0.80
HA11713=1.00	STK2240=6.50	TA7280=1.90	UC3844=1.50	2SC2898=2.50	BUX80=1.80
HA11715=2.10	STK3042/2=4.75	TA7281=2.00	VCU2133=13.00	2SC3156=4.00	BUX98A=4.50
HA12411=5.75	STK3082=5.25	TA7302=2.25	VPU2203=12.50	2SC3178=2.25	MJ15024=6.50
HA17741=4.99	STK4017=3.85	TA7318=4.90	XR2207=4.85	2SC3212=3.50	MJ13009=2.00
IRF840=2.50	STK4042=7.99	TA7328=1.50	UPC1018=1.10	2SC3279=1.15	S2055AF=1.85
KIA6283=2.50	STK4112/2=9.25	TA7604=3.50	UPC1163=1.15	2SC3306=2.50	T906SN=9.99
L4964=4.99	STK4131/2=6.50	TA7680=2.00	UPC1185=6.00	2SC3358=0.60	T1P41C=0.35
LA3300=1.30	STK4141/2=5.50	TA7698=4.75	UPC1212=1.70	2SC3459=2.10	TIP42C=0.40
LA3350=1.99	STK4151/2=6.80	TA8200=3.50	UPC1278M=2.20	2SC3679=3.50	TIP40=0.85
LA4182=1.65	STK4161/2=5.15	TA8215=3.00	UPC1365C=2.50	2SC3795=2.00	TIP147=0.98
LA4422=1.25	STK4191/2=6.85	TA8221=5.75	UPC1536=5.25	2SC3973B=2.75	TIP2955=0.50
LA4446=2.90	STK4272=5.99	TA8618=1.80	15/80H=2.50	2SD200=1.80	TIP3055=0.50
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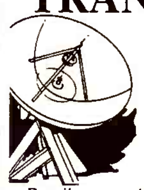

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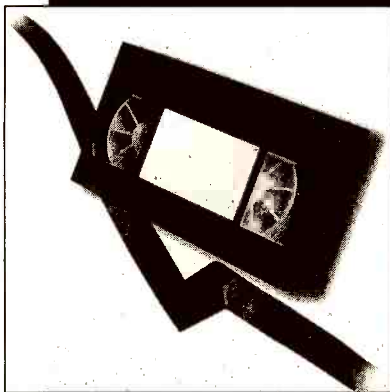


VCR Clinic

Reports from
Philip Blundell, AMIEEIE
Eugene Trundle
Steve Stamford
Gerald Smith
Terry Lamoon
Brian Storm
John Edwards
Ronnie Boag and
Michael Maurice

Grundig VS340

"Buzz on sound" was the complaint with this machine: there was a loud, 25Hz beating noise during playback of any hi-fi tape. This is usually caused by worn hi-fi heads, but a scope check at the hi-fi FM test point (pin 35 of the hi-fi sound module) showed that the signal here was fine. So we started to check through the signal path. Everything was OK up to the output (pins 9 and 3) of IC1135, where the audio signal had 20msec chunks cut out of it.

IC1135 is part of the extrapolator circuit. It should be switched on for 12µsec periods, but was being switched on for 20msec ones instead. The timing is set by the 4070 quad exclusive-or chip IC1140, which was faulty. A new 4070 chip restored normal sound. **P.B.**

Philips VR6557

This machine kept ejecting the cassette because the pin that presses the cassette-in switch down was broken. You won't find the part number for this item in the manual. The nice man at Philips Technical told me that it's 4822 535 10316. **P.B.**

Matsui VP9601N/Tatung TVR634N and TVR734N

Intermittent mechanical deck functions with these machines are often caused by failure of the mode switch. Cleaning it will provide a cure, but replacing it is better. The most common symptom is sporadic failure to accept or eject a cassette. **E.T.**

JVC HRD540/580/910 etc

These models have a similar drum motor that can cause trouble when it fails to produce a PG pulse output – the pulses should be superimposed on the FG waveform. Before fitting a very expensive lower drum assembly or writing off the machine, try replacing the 3·3µF, 30V electrolytic capacitor on the stator PCB. There's no component reference number, but it's the only can-type capacitor – about the size of a match head – on the board. **E.T.**

Hitachi VTM410E

Here's a fault that you could spend for ever trying to sort out without getting near the solution! The symptom is an irregular 'snicking' noise – a bit like the sound of a gas ring spark-igniter – on the playback sound. The cause is static discharge, and the cure is to replace the toothed reel-drive belt. The specially-treated replacement will be supplied when the original part number is used. **E.T.**

JVC HRD860

If the problem with one of these VCRs is complete or intermittent power supply failure, in addition to replacing the start-up capacitor etc. check for a dry-joint at the emitter connection of the chopper transistor Q1. A section of the solder pad seems to detach itself from the rest of the print land. To be sure of the repair, use a tiny length of tinned copper wire to bypass the immediate printed land area. **E.T.**

Sony SLV200UX

This VCR's unusual symptom was the presence, in the record mode only, of a head-switching bar about two-thirds of the way down the screen. During playback the switching point was correct – at 6·5 lines before the field sync pulse, adjustable with VR351. The cause was a faulty servo chip (IC351). It's a 44-pin, surface-mounted device that costs a staggering £39.64 net trade plus VAT . . . **E.T.**

JVC HRD320

This VCR reset its clock with annoying irregularity. Otherwise it was perfectly OK. Once in a while the display said "video" and it locked up. I decided, after the usual fruitless search that occurs when a machine develops a mind of its own, to phone JVC and was told that the back-up capacitor C3 (0·1F, 5·5V) had given up the ghost. A replacement restored normal operation – it's mounted on the display panel. My thanks to JVC for help with this one.

The **Ferguson FV21R** seems to be very similar, so the fault might also be experienced with this model. **S.S.**

Nokia VR3615

This machine wouldn't rewind. Close inspection of the "relay plate" revealed that the pin below the main cam was bent. Straightening it restored the rewind function. **G.S.**

JVC HRA630

When this machine was switched on the lift would sometimes shuffle back and forth. The machine would then revert to standby. The cause was a faulty mode switch. **G.S.**

Daewoo V215

There was no manual or auto tracking. As a result, playback of prerecorded tapes produced poor pictures. A check at pin 22 (TRK

DLY) of IC601 showed that the voltage was low and didn't vary with tracking control adjustment. The cause of the trouble was C520 (10µF), which had fallen in value. **G.S.**

Sony SLV625
This machine would try to load then revert to the unlaced position. Even if the machine did manage to go into the record or playback mode it would intermittently revert to stop. The cause of the trouble was bad connections at both ends of the drum motor plugs. **G.S.**

Samsung VIK316
This machine worked all right but the display was dull. A check on the VF+/– supply produced a reading of 5V AC instead of about 4V DC with 1V AC. The fault was caused by C38 (100µF, 10V). **G.S.**

Nokia VR3615
This machine would sometimes revert to standby when a cassette was inserted. A replacement mode switch assembly cured the fault. **G.S.**

Matsui VP9301
There was a serious wow and flutter problem with the sound. As I had a spare capstan motor in the workshop I fitted it. This cured the fault – sometimes you have a bit of luck! **T.L.**

JVC HRD560
This machine had a playback fault - part of the picture was missing. As it appeared to be a tape path problem I checked the loading arms. Sure enough, the supply arm was loose. This is becoming quite common now with these machines. You can reset the arm with a little glue to hold it, but I would recommend replacement to ensure a reliable repair. **T.L.**

Matsui VP9401
If you get a low sound complaint with one of these machines, check C3606 (10µF, 16V) by replacement. **T.L.**

Panasonic NVHD100
The complaint with this machine was that it would sometimes lose drum lock in the cue and review modes. Although the fault was intermittent, operating the machine from cold would instigate it. Examination of the capstan rotor top bearing showed that there was quite a build up of dirt and debris here. After cleaning this away, the wear on the capstan spindle caused by the partial seizure could be clearly seen. A replacement spindle (VXP1350) and a new top bearing (VXD0140) cured the fault. **B.S.**

Panasonic NVF65
The symptom complained about was "strange speckling on the playback picture". On test we found that there were white flecks at regular intervals all over the picture. The cause was C1018 (100µF, 63V) in the power supply. As it was open-circuit, there was HF noise on the 45V line. If the machine had not been used with line inputs exclusively there would have been bad patterning on the E-E picture as well. **B.S.**

Panasonic NVD80
This elderly digital machine had an intermittent E-E problem: it would sometimes display a ragged dark raster, usually after changing channels a few times. To obtain a clear channel you would then have to unplug the machine and start up again. Fortunately the fault was easy to cure. The outputs from the superannuated power supply module were all too high because C1012 and C1039 (both 47µF, 16V) on the primary side were low in value. Replacements cured the fault. **B.S.**

JVC HRJ400
There was a half-loaded tape in this machine. The only other sign of life was the word "eject" in the display, whose segments were being illuminated sequentially to give a clockwise cyclic rotation effect. No functions were possible. Replacing CP1 on the power supply board brought the machine back to life. **J.E.**

Fisher FVHP716
Tape playback was normal but the E-E picture was severely distorted, with line tearing and vertical judder and rolling. The cure was to replace C8 (1µF), C9 (0·47µF), C16 (10µF) and C17 (1µF) in the IF module. I have to admit that I achieved this more by guesswork than detailed fault analysis.**J.E.**

Samsung SI1240
Tape playback was at about the same speed as fast forward. I did not have a manual, but luckily spotted print corrosion at pins 5-11 of socket CN206. It's at the front right-hand side of the top main board, and can just be seen with the front fascia in position. A good scrape followed by resoldering restored normal operation. **J.E.**

Panasonic NVJ45
This machine would eject a cassette as soon as it had been inserted. Removing and refitting the carriage unit cured the problem. The usual lower deck strip down and alignment weren't necessary. **J.E.**

Nokia VR3723
Intermittent failure to rewind can be a problem with these machines. The first thing to do is to replace the mode switch. If this has already been done, replace the slide cam (part no. 613 094 9240) and the loading belt. **R.B.**

Finlux VR3724
A problem we've had with these machines is colour flashing with some prerecorded tapes. The cure is to replace the video processing chip IC101. **R.B.**

Nokia VR3716
The symptoms with one of these machines were no display, the drum motor running and the capstan driving the supply reel. The cause of the problem was dry-joints at oscillator crystal X702. **R.B.**

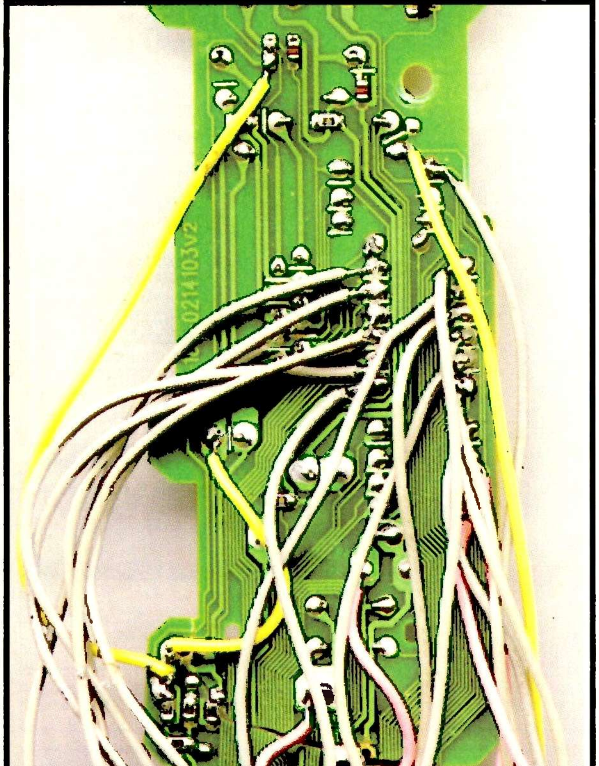
Sanyo VHR276
If one of these machines won't accept a tape, the lift shuffling in and out, replace the rotary switch. **R.B.**

Panasonic NVF55
There were coloured speckles throughout the picture in the E-E mode only. The cause was dry-joints in the tuner unit. **R.B.**

Mitsubishi HSM48
This machine had two faults. First its mechanism was jammed, with the exit guide halfway towards the loaded position. The cause of this was a rubber that the customer's daughter had put inside. When the exit guide's gear and the control plate had been replaced the mechanics worked. The second fault was intermittent failure to record sound. This was caused by C932 being dry-jointed at one end. **M.M.**

Alba VCR7800
There was no E-E video. A previous engineer had replaced the RF converter, and in doing so had cut one of the fine tracks that pass near it. Linking this break restored the pictures. **M.M.**

Satellite WORKSHOP



Jack Armstrong

The Pace PRD900

A smart looking lady wearing tweeds and a pork pie hat marched into my repair shop. I could tell from the uniform that she was a landowner. The two dogs and the four-wheel drive vehicle parked outside were also giveaways. Her problem was with a Pace receiver that whistled. I doubt whether many people would dare to whistle in her presence, so the PRD was taking a big risk. She left it with me and instructed me to "phone when ready".

I have been seeing a lot of PRD800/900 receivers recently with power supplies that whistle. An accompanying symptom is that the output voltages are often slightly high. Invariably the culprit is C5 (22µF, 35V, 105°C), but I replace C6 and C7 as well as a precaution.

Sometimes the voltages remain too high, with the 5V rail at 5·5V which is over the limit really. After replacing every component in the power supply without success, I've recently started to change the value of R12 from 22kΩ to 15kΩ. This is a surface-mounted resistor which is connected in parallel with R11 (2kΩ, 1%) to ensure that the output voltages are accurately set. 5·25V appears to be the norm for the 5V rail. It's all a bit of a compromise. If you set the 5V supply too low, the 13V supply falls to 12V or less and, if the cable run is long, you get problems with some makes of LNB.

In this particular case replacing C5/6/7 cured the problem. As the receiver was an early version, with no 9·75GHz menu option, I phoned the lady to ask if she would like me to upgrade it. This involved either replacing the microcontroller chip to provide the 9·75GHz menu option, or simply uploading the channel frequencies to tune each one 250MHz higher, using the Pace Link system on my PC. Being the rich type, she chose the latter, cheaper option.

I kept the price down by supplying an enhanced rather than a universal LNB, and gave her the phone number of a local installer who uses very basic coaxial cable. I warned her that the whole lot would have to be replaced for digital MPEG-2, but she sniffed and told me to mind my own business!

Cambridge ARD200

This receiver also turns up as the BT SVS200, or with a JVC or Alba badge. It was cleverly designed to give quite good performance with ease of manufacture, but is difficult to repair when it goes wrong. With a dead receiver however all that you normally need is a fuse. So I was rubbing my hands with glee when a young fellow came into my workshop and told me that his bedroom receiver didn't light up.

"Go and play outside" I said, "I'll have it fixed in a twinkle. It will cost about a tenner. Where's your mam?"

The spotty youth ran his sleeve across his nose and informed me, in a surprisingly deep voice, that he was fifteen and didn't require his mam. He went out and disappeared down an alleyway.

Unfortunately the fuse was intact. Checks in the power supply showed that the outputs were all present but too low. My copy of *The Satellite Repair Manual*, fourth edition, told me to "replace the TL431 adjustable zener and the CNY17-2 opto-coupler".

I managed, with much swearing and use of the desoldering station, to extract these items from their nasty, plated-through holes. Replacements were fitted and soldered in place. The result of all this effort was – nothing! The fault was still there.

The spotty youth had already poked his nose around the door and asked me, cheekily, "how long is a twinkle?" But I was determined not to get too frustrated. I have a repair trade friend who tells me that he usually "solves" such problem repairs by placing them carefully on the floor then jumping on them with both feet. After this he phones round his colleagues (me, usually) in a desparate attempt to find a replacement!

A glance (actually about half an hour) at the circuit diagram finally convinced me that the culprit had to be the BC846B transistor Q53, which acts as an emitter-follower at the output from the optocoupler. Using all three hands to hold the magnifying glass, solder and iron, I succeeded in replacing the flea-sized object. Wonder of wonders, this worked!

The spotty youth payed up his tenner with bad grace. So I stuck my tongue out at him. Two hours' work for this!

Grundig

At the time of writing this it would appear that Grundig has handed over its spares operation to CPC, as Amstrad did a year ago. It will take a while for CPC to decide what to stock, so many spare parts are currently unavailable. For example my workshop contains a GRD300 awaiting a vacuum fluorescent display, a GRD280 awaiting a microcontroller chip and various Minerva and Matsui receivers which I have taken in part exchange and rob for spares as there was no chance of repairing them at an acceptable price. Hopefully the situation will have been corrected by the time you read this. Willow Vale continues to supply Grundig parts for out-of-warranty items of course.

A Pace MSS1000

The power supply in this receiver, which arrived by carrier, had been killed by a lightning-induced mains surge. Unfortunately the damage had been increased by its owner, who had decided to have a go at fitting a repair kit. Even time-served bench technicians have problems with power supply kits, so I was not too surprised to see the mess beneath the board in this receiver. Several copper tracks had been peeled away, and dark brown flux was interspersed with solder splashes.

Allow me to digress while I comment on fitting a kit. First, the idea is to leave the receiver looking exactly as it did before you took the screws out. Bend the legs of resistors and diodes at right angles so that they match exactly the relevant hole pitch, and don't rip off the pads when you insert the component. Bend the legs towards each other, as the factory machinery would have done. Bending the legs outwards can create short-circuits. Do not leave any component standing proud of the board.

Vibration can fracture the tracks. This applies especially to the heavy chopper transistor. Even some 'engineers' leave it on stilts. Wrong! Press it down until the shoulders of its legs touch the board. Some designs rely on the copper tracks to dissipate heat, so the legs must be kept short. If a component is left standing proud, it could move and break the tracks.

The only exceptions to this are the pluggable resistor, which is designed to stand up, and some high-dissipation components whose legs must be kinked to secure them before soldering. Lecture over.

The MSS1000 receiver had suffered horribly. The optocoupler had been fitted the wrong way round, and the leads of the TL431 voltage-adjustable zener diode had been used to bridge the gaps between the holes and the tracks because the solder pads were no longer there. I replaced all the badly-fitted parts, then started to carry out measurement checks. Three surface-mounted resistors (10Ω, 1kΩ and 470Ω) were open-circuit. The silicone insulator behind the SSP5N90 chopper MOSFET had been torn.

When I was happy that there was no more damage, I connected the unit to the mains supply. The screen presented me with just a row of zeros. This is a classic symptom of an I2C bus fault. The micro-controller chip uses the bus to send and receive serial clocked data to/from the other ICs in the circuit. You usually find that either the EEPROM or the MSP3400 audio processor chip is faulty. Not this time however: the Nicky chip U26, next to the tuner, was the culprit.

As the EEPROM had been corrupted, I used my Pace Link computer system to download the standard programming. Finally, I upgraded C11 and C12 as recomended by Pace (part nos. 856 1082750 and 856 1583750 respectively). These are ultra-high reliability type capacitors, and the value of C11 is increased to 1,500μF. In my opinion C216 (1,000μF, 63V) should also be replaced, as it is highly stressed.

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 stamped envelopes.

Test Case 416

Doc Colin came to Sage's bench with a job card in his hand. "Where are the field timebase twiddlers in a Sony KVX2174 telly?" he asked. He had looked at the service manual for the AE2B chassis and had been unable to find them.

He was told that he would need an electronic screwdriver and was referred to page 32 of the manual. With this guidance he retired to the cab of his van to check it out. He discovered that the electronic screwdriver is in practice the user's remote control handset, and that all the presettings are stored in a memory chip. So he would be able to deal with the fault in Mr White's telly without even taking the back off, wouldn't he?

Off he roared to the White residence, with the Sony manual on the passenger seat. The reported symptom was that the picture had "slipped" – a typical user description! When Colin checked he found that the picture was displaced vertically and was slightly lacking in height.

Following the manual's instructions, he got the set into the service mode, selected the CXD2018 scan control chip from the menu, and addressed memory locations 01 (vertical size), 02 (vertical shift) and 04 (vertical linearity), changing the data at each location to check out their operation. They all worked. So he set up the field timebase, using his pattern generator – which included a crosshatch-with-borders display.

Thinking how wonderful the electronic screwdriver system was, Colin the Doc sped on to his next call with never a thought as to why the picture had suddenly gone awry. He had cause to wonder next morning, when he found the same rental card in his work pile. "As before, customer irate" it said.

When he returned to the site he found Mr White grumbling. Colin hooked up his pattern generator and, with the remote control zapper back in his hands, discovered that this time the picture was overscanned vertically and had moved in the opposite direction on the screen.

Making sure that Mr White didn't see how to get the set into the service mode, Colin once again reset the software for a correctly-scanned picture. But he had a sinking feeling that the latest settings were virtually the same as the original ones. Sure enough, that same afternoon he was summoned once more to the set and the now furious Mr White. The picture had "slipped" again. Perhaps this electronic screwdriver business wasn't such a boon after all! Anyway, the set would have to be taken back to the workshop, where it would be someone else's problem to deal with.

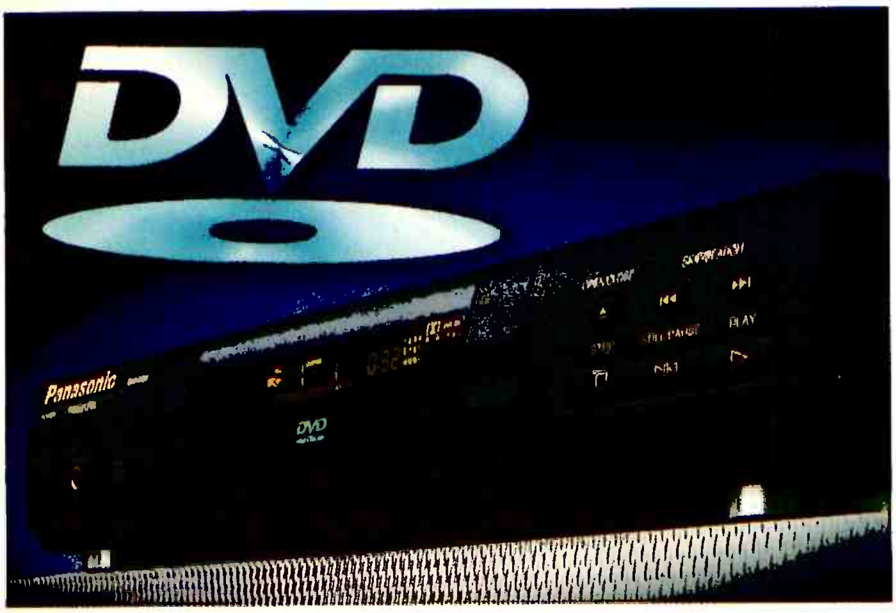
That someone else was none other than Television Ted, who has much experience of Sony sets. He listened to Colin's story, then started his diagnosis by carefully setting up, with the workshop test pattern, the field scanning. He noted all the settings and left the set to run. After three hours the picture jittered a bit and showed the symptoms previously described.

Ted checked out the software settings. They hadn't changed – at least their numerical values, as displayed on the screen in the service mode, hadn't. As the fault seemed reluctant to respond to either mechanical or thermal tests, Ted connected two voltmeters to the set, took a note of their readings, then waited until the picture geometry once again changed. He was soon on the right track, and next day the set, now with the fault cleared, was on its way back to Mr White.

Was it a software problem introduced by the control system, or was there a fault in the timebase itself? You'll find the answer on page 755.

Panasonic's Way Ahead

In May Panasonic held a European conference in Paris to present its latest video/TV technology. This included TV sets, digital camcorders, flat-screen displays and DVD players.
George Cole reports



Panasonic's first European DVD player, Model DVDA100.

With sales expected to reach one and a half million TV sets this year, Panasonic has about five per cent of the European TV market. The company's aim is to double this to ten per cent by the year 2000. As part of the plan, Panasonic has opened a new TV plant at Pilsen in the Czech Republic. Production started in April 1997.

Quintrix CRTs

Panasonic reintroduced its Quintrix picture tube technology, first launched in the Seventies, in Europe last year. The technology was initially used in 25 and 32in. CRTs. This year there are plans to adopt it for a much wider range, from 21in. to a mighty 36in. widescreen tube (Quintrix Wide). Quintrix employs a number of technical features that contribute to improved picture quality.

One of these is specially treated pigmentation for the red and blue phosphors. As a result, ambient light of the same colour is reflected while ambient light of other colours is absorbed, giving a fifteen per cent contrast improvement. In addition, red and blue phosphors with EBU (European Broadcasting Union) colour points have been introduced. These are normally used only in broadcast monitors, and have a higher colour purity.

Quintrix 4:3 aspect ratio tubes employ a Quadrupole In-line Gun (QIG) and a coma-free deflection yoke to give a twenty per cent increase in picture sharpness. The QIG has a redesigned first grid aperture of rectangular instead of circular shape and an extra grid to provide an additional pre-focus lens, see Fig. 1. As a result, the vertical beam size at higher currents is reduced, giving improved focusing at the edges of the screen.

The coma-free deflection yoke is used to reduce an effect known as spot-coma aberration. This is caused by the basic barrel-shaped deflection field distorting the beams produced by the two side guns, so that the vertical spot size produced by the red and blue beams is greater than the size of the centre, green spot. The coma-free system uses coma-correction elements to introduce pincushion correction to the deflection field, see Fig. 2. This compensation equalises the size of the three beams, reducing red and blue blur. There is an overall ten per cent resolution improvement.

Quintrix tubes also use new bimetal thermal-compensation springs to hold the shadowmask, reducing movement by 75 per cent in comparison with a conventional CRT. A magnetic shield fixed within the CRT is used to reduce electron beam movement caused by the Earth's magnetic field. According to Panasonic this feature reduces the beam movement by 50 per cent.

Quintrix Wide (16:9 aspect ratio) tubes use an Over-Lapping Field (OLF) electron gun. With this arrangement (see Fig. 3) the diameter of the main focusing lens is increased to 7·9mm in comparison with the 4·5mm of the three separate lenses in a conventional in-line gun tube. As a result, the electron beams fill a greater screen area with sharper focusing.

The 36in. Super Flat Quintrix Widescreen TV set on display was an impressive-looking beast. Its CRT has a dot pitch of 0·7mm, the same as that used in Panasonic's 1,125-line Hi-Vision HD-TV sets in Japan. The CRT alone weighs 55kg – the set needs four people to lift it! Three scart connectors are provided, plus RF, composite video and phono audio sockets. The set is due to be launched later this year, but no price information is available to date.

Flat-screen Displays

Panasonic will be launching flat-screen TV sets in Europe in mid-1998. At the Berlin IFA audio-video fair in 1995 Panasonic showed its own flat-screen display technology, known as the beam-matrix display. It's a cross between CRT and LCD technology, and produces good-looking pictures. Subsequently beam-matrix sets were released in Japan, using the name FlatVision. A 14in. FlatVision set is just a few inches deep, but the sets were expensive (the Japanese equivalent of about £2,000). Panasonic has decided that there is cheaper technology it can use.

Panasonic now backs plasma display technology, and showed a prototype 42in. receiver. The power supply and tuner are separate, so the display can be hung on the wall. The set we saw was an NTSC version with VGA input for computer graphics. It weighs around 15kg. No price details were announced, but it won't be cheap!

TV Products

There was a chance to see a couple of other interesting TV products that Panasonic now has on sale in Japan. First an Internet TV with a 32in. 16:9 aspect ratio screen, a built-in 33·6kbit modem, two Mbytes of memory and Netscape browser software for exploring the Internet. The set performed well, and the demonstrator showed how the remote control handset can be used to log on to Panasonic's web site. But there is at present no way of upgrading the set, for example to use the latest version of the browser.

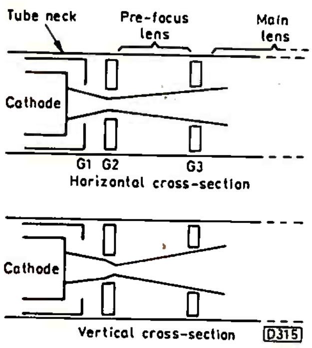
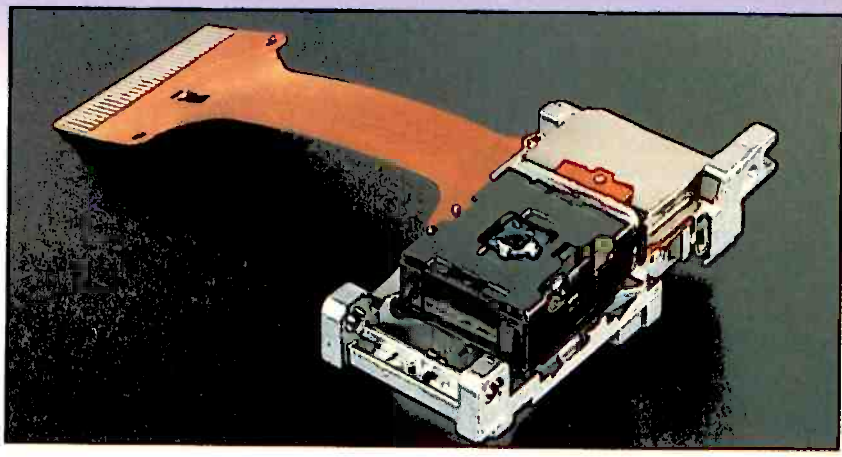


Fig. 1: Principle of the quadrupole in-line gun. The first grid has a rectangular aperture. As a result of this and the additional pre-focus lens the spot diameter has been reduced over the whole screen area.



The dual-focus optical pickup assembly used in Panasonic's DVD players.

This illustrates the current gap between computer and consumer products. Consumers tend to keep their sets for seven or so years, but PC technology changes at a much faster rate. New versions of browser software appear regularly, and often include new features. The first version of Netscape for example couldn't cater for animation or frames (pages within pages). When a new browser version arrives, web pages are frequently upgraded to take advantage of the enhanced features, which often won't work with earlier versions. Presumably Panasonic will develop a means of downloading software upgrades for future versions of the set.

Another product was a 28in. set with a built-in DVD player, Model TH28GD1. It costs the Japanese equivalent of £1,400, but Panasonic says that there are no plans for a European launch. This is a shame, because it makes a good TV/video player. The deck can play DVD, CD audio and Video CD discs (including those with karaoke tracks). It has a 16:9 Quintrix tube and provides a Dolby AC-3 multi-channel sound output (more on this later).

Digital Video

Panasonic unveiled two new camcorders that conform

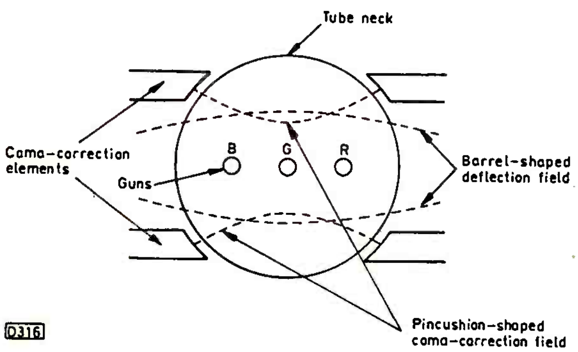


Fig. 2: How the coma-correction system works.

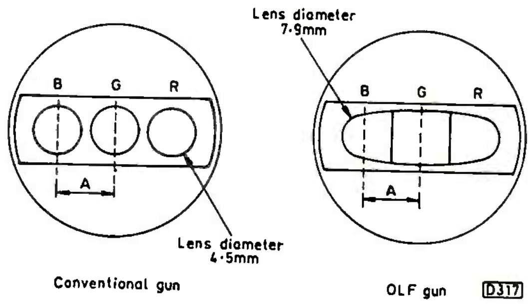


Fig. 3: The OLF electron gun used in 16:9 aspect ratio tubes has a wider main lens diameter (right) compared with a conventional in-line gun tube (left). In both cases the beam separation (A) is 5·5mm.

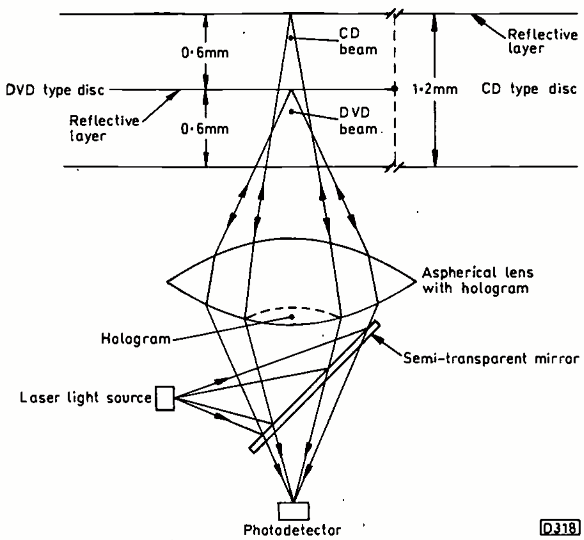


Fig. 4: Operation of the dual-focus DVD optical system. Note that the reflective layer is scanned through the disc.

to the Digital Video Cassette (DVC) format. They use the miniature version of the format called Mini DV. Panasonic's first Mini DV camcorder, Model DX1, had three CCD imagers and was aimed at the top end of the market. The new Models NVDS1 and NVDS5 have a single CCD imager and are aimed at a wider market. DVC is selling well in Japan, accounting for just over half of the camcorder market (53 per cent). The percentage is expected to rise to 70 by the end of the year.

One interesting development is a long-play record mode for this format. In fact Panasonic revealed that there are now three DVC record modes, SP, LP and ELP (Extended Long Play). These are part of the official DVC specification. Details are listed in Table 1. Picture quality in the SP and LP modes is described as "excellent", and in the ELP mode "very good". In the SP and LP modes the horizontal resolution is 500 lines – although the value is the same in both modes there is some loss of detail in the LP mode as less data is used.

The NVDS1 and NVDS5 both have an IEEE 1394 4-pin terminal that enables images and sound to be downloaded to a suitably-equipped PC. Panasonic is working with Microsoft to develop non-linear editing software (i.e. editing with a hard disc, which gives random access, rather than on tape which is a linear medium).

Panasonic is to launch an optional PC kit for both camcorders. It includes an RS232 PC connecting cable and DV Studio software that converts a digital image into a bit map file of about 900Kbytes size. In addition some clever software called PhotoEnhancer, developed by the US company PictureWorks Technology, is included. This enables you to do some fancy things with your digital images, such as adjusting the contrast, brightness, colour or focus. In one example shown, an over-exposed picture of a couple standing on a Hong Kong street was magically transformed into an image with the correct exposure.

PhotoEnhancer is also supplied with Panasonic's new digital camera, Model DCF1, which is better known as the "Card Shot". This has a 1·8in. LCD monitor, a 350,000 pixel CCD imager, and records images on a 2Mbyte memory card. The latter is about the size of a large postage stamp and can store eleven images in the fine mode or 47 in the economy mode. Fine mode provides VGA picture quality (i.e. 640 x 480 pixels).

The DCF1 has a digital input and output terminal, enabling images to be downloaded to a PC. Users can also slip the memory card into a PC card adaptor and use it with a PC that has a card slot. PC cards are about the size of a credit card, and thus have a greater memory capacity than the DCF1's memory card. There is also a composite video output so that images can be viewed with a TV set or monitor. No price details were available.

DVD

Panasonic spent a fair amount of time demonstrating DVD equipment. The DVD format is being introduced as a successor to the CD format. To recap, DVD uses a CD-sized disc (same thickness and diameter) but records a much greater amount of information. A red laser is used: this has a shorter wavelength than the infra-red CD laser (630-650nm instead of 780nm), enabling pits roughly half the size of the CD ones (0·4microns compared with 0·83microns) to be read. The track pitch is also smaller, 0·74microns instead of 1·6microns.

A DVD disc consists of two 0·6mm plastic substrates which are bonded together by a process involving photopolymer resin and ultraviolet light. Although this gives the same thickness as a conventional CD, the recording layer depth for each format is different.

To be able to read both CD and DVD discs, a DVD player must have an optical system that can cope with the two different focal lengths. One solution would be to use switchable lenses, but this is mechanically complex and expensive. Panasonic's solution is to use a dual-focus optical pickup with an aspherical objective lens that incorporates a hologram, see Fig. 4. Light that passes through the hologram at the centre is focused to form the CD spot, while light that passes through the periphery of the lens forms the DVD spot.

The basic DVD disc is single sided and has a single recorded information layer on one substrate – the other substrate is used simply to strengthen the disc. It can store up to 4·7Gbytes of data (seven times the capacity of a CD). There are other possibilities in the DVD specification however.

The single-sided dual-layer disc uses both substrates to store information: one has a reflective and the other a semi-transparent information layer. The information in both layers is read from one side of the disc by moving the objective lens slightly. This arrangement increases the storage capacity to 8·5Gbytes.

With the double-sided, 'single-layer' disc each substrate has a reflective information layer. The layers must be read from opposite sides of the disc, which has a maximum storage capacity of 9·4Gbytes.

Finally the double-sided, dual-layer (four layers in all) disc has two substrates each with a reflective and a semi-transparent information layer. This combination of the two previous arrangements increases the storage capacity to 17Gbytes.

Dual-layer and double-sided discs are not expected to come into use for some time.

DVD will be used for data storage, domestic video and domestic audio. The specification for the latter is still being devised, but the DVD-ROM (used for data storage) and DVD-Video (used for video programmes) specifications have been finalised and players have been developed and are starting to be marketed. We'll concentrate on DVD-Video.

By using a variable-bit compression system, DVD-Video can store up to about 133 minutes of MPEG-2 quality video on a single-layer disc. A dual-layer disc could store up to four and a half hours of video. Panasonic thinks that DVD will become a major rival to VHS and the LaserDisc in the prerecorded market, and could even become an important domestic video recording format. The DVD demonstration we saw, featuring a James Bond film, showed that the format's picture quality can outstrip VHS, S-VHS and LaserDisc.

Panasonic forecasts big things for DVD, with world demand for the discs reaching 25 million this year and one billion in 2000. A number of those present felt that this was a rather optimistic view. One problem that DVD faces is a shortage of prerecorded software. In April this year there were just 229 titles in Japan and 172 in the USA. At the time of writing this (June) there was just one European title – a German version of the film Twelve Monkeys.

Nevertheless Panasonic is gearing up for DVD manufacture. A new $30m (£20m) DVD plant came on stream in Torrance, USA in July, with an initial production capacity of two million discs a month. Panasonic has launched a European DVD production service called Panasonic Owl.

Panasonic's first European DVD player, Model DVDA100, was launched in Germany in February. It should be available in the UK by the time that you read this, with a price tag of some £500-£600. It conforms to both the PAL and NTSC formats, which may seem odd for a European machine. The Regional Code system prevents discs intended for one region (say the USA) being played on machines designed for a different one (say Europe). But some DVD discs may be promotional or giveaways, which the publisher wants to distribute in various markets – these may not be protected by the Regional Code system.

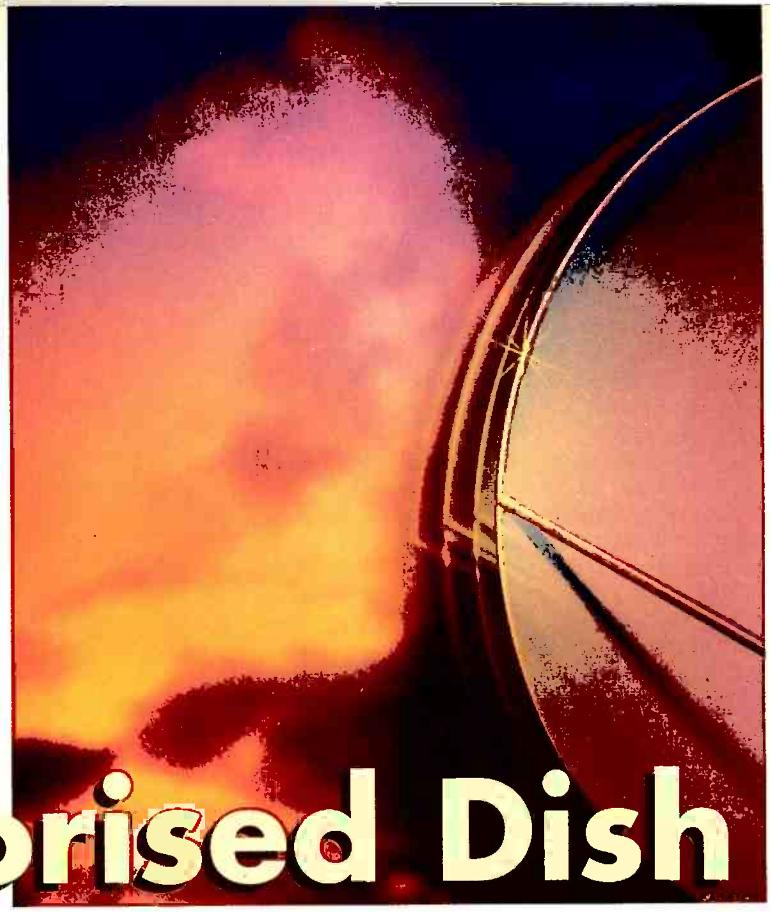
The DVDA100 provides 96kHz/20-bit audio, audio CD/Video CD compatibility and has an output socket for Dolby Digital AC3 audio. The latter has caused some consternation, because the DVD standard specifies AC3 multi-channel audio for NTSC markets and MPEG-2 multi-channel audio for Europe. When he was asked why the European player doesn't cater for multi-channel MPEG-2, Panasonic's optical discs system division director Toshikazu Yosumi said that the decoders weren't ready. Lindsay Holman, Panasonic Owl's development manager, added that the company had not received a single order for a multi-channel MPEG-2 title. European consumers may find that they have to wait for a good supply of multi-channel DVD film titles.

One wonders how successful DVD will prove to be. Initially, players will cost almost three times as much as a standard VHS recorder. Software will be scarce, and the Regional Code system makes the format less attractive. A recordable DVD-RAM system will be very expensive initially. My guess is that DVD will succeed in the long run, but it will be a long time before we start waving goodbye to the trusty VHS boxes beneath our TV sets.

Table 1: DVC recording modes

Format	*SP**	*LP**	*ELP**
Mini DV	60	90	180
DVC	270	405	810
Track width (microns)	10	6·7	6·7

*Times in minutes.



Pete Haylor, G6DRN, has devised this simple unit for aligning and testing motorised dish installations

Motorised Dish Tester

An increase in the number of motorised dish system installations and repairs led to the development of this little project.

The equipment used to align a motorised satellite TV installation should be portable, small, light and if possible battery operated. After buying a spectrum analyser, I needed a power system to drive a dish and also, for fault finding, some way of testing the reed switch – all operated from batteries.

When I looked through the catalogues the only suitable item I came across cost almost £195. But it did have some extra features, such as polariser control. The tester I devised cost only £25 however, using some parts obtained from a radio rally.

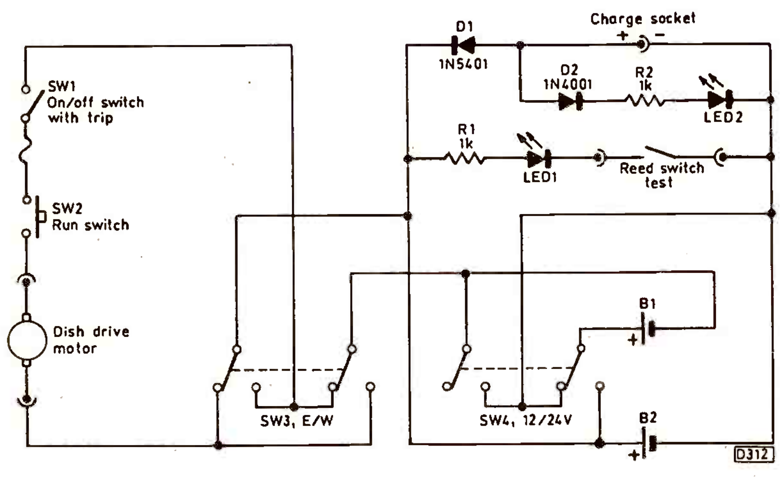


Fig. 1: Circuit diagram of the unit.

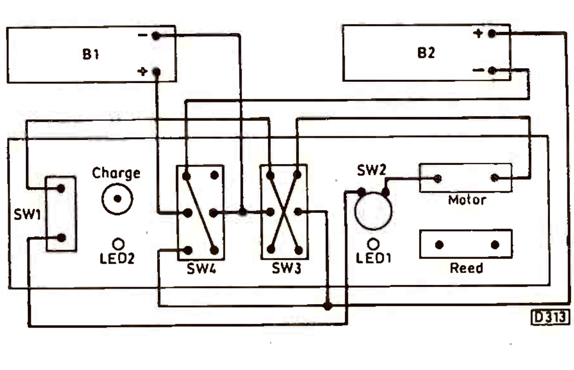


Fig. 2: The layout adopted, showing the 10A wiring.

Circuit and Specification

Fig. 1 shows the circuit diagram. The arrangement provides a 12V or 24V motor drive at up to 3A, a reed switch test facility and is portable.

The simple reed switch test circuit, which is fed from the 12V supply, consists of LED1 and a 1kΩ resistor. If the reed switch is operating correctly, the LED will flash when the jack arm moves. If the LED remains on continuously, the reed switch is shorted. If the LED doesn't light at all, the reed switch is open-circuit.

Construction

Figs. 2 and 3 show the wiring details. The layout is the one I adopted: you can build the unit to suit yourself – there's nothing critical. It's all very simple, but care must be taken because of the current that could flow with incorrect connections.

The two sealed lead-acid batteries I used are tested ex-equipment ones rated at 12V, 3·2Ahr. They cost me £4 each. The case cost £3 and the other parts required were all bought from my usual suppliers. They could be obtained from Maplin, RS or Farnell. Suggestions are made in the accompanying parts list. The 12/24V and EW switches are of the same type. A standard switch and separate fuse could be used instead of the suggested on/off switch with trip (see below).

To provide a measure of safety, 10A flex was used for the main wiring (Fig. 2). Fuse provision was a bit of a problem, because of the possible high-current demand with a stiff jack arm. So I used a mains switch that incorporates a thermal trip (Farnell part no. 597-880).

Use

The unit has been used to drive dishes of up to 3·1m diameter. It has worked with ease on the 24V setting.

The idea of the 12V setting (SW4) is to enable the batteries to be charged from a 13·8V charger. Alternatively, if only a standard charger is available, a kit can be obtained from CPC (part no. HKSK127): this will switch off the charger when the battery has been fully charged. Or a charging circuit from a house alarm can be used.

If required several extras could be added to the unit, such as a polariser control, a 22kHz tone switch, and an auxiliary 12V supply to power other battery-operated equipment.

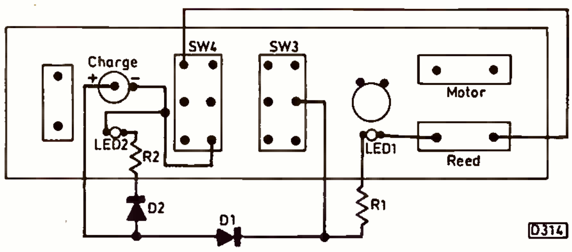


Fig. 3: The low-current (1A) wiring.

Parts list

SW1. On-off switch with 5A trip. Farnell part no. 597-880.
SW2. 3A press-to-make switch. CPC part no. SW00037.
SW3, 4. 3A minimum DPDT switches. Farnell part no. 150-555.
Two loudspeaker connectors. CPC part no. CN00518.
One charge socket.
Two LEDs and two 1kΩ resistors.
One 1N5401 and one 1N4001 diode.
10A and 1A cable for wiring.
Two sealed lead-acid batteries rated at 12V, 3·2Ahr.
Available from Greenweld Electronics Ltd. (01703 236 363) etc.
Case to suit.

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Servicing the Salora M Chassis

Because of its use of digital chips for signal and scan processing and its IPSALO circuit, the Salora M chassis presents problems when fault finding. There are ways of achieving a fairly quick diagnosis however, as Chris Watton explains

The Salora M chassis was one of the first to appear in which signal processing and timebase waveform generation are carried out digitally. As with other digital chassis, engineers tend to avert their eyes when one of them comes into the workshop. Once the back has been removed, you find lots of forty-pin ICs. Where do you start?

Block Diagram

Well, if you look at the block diagram (see Fig. 1) you will see that all the normal operations in a TV set have to be carried out, and that everything is split up into logical sections.

So we can understand what goes on in the set. Things just look a bit different, with timebase waveform generation carried out in one chip (DPU – deflection processor unit), video processing (PAL decoding etc.) in another (VPU – video processor unit), teletext operation in another (TPU – teletext processor unit) and so on.

The VCU (video codec unit) carries out video signal analogue-to-digital conversion and also digital-to-analogue conversion to feed the RGB output stages. The DTI chip provides digital transient improvement, while the MCU chip generates clock signals.

There are two separate chips for the audio section, an analogue-to-digital converter (ADC) and an audio processor (APU) which produces pulse-width modulated outputs.

The whole lot is under the control of the CCU (central control unit) chip. The MEA chip provides tuner interfacing.

The RGB, audio and field output stages are all conventional. The chassis follows the Salora practice of the period in having an integrated power supply and line output stage (IPSALO). With this arrangement, the chopper circuit and line output stage share a single transformer. As with any chassis, these are the sections of the set where the majority of faults occur.

Servicing

In the following notes we'll outline the signals and voltages you should expect to find at the active pins of the various chips and what could be the cause when a signal is missing. To service one of these sets it's essential to have an oscilloscope, a digital meter, and a signal generator to produce colour bars and, should a set's geometry have to be adjusted, a crosshatch pattern with a circle.

Setting Up

Setting up is seldom necessary in normal servicing, but a full set-up may be required if a memory chip has to be replaced. We'll deal with this later. All adjustments except the first anode (G2) and focus controls and a preset in the tuner/IF module for AGC are carried out using the remote control unit. This, after entering a password, becomes a service processor. The password is to prevent the customer accidentally selecting the service mode, which could result in all sorts of problems – I shudder to think about it. My advice is that if the set doesn't need adjusting, don't use the remote control unit to have a little twiddle: it isn't quite as simple as putting a preset back where it was.

The remote control unit can also be used to configure the set for different systems and makes. Granada sets for example require a password to store the tuning information. The idea of this is to prevent customers mistuning their sets, thus preventing wasted call outs to rented sets. So here's one advantage of digital operation. Another is that the cowboy down the road or the next door neigh-

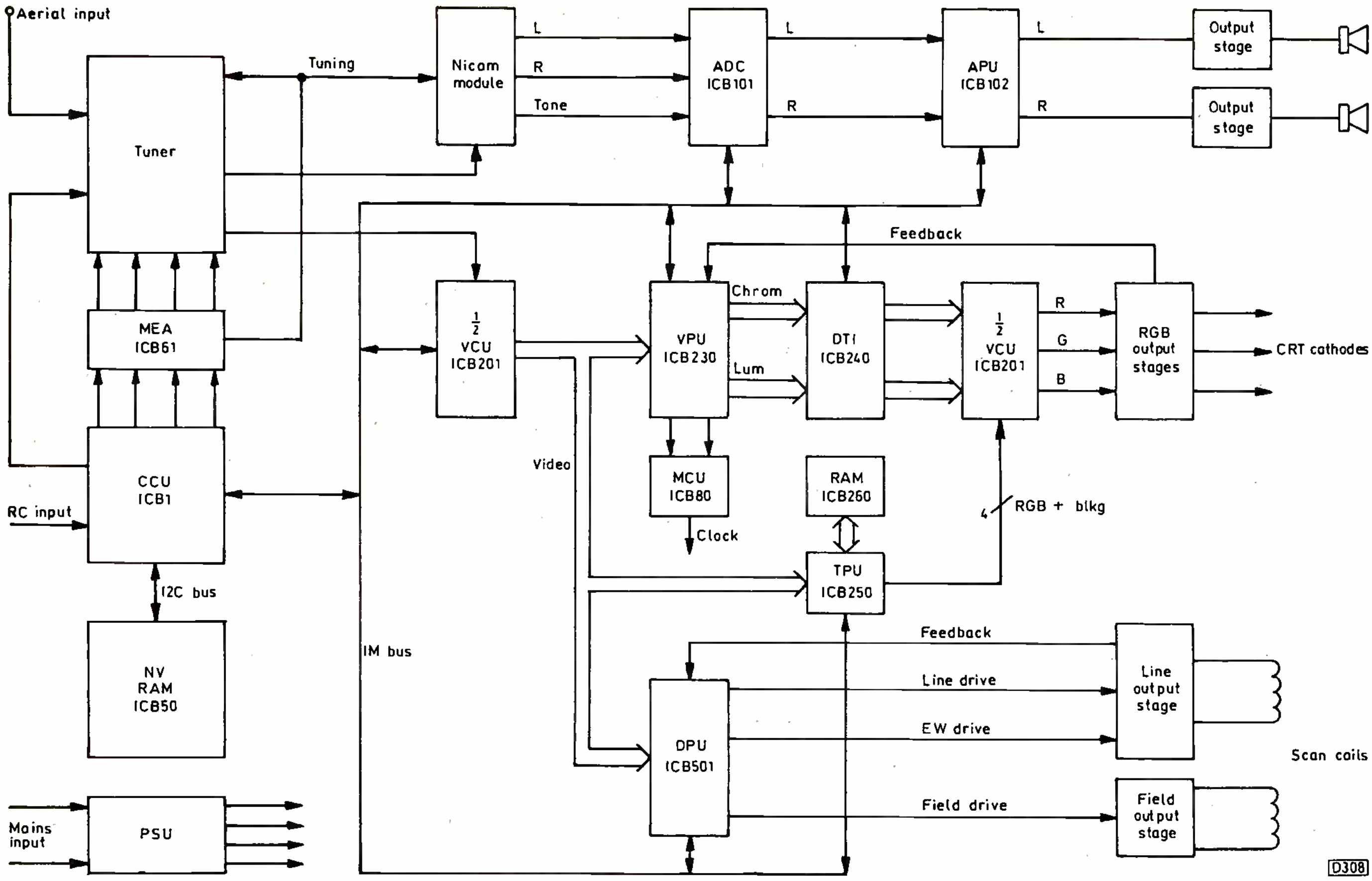


Fig. 1: Block diagram for the Salora M chassis.

bour who is good at fixing pushbikes won't have messed thing up before you get there.

Bear in mind that with digital operation things don't need to be adjusted very often. So apart from the tube going low-emission or failure of an output stage we shouldn't have much to worry about. If only this were so! You are usually faced with a set that won't go at all. The "where do I start?" feeling returns pretty quickly.

No Go

A few simple checks can be carried out to establish where the cause of the trouble lies. For the set to start up, there are several requirements: there has to be power, line drive and control of the line oscillator by the central control unit (the microcontroller chip). The logical place to start is the power supply (see Fig. 2), which as we have seen is of the IPSALO type.

The LF0070 hybrid chopper control/driver chip HB701 has the word "SALO" printed on it. The circuit has no provision for adjustment, being designed to generate an HT supply of 150V at pin 15 of the IPSALO transformer MB601. This supply is used by the line output transistor. But with the chopper and line output stages integrated in this way, how can you find out which one is faulty in the event of a power supply failure? Unfortunately the chopper circuit won't run with a 60W bulb as its load. So we must make some other checks.

The first thing to do is to switch off and pull out the mains plug. Then switch the set on and reconnect the mains input. *This will force the set into the standby mode.* If the set will come on in standby, a few voltages can be checked. These are the + and –15V, standby 5V and –4·5V supplies.

If these supplies are present, check the voltages around the line output transistor TB525. There should be 0·7V at its base and 0V at both its emitter and collector. If this is the case, press one of the remote control unit's number keys. The voltage at the base of the line output transistor should fall or become negative. If this doesn't happen the cause of the fault is probably in the line drive/standby circuit, because standby is achieved by switching the line output transistor on so that pin 14 of the IPSALO transformer MB601 is shorted to chassis. This does not remove the ±15V supplies, it simply reduces the chopper drive so that the circuit operates in the low output condition, with the transformer no longer synchronised to the line frequency.

Back to the line output transistor. If you disconnect its base and its collector voltage rises to about 140-150V, the cause of the trouble is most likely to be in the line drive circuitry. If there's no increase in the collector voltage, the line output transistor or an associated diode or both may be short-circuit. If the collector voltage rises above 150V, the LF0070 hybrid chopper control chip HB701 is suspect (if the HT voltage rises to a high level because this item is faulty, the set will be dead). If the collector voltage is low, say 125V, don't worry for the moment: sometimes the power supply doesn't do as it should do when the line output transistor isn't running. A low voltage reading will not be caused by excessive current demand from another circuit, as in this case the power supply would simply shut down.

If the set remains 'dead' when you switch it on from standby you can be reasonably sure that the power supply is OK and that the microcontroller chip ICB1 is working, as it must have been powered and must have received a reset pulse. Also its clock must be running. To find out what is happening, disconnect the line output transistor and connect a scope to pin 31 (line output)

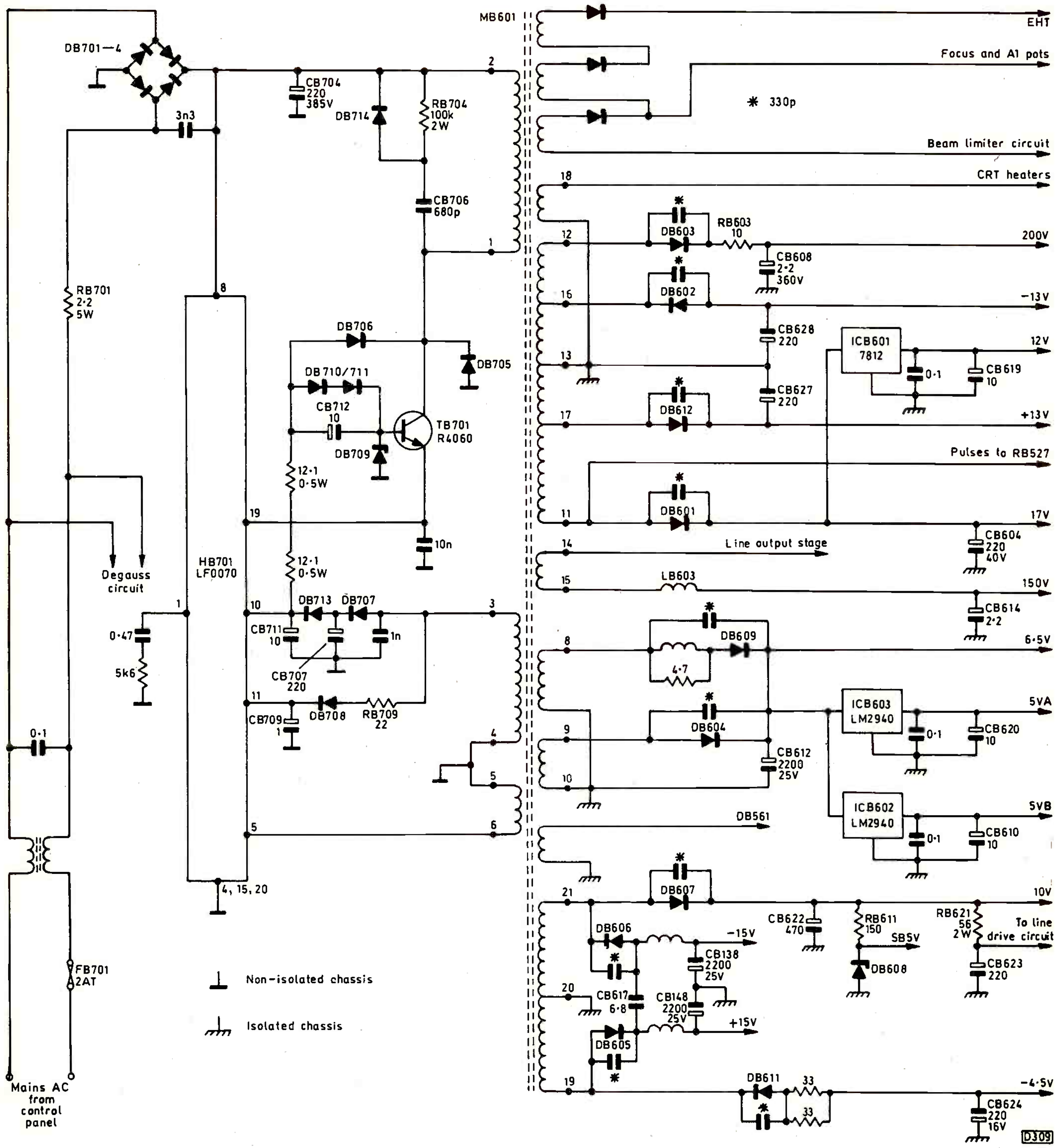


Fig. 2: The power supply circuit used in the Salora M chassis. The mains switch and some filtering is on the control panel. Transformer MB601 is common to the chopper power supply and the line output stage. Winding 14-15 is used for the line output stage. The chopper transistor TB701 is driven at its emitter by a series-connected FET within the control chip HB701. There are some very minor differences between the 87 and the 60/80/90 series versions. For diode types see list in nearby box.

of the DPU2543 deflection processor chip ICB501. Force the set into standby, then press a number key. You should see the line drive appear.

If not, connect an external 5V supply to pin 2 (output) of the 5V regulator ICB602 and look at the drive waveform. If it is now present, check the route between transistor TB501 and the base of the line output transistor TB525, i.e. the line drive circuit. Check transistors TB501, TB502, TB521, TB522, TB523 and TB524 (see Fig. 3).

If the line drive isn't present, check for a clock signal (4MHz pulses) at pin 34 of ICB501. If this is missing suspect a print fault: the signal comes from a crystal which is connected to pin 1 of the microcontroller chip

Power supply diode types

DB601-3	RGP10G
DB604	PE2D
DB605-6	RGP15J
DB607	RGP10G
DB608	5·1V zener
DB609	PE2D
DB611	BAV21
DB612	RGP10G
DB701-4	BY133
DB705	OF799
DB706	BA159S
DB707	PE2D
DB708	BAV21
DB709	12V zener
DB710/1/3	BAV21
DB714	BA159

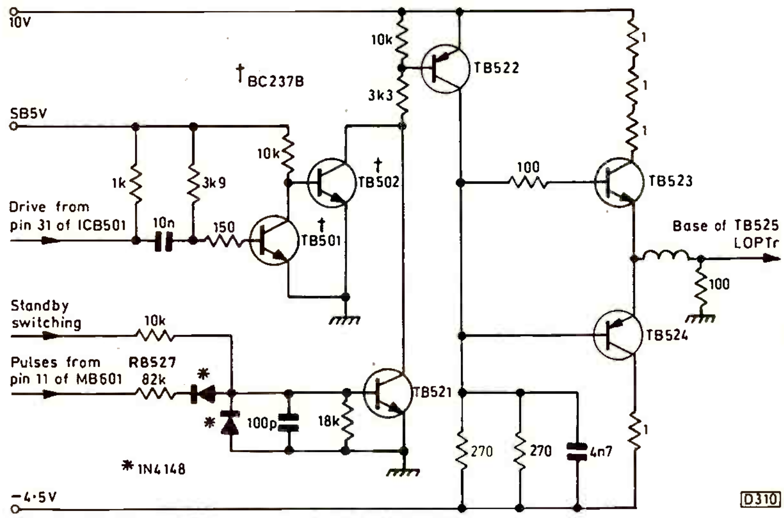


Fig. 3: The unusual line drive circuitry. For transistor types (TB521-4) see text.

ICB1, and this must be working if the set can go into standby. If the clock signal is present and ICB501 isn't producing a line drive output, the chip is probably faulty.

Line Output Stage Faults

If the line output transistor is faulty, check for dry-joints – you'll find some. Also replace the three electrolytics between the line output heatsink and the audio outputs. These are CB622 (470µF, 25V), CB623 and CB624 (both 220µF, 25V). We now use 105°C capacitors in these positions as they seem to lead a pretty stressful life. We also replace the three diodes in the line output transistor's collector circuit – DB523 (BY448), DB524 and DB525 (both BYV95C). They can become intermittent, so cold checking them is a waste of time. You may also find that the BS208 EW modulator driver FET TB526 is short-circuit or leaky – in some sets two such transistors are fitted, connected in parallel.

Two capacitors in this area tend to fail. These are the tuning capacitor CB527 (8·2nF, 1·6kV) and the S-correction/coupling capacitor CB531 (250nF, 250V). They can fail intermittently, so replace them if in any doubt. The values just given apply with 110° sets: with a 90° tube CB531 is 330nF and CB527 is 5·6nF with 1·5nF (CB528) in parallel.

The Transformer

It is not very often that the IPSALO transformer MB601 fails, which is a good job in view of its cost. But if you have a transformer tester like our old Jabco, with the transformer out a green light should be seen across the HT winding 14-15 and the chopper primary winding 1-2.

The Field Output Stage

If the power supply is overloaded, the TDA8172 field output chip ICB570 is the usual culprit. Its ±13V supplies are derived from pins 16 and 17 of the IPSALO transformer. A short-circuit TDA8172 will usually show itself up by producing a peculiar illumination at the top of the screen however. If the chip has failed, it is advisable to replace CB571 (100µF, 50V) in the flyback boost circuit and the supply reservoir capacitors CB627 and CB628 (both 470µF, 35V).

If you have no picture when the field output chip has been replaced, and the RGB output stages are cut off with about 190V at the tube's cathodes, check DB574 (1N4148) in the V SAFE return to pin 25 the deflection processor chip ICB501. If this diode is leaky, the chip will think that the field scanning has stopped and will tell the VCU chip ICB201 to protect the tube.

EW Modulator Circuit

The EW modulator and width circuit is controlled by an output from the DPU chip ICB501 (there is also an anti-breathing link to the beam sensing circuit). If there is a width or EW fault, the cause is usually one of the transistors TB527 (BC237B), TB528 (BF422), TB529 (BC237B) or TB526 (BS208) or, very often, resistor RB542 (18kΩ). This resistor is often intermittent, the result being width variations.

If there is only a 2in. wide scan, TB526 is probably open-circuit. But this can often be seen only when the set is switched off, as the blanking circuit should operate if the line scan is not at least half the screen width. On some sets however the narrow scan may be bright, with flyback lines on it.

To Follow

The DPU chip controls picture geometry. When adjustments are made, the settings are stored within the X2404 EPROM chip ICB50, which also stores all the information for tuning, system setting up and customer controls. This chip can be responsible for various faults, which we'll list next month.

We now have power and timebase scanning. Next month we'll look at the control system.

Obituary

David Poole of Davenham Satellites, Northwich, Cheshire died peacefully in his sleep on June 6th, aged 44, after a 12-month battle with cancer. He will be remembered by every single one of his many customers as a cheerful installer who liked nothing better than to make his customers happy – then relieve them of their cash, which they gladly handed over to this friendly fellow. A sad loss for his wife June, daughter Kimberley and his relatives, friends and customers.

The mail order side of David's business is now being handled by SatCure.

TV Fault Finding

Reports from
Philip Blundell, AMIEEIE
Michael Dranfield
Stephen Leatherbarrow
Chris Watton
Michael Maurice
Christopher Nunn
John Edwards

Philips MD1.1 Chassis

This set (Model 28PT4521/05) appeared to be tripping. Although it was dead, you could hear the power supply pulsing and the standby LED was going red, orange, green once every two seconds. According to the fault-finding tree in the service manual, this shows that there is an I2C bus fault. Scope checks proved this: the SDA line was being held low.

The nice designer at Philips had included 100Ω resistors in series with each device that's connected to the bus, so it was simply a matter of carrying out resistance checks to find out which one had the short-circuit to chassis. The faulty item was the tuner. **P.B.**

Philips D16 Chassis

When it was first switched on from cold this set (Model 28DC2070/25R) had no colour and poor sync. Heat from our hairdryer and freezer soon revealed the cause of the fault – the two electrolytic capacitors in the IF module. **P.B.**

Thorn CI5012R

This colour set was dead. We did not have a circuit diagram but found that the power supply is similar to that used in the Samsung P68 chassis (see *Television* December 1996, page 113).

The 125V HT supply to the line output stage was correct in standby, but dropped dramatically when the set was brought out of standby. With the line output transistor removed and a dummy load connected instead, the 125V fell to 60V. So attention was turned to the power supply. The voltage at pin 6 of the SDH209B chopper-control chip IC801 was low, which usually means that the chip is faulty. A replacement got the set working again. **P.B.**

Grundig CUC120 Chassis

The vision disappeared when the set had been on for a few minutes, leaving a blank raster. We found that the signal at pin 24 of the tuner/IF module disappeared – the supplies remained constant. Scope checks inside the module revealed that the BC338 transistor T2251 was going open-circuit intermittently. **P.B.**

Philips CP110 Chassis

If the BUT11AF chopper transistor Tr7665 in the power supply is short-circuit, take the following action. Replace Tr7665 (BUT11AF), IC7669 (TEA1039), and D6657-6660 (four 1N5061 diodes). Fit a 39Ω resistor (part no. 4822 050 23909) in parallel with L5656. Remove C2657 (2·2nF) if fitted. If C2661 is 1,500μF, change it to 2,200μF (part no. 4822 124 21511). Check the degaussing posistor and replace it if in any doubt. Check that R3658 (120Ω) and R3659 (100Ω) haven't changed value.

If the power supply won't start up, C2656 (150μF, 385V) is probably low in value. **P.B.**

Hitachi CPT2158

This set, for which we didn't have a service manual, had a very odd sound fault. The sound was low, with an audio tone that whistled away in the background. When the volume up/down buttons were pressed, the tone would change to a series of bleeps that varied in tone and frequency. If you have ever listened to a computer game on a tape recorder, this is exactly what the set sounded like.

A squirt of freezer on IC402 (AN5836), which we assumed was involved with volume control, slightly improved matters. So a replacement was ordered. When it was fitted, the fault remained the same. Disconnecting the L and R inputs made no difference. Neither did disconnecting the inputs to the audio output chip. This suggested that the fault was still to do with IC402. But voltage checks seemed to be inconclusive. Pin 2 was at 4·9V, which seemed about right if the device was supplied from a 5V line.

As we'd gone as far as we could, we turned out the drawer of Hitachi manuals to look for another set that uses the AN5836 chip. We found it in Model C25-P238, and the manual provided us with the information we needed. The chip is a stereo tone control and preamplifier device which should have a 12V supply at pin 2. When we traced the print back we came to R926, which had 15V at one side and 4·9V at the other. R926 is connected to two transistors, Q903 and Q904, which are presumably part of a regulator circuit. Q904 had no base voltage, because the 12V zener diode ZD902 was short-circuit. Replacing this item cured the fault. **M.Dr.**

Grundig CUC2410 Chassis

One of these sets turned out to be a real nightmare. A customer asked how much it would cost to have it repaired for a line across the centre of the screen. After being told about £40, he brought it in. What he hadn't said was that the set was arcing violently.

An investigation showed that there was a pinhole in the side of the EHT tripler. When we'd replaced the tripler, the RAM chip in the tuner, the field output chip, the IF amplifier chip and various other bits of silicon the set worked well enough – except that the sound disappeared when it warmed up. A squirt of freezer on the TBA130 intercarrier sound chip cured the problem, but nobody had this chip in stock. Willow Vale offered to help with an exchange panel at around £25, so we ordered it. Imagine our horror when the panel failed to cure the fault!

A call to Willow Vale put us in touch with Alan Dyson, who knows all about Grundig sets. He suggested various checks, but we got no further. We suspected the main microcontroller chip, as this is connected to the TBA130 chip via a serial data bus, but replacing this would be an expensive move. In desperation we glued a small heatsink on the TBA130 chip. This worked until the channel was changed. We now had BBC-1 and ITV sound, but with BBC-2 and Ch. 4 there was no sound at all! At this point we decided that there was no alternative to replacing the SDA2011-A003 microcontroller chip, which finally cured the fault. Our thanks to Alan Dyson for his help, and to Eddie at Willow Vale who agreed to take back the sound panel. Phew! **M.Dr.**

Philips CF1 Chassis

Our customer complained about intermittent picture faults. When we tested the set we found that there was poor line sync from cold and that following this the field scanning would be unstable, with varying periods of jitter or perhaps a field roll. C2368 (4·7μF) was found to have gone very low in value. It's connected to pin 6 of the TDA2577A timebase generator chip IC7375. **S.L.**

Ferguson ICC9 Chassis

A blank raster and no sound were the symptoms with one of these sets (Model B59F). As we've had this before, we headed straight for TX07, a surface-mounted BC846B transistor which is fitted on the print side of the PCB. It measured short-circuit as fitted, but OK when it was removed. A replacement cured the fault. **S.L.**

Sanyo CBP3018

Two of these colour portables arrived in the workshop at the same time with the same fault – the HT was high at about 180V instead of 130V. As a result, the 2SD1649/ BU508AF line output transistor Q402 had gone short-circuit and the HT smoothing capacitor had blown its end cap off. The cause of the problem was R555 (47kΩ), which was open-circuit. After replacing these items the HT was correct but the sets were still dead because there was no line drive. Q551 (2SB764) was open-circuit in one set and short-circuit in the other. The BC640 is a suitable replacement. **S.L.**

Philips 2A Chassis

The cause of poor field sync and occasional line jitter was traced to C2500 (1μF, 50V). It's connected to pin 6 of the TDA2579/N5 timebase generator chip IC7535. **S.L.**

Ferguson TX98 Chassis

If one of these sets goes to standby or Ch. 1 intermittently, deal with the no doubt numerous dry-joints then replace the TDA8138 multiregulator chip IC11. This should provide a cure. **S.L.**

Philips CP90 Chassis

The symptom with one of these sets was severe picture flutter. A check on the HT voltage produced a reading of 89V – 95V is normal. Attempts at adjustment produced varying amounts of flutter or a nearly normal display, but not at 95V.

The power supply itself turned out to be blameless. We eventually traced the cause of the trouble to C2638 (470μF, 16V), which is the reservoir capacitor for the 13·5V (+12) supply derived from the line output transformer. **S.L.**

Sharp DV5103H

This early digital set was stuck in standby, with its bicolour LED stubbornly remaining red. A check showed that the 113V HT supply was at 185V! The cause was traced to R753 and R781, which are both 39kΩ and were both open-circuit. Replacement resistors cured the fault, but we then found that there was a pin-hole failure in the line output transformer's insulation. Oh, well! **S.L.**

Philips CP90 Chassis

A recent case of lines on the picture with a quite severe and irritating flutter, mainly at the top of the raster, was caused by the electrolytic capacitors in the IF can. We had to replace C2044, C2098 (both 1μF) and C2067 (10μF) to eliminate the effect completely. The model concerned was the 21CE1250. **S.L.**

Sony KVX2532U (AE1B Chassis)

This set suffered from severe field distortion. The field scan was cramped at the bottom and expanded at the top. The cause was the 680μF, 25V field scan coupling capacitor C531. **S.L.**

Sony KVX21TU

The symptoms with this set were flashing on the screen with smearing followed eventually by a blank raster. Very similar in fact to the effect produced by the common problem of dry-joints in the IF unit. But this time the TDA4580 RGB controller chip IC301 was the cause of the trouble. It was running at a very high temperature. The replacement ran cool. **S.L.**

Akura CX24

There were no signals and a check at the tuner unit's tuning voltage pin produced a fixed reading of 31V. A scope check at pin 1 of the TMP47C434N3147 microcontroller chip IC001 revealed a correct squarewave that varied as the tuning signal altered (on-screen display). But the 2N3904 transistor Q009 in the integrating circuit didn't respond. The transistor was OK, the cause of the trouble being loss of its base bias. This is provided by R023 (47kΩ) which was open-circuit. **S.L.**

Tatung 160 Chassis

The line output transistor was short-circuit but when a replacement was fitted the set remained dead. The HT supply was present but there was no line drive. This is generated in the TDA4503 chip I801, whose supply at pin 22 was missing. Tracing back from this point we found that the 12V regulator transistor Q501 had a supply at its collector but no voltage at its base. This is obtained from the HT line via R507 and R508 (both 12kΩ). One of these resistors was open-circuit, but they should be replaced as a pair. **C.W.**

Panasonic TX2461 (U5W Chassis)

This set had a zero in the display, no picture and a whine that came from the power supply. We suspected the line output transformer, but HT was present at the collector of the line output transistor. There was no line drive at its base however. Further checks revealed that the 26V supply was missing because the RU3B rectifier diode D852 was open-circuit. **C.W.**

Akura CX33
This set came out of standby, but the power supply didn't start up because R811 (560kΩ) was open-circuit. Note that the reservoir capacitor remains charged for some time when this resistor goes open-circuit. Ouch! **C.W.**

Sony KVM1400
This set tripped for a few minutes then came on. But there was no sound and a whisp of smoke filtered up from the PCB. We found that the TDA7245 audio output chip IC201 was short-circuit and that safety resistor R617 had gone open-circuit. The shorted chip had loaded the power supply until the resistor blew. **C.W.**

Sony KVX21TU
The owner reported a burning smell after which he hastily switched off. Lucky for him – this prevented a power supply rebuild. R614 was dry-jointed and had burnt the print. Fortunately there's an alternative position in which to fit R614. We did this, tidied up the board and switched on. The power supply came to life then died. Further checks showed that R611 and L607 were both open-circuit. After replacing these components the set worked normally. **M.M.**

Hitachi C2564TN
This set was dead apart from a tripping squeal. We found that the EW loading coil L650 was dry-jointed, F902 was open-circuit and D704 was leaky. When these points had been attended to we were rewarded with start up, EHT rustle then a bang and a puff of smoke from the TDA2009 audio output chip IC100. A new chip completed the repair. **M.M.**

Sanyo CBP3011
This set was stuck in standby. The chassis uses an optocoupler to switch the main power supply out of standby. It wasn't being switched because pin 21 of the microcontroller chip had a 48Ω leak to the 5V rail. A new IC cured the fault. **M.M.**

Finlandia C59JZ5/E
There was an unusual symptom when this set was switched on – line collapse (a vertical line in the centre of the screen). Scope checks showed that there was a line scan waveform at both sides of the scan coils. Capacitor Ch10 had split open, a replacement curing the problem. The new capacitor supplied was rated at 250V instead of the original's 160V. Maybe this explains the fault. **M.M.**

Panasonic TC681UR
When this set was switched on it would go to ch. 16 with no buttons on the front working except search. I didn't have a circuit diagram and thought that the best thing to do would be to start with the supplies around the microcontroller chip. This proved to be the right approach: transistor Q1023 had approximately 32V at its collector, 12·8V at its base and only 2·3V at its emitter! A TIP31C used as a replacement cured the fault. **M.M.**

Bush 2059NTX
This receiver came in with loss of line hold and no sound. As there was no line lock, the coincidence detector was muting the sound. I adjusted the line hold control, which was now nearly at one end, tested the set for a few hours then returned it to the customer.

Two days later it was back in the workshop. This time it was dead with a short-circuit line output transistor (Q402, 2SD1555). After replacing Q402, also C909 (47μF, 25V) in the power supply, I found that the receiver worked and the line hold control could be set at near the centre of its range.

There was still a fault however: the set wouldn't go into standby. Replacing Q907 (2SC2335) finally restored it to full working order. **M.M.**

Mitsubishi CT2553STX
Tuning drift was the complaint with this set. It should have been easy to deal with: the IF module is usually responsible, mainly because of dry-joints at two of the coils and the SAW filter. But neither resoldering nor replacement of the capacitors in the power supply cured the fault. Eventually we replaced all the capacitors in the IF can. This cleared the fault in the workshop, but not in the customer's home where the loft aerial gave poor results. A new aerial mounted on the chimney produced the good picture that you expect with these sets. **M.M.**

Bush 2002
This set produced a snowy raster, wouldn't tune and had no on-screen graphics. A new TMS73C47 microcontroller chip cured these faults. The following morning the set wouldn't power up from cold. The two 47μF, 50V capacitors in the power supply were to blame for this. They could possibly have been responsible for the original logic fault. **C.N.**

Philips CP110 Chassis
It took a time for the picture to appear. This was faint then brightened as the set warmed up. A check on the HT gave us the clue. Replacing the 22μF reservoir and smoothing capacitors C2670 and C2621 cured the fault. **C.N.**

GoldStar CIT2168 (PC04A Chassis)
Intermittent field collapse was the fault with this set. A nice, simple dry-joint problem I thought. No chance! Voltage checks around the TDA1170N field timebase chip showed that pin 5 was at 5V instead of 25V. Replacing D301 (1N4003), which is connected in series with this pin, cured the fault. **C.N.**

Matsui 1455
A rolling picture when the set had warmed up was the complaint. On close examination I could see slight line tearing which became worse when the set was warm. Heating the tuner section drastically increased the line tearing, and the picture began to roll. But this was a bit of a red herring. The cause of the fault was the 1N60 diode D103, which is connected to pin 5 (IF AGC) of the IF chip IC101. **C.N.**

Sharp CV3730H
This set would revert to standby after about ten seconds. Without a signal it would remain on all day! The cure came from Sharp's Technical Department, after I'd run out of ideas. It's a beam limiter fault, the cause being R623 (1·2MΩ) which goes open-circuit. **C.N.**

Panasonic Alpha 2W Chassis
When this set had been on for a few hours the right-hand side of the picture would creep in by a couple of inches and there would be slight EW distortion. Although there were no signs of dry-joints at its pins, experience suggested

that the first step should be to resolder the line driver transformer. This is all that was required. **J.E.**

Hitachi G8Q Chassis

This set was dead with no power supply action. Cold checks revealed that D907 (BYV10-40) was short-circuit. It's connected to the gate of the FET chopper transistor Q901 to prevent the drive from the UC3844 control chip IC901 going negative. As I've not had this diode fail before I decided to replace Q901, Q902 (which is in series with Q901) and IC901 as well. **J.E.**

Philips K40 Chassis

A very bright raster with no picture content illuminated only the centre of the screen, from about a third down from the top and the same from the bottom. The cause of this strange symptom was R3179 (6·8Ω), which was open-circuit. It's in the line output stage derived 190V supply to the RGB output transistors. **J.E.**

Hitachi G8Q Chassis

This set would take several seconds to come to life when switched on from cold. It then produced a picture with severe line tearing and ragged edges. The cause of this was C933 (2,200μF, 25V) which was open-circuit. It's the reservoir capacitor in the supply to the 12V regulator IC932. **J.E.**

Philips CP110 Chassis

"If you can't fix this set I'll put a hammer to it" the very irate customer said. He went on to explain that the set would shut down very intermittently, and would come back on only after several attempts. This would ruin his viewing.

As he spoke, the set went to standby. It didn't take long to spot the cause – a dry-joint at pin 2 of the chopper transformer. A good resolder in the power supply was all that was needed. **J.E.**

Panasonic Alpha 2W Chassis

There was a high-pitched squeal from the power supply and no line output stage operation. I found that the 2SD1441 line output transistor Q551 was short-circuit and the thermal link R567 in the HT feed to the stage open-circuit. As no other shorts or defects could be found I fitted new components.

After a three-hour soak test the set shut down and the squeal returned. Why does this always happen after you've told the customer that his set has been fixed? Anyway this time I fitted replacements then carried out a thorough check on the soldered joints in the line timebase. As one of the line driver transformer's legs looked suspect I removed the transformer, cleaned and tinned its legs, then refitted and resoldered it. A long soak test proved that all was now OK. **J.E.**

Decca 140 Chassis

When this set was switched on from cold there was no sound or raster, only a loud 'motorboat /thumping' noise from the speaker. This would last for about four minutes, then the set would gradually come to life and provide normal reception. Capacitors C807, C808 and C810 (all 100μF) in the power supply had dried up. **J.E.**

Black and white days

Was the job of a TV engineer any different thirty or so years ago? Malcolm Scott takes us down memory lane and recalls some of the sets and customers he encountered

As a teenager in the late Sixties I spent a lot of time tinkering about with TV sets. Managing to get a picture on a screen that had lain dormant for several years produced a feeling of great satisfaction, and for a while this was to become more than just a hobby.

It seemed too good to be true when, in the early Seventies, I was offered a job as a black-and-white TV engineer and was actually paid to do something I loved doing. Unbelievable in fact. Just like some of the sets and people I was to encounter.

Doing the Impossible

To start with I did a stint in a small shop that boasted TV repairs While U Wait. The sort of set-up where the customer brings in his set, you repair it while he peers over your shoulder, then he takes it away moaning about the cost. Fine in principle, but let's be realistic. What happens when three or more sets arrive at once? Add the five which are already waiting that saturday afternoon and you have an impossible situation.

"But the sign says while you wait . . ." was the all too familiar gripe. What it didn't say was how long they had to wait! Miracles really do take longer.

A Bare Bush

I remember a very elderly 14in. Bush Model TV53 being plonked on the counter by an even more elderly man. "It's dead" he panted, a state he looked close to himself. "It was all right when my son borrowed it, so it can't be much. Probably only a valve." Wasn't it always?

Hoping that it might be a quickie, I unscrewed the flaking rear cover and soon saw why it was now as dead as the proverbial. Ironically, his diagnosis hadn't been far wrong.

"You say it was all right when your son borrowed it?" I enquired.

"Fine" he wheezed. "Hasn't got the money for one of his own, so I let him have mine sometimes. Between you and me" – his voice dropped to a whisper – "he's a bit of a waster. Would sell anything for a bet on the gee gees."

I hadn't the heart to tell him that this evidently included all the valves in his old set. There wasn't one remaining. I suggested he had a word with his son about it.

Do you sell Pins?

That same afternoon the phone interrupted my work on a deluge of While U Wait repairs. A flustered voice at the other end asked "do you sell pins?"

"No, we're a TV shop!" was my equally flustered reply.

"That's why I'm calling" the voice persisted, "I want a pin for my radiogram."

The penny dropped. "Ah, a stylus!" I replied. "Yes, we keep some. What number?"

"Only one" came the reply.

I realised that this wasn't going to be easy. "No, I mean what's the number on the stylus?" Silence. "The number of the cartridge will do" I added, trying to be helpful.

"Cartridge? But I only want a pin. Do you sell pins?" The pile of TVs awaiting repair seemed to be growing apace as the conversation continued.

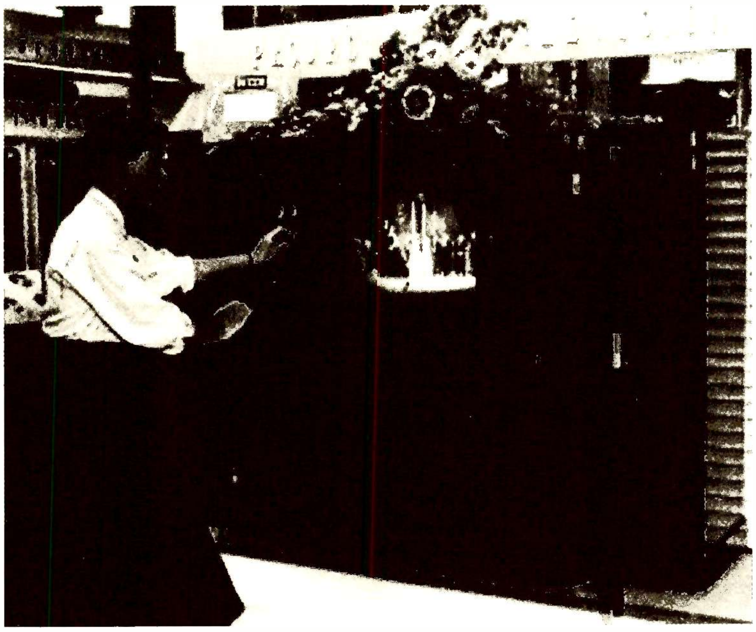
"The cartridge is the thing the pin fits into" I explained. "The number I need should be on the cartridge." Assuming of course that it wasn't some kind of wind-up contraption that really did need a pin!

Further silence. "I tell you what" I finally offered, "bring me the old pin and I'll try and fix you up." He seemed happy with that and put the phone down. Then it was back to the bench.

A Few Quickies

The next patient was a 24in. KB set fitted with the VC200 chassis. It refused to speak to its owner. I couldn't blame it, the owner being an irascible old fellow who kept calling me "boy" and insisting that I get a move on as he was parked on double yellow lines. His set's reluctance to talk turned out to be the usual 6MHz sound can problem. A replacement restored conversation.

Next through the door came a 20in. Ferguson set that



How's this for a home entertainment centre – and weren't the girls gorgeous then?!

had a terrible smell. When the back was removed I saw that it was a 1500 chassis set. Switching it on confirmed that the bad-egg smell came from a faulty e.h.t. tray. A new tray put everything right.

Then a young lady brought in her KB portable – the old VC300 series chassis. "Just writhes about and makes a terrible noise" she smiled. She was wearing the hot pants then fashionable. Very skimpy ones at that.

I found myself fumbling to get the back cover off. When the set was switched on it produced a loud hum and a belly-dancing picture. No problem, just replace the bridge rectifier.

Unsoldering it was no mean feat however. It appeared to be welded in. I swear to this day that it was bending over the hot soldering iron that brought me out in a sweat such that my glasses began to steam up. The job was eventually done, but I'm sure that the young lady must have had doubts about me.

Pinless Pops in

I barely had time to clean my glasses when my short run of successes was interrupted by a little man who trundled through the shop door with the chassis of an old radiogram, the leads and plugs trailing behind him. He was followed by a couple of youngsters. The first carried two loudspeakers while the second gripped a turntable that had a record still in place.

I recognised the voice immediately when the man dumped his disembowled music machine on the counter. "A pin – I need a pin for it."

"But I only wanted to see the stylus" I wailed.

"Don't get technical again" pinless replied. "Hadn't a clue what you wanted me to bring, so I brought in the lot."

That wasn't true unfortunately. The only bit he and his offspring hadn't brought along was the pin, or rather the bit it fits in. I looked at the valve line up and decided to fit an Acos GP93 series cartridge complete with pin. Then off they went. Somehow I doubted whether the disembowelled machine would ever make music again.

A Russian Experience

My last job that day was a 23in. Rigonda set with a field fault. I was to become quite familiar with these Russian made TV receivers when I moved on to become a bench engineer with a rental company – simply because no one else would touch them! They were big and bulky, weighing about the same as a colour set. The lovely polished-wood cabinet and hefty mains transformer, something unheard of in contemporary UK monochrome sets, were responsible for the weight. When I looked inside one of these receivers for the first time I wondered how the Russians ever got into space!

The sets were hardly at the cutting edge of TV technology, but they did produce excellent pictures. The circuitry was eccentric and at least twenty years behind the times. Previously I'd only read about the thyratron valve as a field oscillator. The Rigonda set actually used one – a soldered-in job that was reminiscent of the old EY51 e.h.t. rectifier but with more leads to sort out. Judging by the number of thyratrons I had to replace because of field jitter, the triode section of a humble PCL85 would have been a much better option.

Fade Out

I didn't regret leaving the While U Wait operation, but the bench engineer's job with a TV rental company was to be the end of my black and white days and, soon after, my TV trade days. First there was initiation into colour. This introduced me to the Thorn 3000 chassis, which frightened the life out of me. Maybe those Russian Rigondas weren't so bad after all!

Right in the midst of my training for colour we were swallowed by a bigger fish. Despite the new momma fish's claims that "we never make people redundant", my soldering iron was unceremoniously unplugged and I was sent on my way to find a proper job.

My career in the TV trade was a short one. The technology has moved on considerably since then, which is no bad thing. But I really did enjoy those days of black and white TVs!

Letters

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

Anti-static Freezer

Freezer spray used to contain CFC or HCFC propellants, which are now banned by the Montreal Protocol. A replacement ingredient currently in use is HFA, which according to an article in *Electronics Manufacture and Test* (May 1997) can generate a high static charge (nearly –9kV in some cases). This could cause electrostatic discharge damage to semiconductor devices. The article points out that one manufacturer has a product (Electrolube MCF) which generates only –100V. Several other products caused a charge which, even after 40secs, was in excess of –13kV on a 15pF test rig.

Service personnel should be aware of this relatively new source of static charge when servicing MOS circuitry.

Ray Porter M.Sc, C.Eng.,MIEE.,
Stourbridge, West Midlands.

Channel 5 and Cable

I have been involved in a long argument with the local cable contractor here (Nynex) about the choice of output frequency for its set-top boxes, which originally produced an output on ch. 48. When this frequency was allocated to Channel 5, the cable box output was changed to ch. 46. This gives rise to two effects, both of which are unpleasant.

First, as the Channel 5 transmissions on ch. 48 are quite weak (only 12·5kW, compared with 500kW for the four co-sited services), and are only two channels away from the strong Nynex signal, the latter causes patterning on Channel 5. This appears as two vertical white lines that slowly traverse the screen then immediately repeat – what you might describe as 'line flyback'.

Secondly our BBC-1 is on ch. 55, which is nine channels away from the new Nynex output. Weren't we all taught never to have channel spacings of 5 or 9, because of image-frequency effects, and wasn't this why great care was taken to avoid such a situation when the UHF band allocations were made in the Sixties? This is of course one of the problems that make it difficult to find a suitable gap in which to insert the Channel 5 signal.

Nynex can change the output used by its terminals on an individual basis, by remote control as it were. But Nynex refuses point blank to do anything about the problem. The reply I got (from an agency engineer) was that "this is what our engineer has decided, and there it will stay". Another comment was that "its Channel 5's problem".

What can one do? Any ideas? The best way, if Nynex refuses to help, would be to frequency shift the cable signal to around ch. 69, in nobody's way (our local four are 55, 59, 62 and 65). Does somebody supply such a device?

Mike Harris,
Cheadle, Cheshire.

Editorial comment: See review of Pace unit on page 742.

Self-cleaning Heads

A customer complained that his Aiwa VCR with self-cleaning heads kept clogging up. He also said that even after using a tape-head cleaner the machine would clog after two or three tapes had been played.

I checked his machine and found that he was quite right. On closer inspection I saw that the internal video head cleaning pad was black and full of dirt. Replacing the pad cured the problem. The dirty pad was not cleaning the heads – it was applying muck to them.

Francis Beach, Beach Electronics,
Cricklewood, London NW2.

Electrolytics in Pace Sat Boxes

I'd like to comment on two points in Satellite Notebook, July (page 667), regarding electrolytic capacitors. First, Pace power supplies. It is extremely unusual for an electrolytic capacitor to fail because it's exposed to a low working voltage. Since the components in question had bulged, it is more likely that they couldn't stand the temperature to which they had been exposed. So the advice to use 105° rated components is right.

The Pace VC100 decoder point is intriguing. With SW1 closed and no DC offset on the incoming video, the side of C2 connected to the base of Q1 is, with the values of R4 and R5 shown, at +6·5V with respect to its other side. With SW1 open and the maximum permitted 2V DC offset on the incoming video, the polarisation voltage is still the same way (but only 4·5V of course). I wonder what Pace was thinking about?

John Woodgate,
Rayleigh, Essex.

The capacitors in Pace PRD receivers, mentioned in Satellite Notebook last month, are low-leakage types rated at 105°C. Pace has always used 10µF, 50V and 22µF, 35V capacitors in these positions, partly because electrolytics with the required characteristics are not generally available at lower voltage ratings.

C9 in SS series receivers is specified as 50V working, but Pace also used 63V as an alternative when 50V capacitors were not available. Very early SS9000 receivers had the PCB marking reversed, so the capacitor was fitted with reverse polarity. Some units are still working like this today.

The polarising voltage used to be a consideration years ago, when 350V capacitors were used in valve circuits. Advances in capacitor manufacturing techniques have largely eliminated the problem.

Martin Pickering, B. Eng.,
Sandbach, Cheshire.

Mitsubishi CT21ASTX

In TV Fault Finding last month Michael Dranfield commented on difficulty in obtaining the correct replacement field output chip (TDA8178S) for this chassis (Euro 12). We had the same problem recently. Our supplier Willow Vale Electronics told us that the device is no longer available and now supplies a repair kit instead. The quote we had was £24.

Mark Allen,
MA Video, Cornwall.

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TRANSISTORS/LINEAR ICs

Part	Price
BC107	8p
BC108	8p
BC109	8p
BC109C	10p
BC140	20p
BC142	20p
BC143	20p
BC147	8p
BC149	8p
BC159	8p
BC160	30p
BC171	10p
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BC177	14p
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Part	Price
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BUT11AF	55p
BUT12	80p
BUT13	310p
BUT18	80p
BUT18AF	80p
BUT30V	1700p
BUT56A	100p
BUT76A	80p
BUT90	1300p
BUT92	1200p
BUV18	650p
BUV20	650p
BUV21	400p
BUV23	475p
BUV24	350p
BUV25	110p
BUV26	150p
BUV27	125p
BUV28	110p
BUV37	175p
BUV46A	75p
BUV47	120p
BUV48A	175p

Part	Price
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BUV48C	250p
BUV50	425p
BUV61	1000p
BUV70	200p
BUV90	175p
BUV93	375p
BUW11A	200p
BUW11AF	225p
BUW12	125p
BUW12A	150p
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BUW13A	200p
BUW32A	500p
BUW48	550p
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IRFZ42	275p
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MJ2955	55p
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MJ3001	100p
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MJ10012	300p
MJ11015	250p
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MJE520	30p
MJE2955T	65p
MJE3055T	65p
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MJE13007	100p
MJE13009	100p
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MJF18004	175p
MJF18204	350p
OC28	350p
OC29	250p
OC35	350p
OC36	250p
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S2055A	175p
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S2530A	100p
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TIP2955	50p
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TIPL760	100p
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2N2646	40p
2N2904	20p
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2N2906	18p
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2N3019	28p
2N3053	18p
2N3054	40p
2N3055	38p
2N3055H	50p
2N3440	45p
2N3441	175p
2N3442	85p
2N3771	85p
2N3772	90p
2N3773	100p
2N3819	29p

Part	Price
4N35	50p

RECTIFIER DIODES

Part	Price
BY127	8p
BY133	8p
BY164	40p
BY179	35p
BY184	32p
BY206	11p
BY207	20p
BY227	19p
BY228	28p
BY298	15p
BY299	18p
BY329-1200	150p
BY448	20p
BYT11	25p
BYT13-1000	30p
BYV96E	25p
BYW96E	36p
BYX10	15p
BYX55/600	25p
IN4001	3p
IN4002	3p
IN4003	3p
IN4004	3p
IN4005	3p
IN4006	3p
IN4007	4p
IN4148	2p
IN5400	9p
IN5401	8p
IN5402	8p
IN5403	8p
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IN5405	11p
IN5406	12p
IN5407	12p
IN5408	12p
RGP10	25p
RGP15	25p
RGP30	16p
SR2M	60p

I.C. SOCKETS

Part	Price
8 PIN	4p
14 PIN	5p
16 PIN	6p
18 PIN	9p
20 PIN	10p
22 PIN	12p
24 PIN	13p
28 PIN	13p
40 PIN	15p

ZENER DIODES

Part	Price
400 mWatts 2V7 to 39V	5p
1.3 Watts 2V7 to 39V	9p

VOLTAGE REGULATORS

Part	Price
7805	25p
7806	25p
7808	25p
7812	25p
7815	25p
7818	25p
7824	25p
7905	25p
7906	30p
7908	30p
7912	30p
7915	30p
7918	30p
7924	30p
78L05	24p
78L08	24p
78L12	24p
78L15	24p
78L18	24p
78L24	24p
79L05	35p
79L08	35p
79L12	35p
79L15	35p
LM309K	100p
LM317T	100p
LM323K	350p
78H08KC	800p
79H12KC	700p
79HGKC	800p

LEDs

Part	Price
3mm	
RED	5p
YELLOW	8p
GREEN	8p
5mm	
RED	5p
YELLOW	8p
GREEN	8p

RECTANGULAR LEDs

Part	Price
5mm x 2.5mm	
RED	5p
YELLOW	8p
GREEN	8p

LINEAR ICs

Part	Price
AN203	210p
AN210	165p
AN211	150p
AN214Q	170p
AN217P	95p
AN228	280p
AN252	150p
AN259	250p
AN262	140p
AN271	230p
AN274	250p
AN277B	400p
AN278	60p
AN301	330p
AN302	650p
AN303	250p
AN304	360p
AN315	210p
AN316	350p
AN337	600p
AN360	100p
AN362	140p
AN363	150p
AN366	150p
AN610	160p
AN3211K	375p
AN3215K	350p
AN3231K	300p
AN3236K	450p
AN3310K	325p
AN3312	350p
AN3313	300p
AN3320K	450p
AN3331K	450p
AN3792	300p
AN3794	325p
AN3814K	450p
AN3821K	600p
AN3822K	600p
AN3830K	800p
AN3990K	300p
AN3991K	400p
AN5010	250p
AN5011	225p
AN2020	80p
AN5025	250p
AN5033	400p
AN5034	400p
AN5070	125p
AN5071	100p
AN5111	450p
AN5132	250p
AN5135NK	400p
AN5138NK	350p
AN5150	400p
AN5151	200p
AN5210	675p
AN5215	100p
AN5222	200p
AN5250	160p
AN5256	150p
AN6260	300p
AN5262	175p
AN5265	80p
AN5315	600p
AN5352	600p
AN5411	450p
AN5421	150p
AN5429	420p
AN5431	275p
AN5435	125p
AN5436N	160p
AN5512	100p
AN5515	160p
AN5520	550p
AN5521	100p
AN5560	350p
AN5601K	750p
AN5612	200p
AN5613	200p
AN5615	300p
AN5620	250p
AN5622	275p
AN5625	400p
AN5630	375p
AN5633	350p
AN5635N	330p
AN5640	500p
AN5700	90p
AN5701	150p
AN5710	100p
AN5712	180p
AN5720	70p
AN5722	140p
AN5730	160p
AN5732	120p
AN5750	75p
AN5753	130p
AN5763	250p
AN5790	240p
AN5791	225p
AN5836	450p
AN5862K	225p
AN5900	130p
AN608P	125p
AN620	250p
AN6130	130p
AN6135	120p
AN6209	350p
AN6250	50p
AN6247	200p
AN6270	400p
AN6300	600p
AN6306	380p
AN6310	200p
AN6320	180p
AN6326N	250p
AN6332	320p

Part	Price
AN6340	600p
AN6341	200p
AN6342	325p
AN6344	440p
AN6345	400p
AN6346	350p
AN6350	610p
AN6352	450p
AN6356	300p
AN6359	500p
AN6360	320p
AN6362	400p
AN6363	375p
AN6367NK	400p
AN6368	275p
AN6371	350p
AN6387	480p
AN6550	100p
AN6551	50p
AN6552	45p
AN6554	80p
AN6555	50p
AN6605	35p
AN6612	60p
AN6650	45p
AN6651	45p
AN6652	45p
AN6671K	425p
AN6676	600p
AN6780S	80p
AN6870	450p
AN6875	150p
AN6878	65p
AN6879	225p
AN6880	75p
AN6882	300p
AN6884	200p
AN6888	150p
AN6889	100p
AN6913	60p
AN700	650p
AN7010K	250p
AN7025K	90p
AN7060	175p
AN7062	300p
AN7072	250p
AN7081K	200p
AN7105	170p
AN7106K	135p
AN7110	75p
AN7111	100p
AN7112	45p
AN7114	120p
AN7115	110p
AN7116	90p
AN7117	65p
AN7120	100p
AN7130	75p
AN7131	90p
AN7133N	325p
AN7134	300p
AN7140	170p
AN7141	70p
AN7142	80p
AN7145	195p
AN7146	210p
AN7147	180p
AN7148	140p
AN7149	160p
AN7154	180p
AN7156	240p
AN7158	310p
AN7160	350p
AN7161N	375p
AN7163	175p
AN7166	350p
AN7168	200p
AN7169	225p
AN7170	260p
AN7171K	400p
AN7172K	325p
AN7173K	450p
AN7177	375p
AN7178	180p
AN7205	35p
AN7213	40p
AN7216	175p
AN7218	60p
AN7220	85p
AN7222	75p
AN7223	105p
AN7224	75p
AN7225	175p
AN7254	150p
AN7256	250p
AN7273	75p
AN7310	60p
AN7311	90p
AN7312	70p
AN7315	40p
AN7330	110p
AN7362	200p
AN7363	225p
AN7410	150p
AN7411	50p
AN7414	275p
AN7415	70p
AN7470	100p
AN8053	200p
AN8275	250p
AN8370	1000p
AN8377	400p
AN8387	350p
BA222	65p
BA225	100p
BA314	40p
BA301	55p
BA311	80p
BA313	60p
BA333	80p

Part	Price
BA335	55p
BA338	80p
BA340	75p
BA343	60p
BA336	175p
BA401	60p
BA402	50p
BA511	145p
BA514	160p
BA516	150p
BA518	150p
BA521	100p
BA524	240p
BA526	180p
BA527	95p
BA532	100p
BA534	220p
BA536	150p
BA546	160p
BA612	120p
BA614	70p
BA618	55p
BA631	280p
BA656	110p
BA658	350p
BA681A	350p
BA682A	300p
BA683A	300p
BA684	400p
BA685	400p
BA715	45p
BA718	45p
BA728	55p
BA806	220p
BA843	130p
BA1310	160p
BA1320	75p
BA1330	120p
BA1332	60p
BA1350	130p
BA1355	125p
BA1356	100p
BA1360	160p
BA1404	120p
BA1604	125p
BA2266A	250p
BA3306	60p
BA3308	70p
BA3312	60p
BA3402	90p
BA3406AL	120p
BA3416BL	80p
BA3422	350p
BA3505F	140p
BA3506A	70p
BA3516	120p
BA3520	130p
BA3521	225p
BA3704	200p
BA3706	75p
BA3812L	80p
BA3822LS	80p
BA3824LS	75p
BA3920	300p
BA4110	75p
BA4210	85p
BA4220	60p
BA4234L	70p
BA4236L	110p
BA4402	45p
BA4403	220p
BA4405	80p
BA4412	50p
BA5101	350p
BA5102	140p
BA5115	75p
BA5115L	75p
BA5204	200p
BA5208AF	110p
BA5402	180p
BA5406	180p
BA5408	180p
BA5413	225p
BA6104	250p
BA6109	110p
BA6110	225p
BA6125	75p
BA6137	55p
BA6138	130p
BA6146	150p
BA6149LS	700p
BA6154	60p
BA6208	175p
BA6209	85p
BA6218	85p
BA6220	55p
BA6222	130p
BA6227	50p
BA6229	130p
BA6235	50p
BA6238A	130p
BA6239A	130p
BA6247	150p
BA6248	140p
BA6259	170p
BA6280AF	300p
BA6290A	200p
BA6294	250p
BA6302A	150p
BA6304	120p
BA6305	140p
BA6321	250p
BA6328	250p
BA6334	75p
BA6410	220p
BA6411	250p
BA6418N	100p
BA6435S	425p
BA6993	150p
BA7001	150p

Part	Price
BA7004	200p
BA7007	200p
BA7021	180p
BA7022	350p
BA7025L	100p
BA7107	475p
BA7212S	200p
BA7252S	150p
BA7604N	100p
BA7751LS	150p
BA7752	250p
BA7755	150p
BA7767AS	155p
BA8504	350p
BA15218	60p
CA3140E	38p
CNX62A	80p
CNX82A	80p
CNX83A	80p
CX136	600p
CX139A	750p
CX141	750p
CX145	725p
CX150B	325p
CX175	325p
CX187	825p
CX804A	775p
CX867	575p
CX868	525p
CX877	300p
CX7925B	550p
CX20015A	600p
CX20106A	75p
CX20109	140p
CX20187	700p
CXA1001AP	1600p
CXA1019P	150p
CXA1019S	225p
CXA1044P	550p
CXA1044BP	475p
CXA1081	275p
CXA1081M	250p
CXA1081S	300p
CXA1082AS	1000p
CXA1191M	250p
CSA1209P	400p
FT5754M	600p
FT5764M	250p
HA1124	125p
HA1125	120p
HA1137W	150p
HA1151	175p
HA1197	130p
HA1199	130p
HA1201	225p
HA1202	125p
HA1319	200p
HA1338	300p
HA1339A	350p
HA1367	300p
HA1377	120p
HA1384	600p
HA1388	320p
HA1389	210p
HA1392	120p
HA1394	170p
HA1396	650p
HA1397	200p
HA1398	175p
HA1406	120p
HA11123	350p
HA11211	170p
HA11215	350p
HA11219	280p
HA11221	180p
HA11225	130p
HA11235	100p
HA11244	375p
HA11247	375p
HA11251	120p
HA11412	600p
HA11414	300p
HA11423	110p
HA11440	250p
HA11485BN	400p
HA11702	330p
HA11703	400p
HA11706	280p
HA11710	500p
HA11713	250p
HA11715	250p
HA11716	480p
HA11718	700p
HA11724	650p
HA11741NT	950p
HA11744	330p
HA11745	330p
HA11749	350p
HA11751	1500p
HA11752	325p
HA11839NT	375p
HA11847	700p
HA12002	220p
HA12003	150p
HA12005	180p
HA12010	300p
HA12016	120p
HA12017	100p
HA12026	125p
HA12038NT	140p
HA12044	350p
HA12045	280p
HA12047	450p
HA12058	320p
HA12088	375p
HA12116	130p
HA12411	175p
HA12412	175p
HA12413	70p
HA12430	200p

LINEAR ICs/JAPANESE TRANSISTORS

Part	Price
TA8164P	100p
TA8184P	350p
TA8189P	130p
TA8200AH	325p
TA8201AK	300p
TA8205	250p
TA8207K	175p
TA8210	300p
TA8211AH	200p
TA8214K	260p
TA8215	300p
TA8216H	300p
TA8217P	120p
TA8220AH	500p
TA8221AH	600p
TA8225H	475p
TA8225L	475p
TA8227	250p
TA8229K	200p
TA8400P	200p
TA8410K	200p
TA8410P	200p
TA8432	200p
TA8605N	350p
TA8606N	350p
TA8607P	320p
TA8611AN	250p
TA8615N	480p
TA8628N	350p
TA8631	500p
TA8632N	550p
TA8644N	425p
TA8646	375p
TA8653N	1500p
TA8659AN	900p
TA8690N	700p
TA8691N	450p
TA8701AN	275p
TA8718N	550p
TA8720	525p
TA8739P	450p
TA8872N	450p
TAA550	25p
TBA120S	40p
TBA396	70p
TBA520	120p
TBA530	100p
TBA540	90p
TBA560	90p
TBA800	40p
TBA810AS	40p
TBA820	55p
TBA820M	35p
TBA920	100p
TBA950	100p
TBA990	60p
TC5020	200p
TC5081AP	80p
TC5082P	170p
TC5090A	230p
TC9125BP	410p
TC9130P	150p
TC9134	750p
TC9135P	125p
TC9137P	500p
TC9138AP	150p
TC9142	320p
TC9143	300p
TC9145	150p
TC9148	200p
TC9149	225p
TC9150	425p
TC9151P	425p
TC9152	425p
TC9153	300p
TC9154AP	225p
TC9156	300p
TC9158P	450p
TC9162	275p
TC9163	375p
TC9164	400p
TC9167P	100p
TC9172P	300p
TC9174P	325p
TC9176P	500p
TC9177P	225p
TCA9940	100p
TCEP100	100p
TD6230BAP	200p
TD62382	200p
TD62506	200p
TD62705	250p
TD6304AP	300p
TD6306P	350p
TD6350P	200p
TD6359P	300p
TDA1001	200p
TDA1002	200p
TDA1003	150p
TDA1005A	175p
TDA1010A	80p
TDA1011	75p
TDA1013	120p
TDA1013A	110p
TDA1015	85p
TDA1016	140p
TDA1020	110p
TDA1022	330p
TDA1023	130p
TDA1024	150p
TDA1025	320p
TDA1028	175p
TDA1029	200p
TDA1035	160p
TDA1038	500p
TDA1041E	250p
TDA1041P	180p
TDA1044	110p
TDA1047	200p
TDA1048	200p
TDA1053	300p
TDA1054	180p
TDA1057	60p
TDA1059B	40p
TDA1060	140p
TDA1062	140p
TDA1068	75p
TDA1072	150p
TDA1074	280p
TDA1077	250p
TDA1082	275p
TDA1083	95p
TDA1085	170p
TDA1087	60p
TDA1092	100p
TDA1097	475p
TDA1151	40p
TDA1154	50p
TDA1170	85p
TDA1170N	85p
TDA1175	175p

Part	Price
TDA1180	120p
TDA1185A	190p
TDA1190	80p
TDA1200B	80p
TDA1220	75p
TDA1235	300p
TDA1236	240p
TDA1251	150p
TDA1270	150p
TDA1327	200p
TDA1405	50p
TDA1410	220p
TDA1412	35p
TDA1506	275p
TDA1508	175p
TDA1510	170p
TDA1512	180p
TDA1514A	450p
TDA1515A	200p
TDA1516Q	350p
TDA1517	250p
TDA1519	200p
TDA1519A	200p
TDA1520	275p
TDA1521	250p
TDA1522	110p
TDA1524	200p
TDA1526	225p
TDA1534	2000p
TDA1540	420p
TDA1541	750p
TDA1542	250p
TDA1543	300p
TDA1552Q	350p
TDA1553AQ	375p
TDA1555Q	375p
TDA1557Q	350p
TDA1558Q	350p
TDA1560Q	675p
TDA1571	300p
TDA1572	175p
TDA1574	125p
TDA1576	170p
TDA1578A	210p
TDA1579	200p
TDA1589	275p
TDA1591	275p
TDA1596	200p
TDA1598	250p
TDA1600	275p
TDA1602A	400p
TDA1670A	230p
TDA1675	250p
TDA1701	300p
TDA1771	250p
TDA1870A	200p
TDA1872A	275p
TDA1904	80p
TDA1905	80p
TDA1908A	90p
TDA1910	225p
TDA1940	180p
TDA1941	300p
TDA1950	175p
TDA2002	50p
TDA2003	65p
TDA2004	150p
TDA2005	150p
TDA2006	70p
TDA2007	120p
TDA2008	100p
TDA2009	160p
TDA2010	150p
TDA2020	120p
TDA2030	80p
TDA2030H	100p
TDA2040	140p
TDA2048	600p
TDA2051V	450p
TDA2052V	525p
TDA2054M	110p
TDA2107	250p
TDA2148	350p
TDA2151	375p
TDA2170	260p
TDA2220	200p
TDA2270	250p
TDA2320	80p
TDA2501	400p
TDA2502	175p
TDA2503	200p
TDA2504	200p
TDA2505	300p
TDA2506	500p
TDA2507	450p
TDA2507T	450p
TDA2510	450p
TDA2514A	500p
TDA2515	450p
TDA2530	450p
TDA2532	120p
TDA2540	150p
TDA2541	120p
TDA2542	110p
TDA2543	210p
TDA2544	200p
TDA2545	120p
TDA2546A	200p
TDA2548	200p
TDA2549	300p
TDA2555	175p
TDA2556	230p
TDA2557	225p
TDA2558	500p
TDA2574V	350p
TDA2575A	100p
TDA2577A	200p
TDA2578A	200p
TDA2579A	250p
TDA2582	130p
TDA2590	170p
TDA2591	110p
TDA2591Q	150p
TDA2593	110p
TDA2594	300p
TDA2595	200p
TDA2600	400p
TDA2611A	100p
TDA2616	250p
TDA2630	300p
TDA2640	250p
TDA2653A	225p
TDA2654	200p
TDA2658	300p
TDA2670	150p
TDA2690	100p
TDA2710-1	400p
TDA2721	200p
TDA2730	200p
TDA2740	300p
TDA2750	350p

Part	Price
TDA2760	400p
TDA2780	600p
TDA2791	275p
TDA2795	200p
TDA2822M	60p
TDA2824	85p
TDA2840	200p
TDA3047	100p
TDA3048	130p
TDA3082	200p
TDA3083	200p
TDA3190	100p
TDA3301B	400p
TDA3310	120p
TDA3410	150p
TDA3420	200p
TDA3501	340p
TDA3502	450p
TDA3504	300p
TDA3505	275p
TDA3506	260p
TDA3507	450p
TDA3510	350p
TDA3520	650p
TDA3530	350p
TDA3540	200p
TDA3541	175p
TDA3560	260p
TDA3561	300p
TDA3561A	300p
TDA3562	260p
TDA3562TF	300p
TDA3563	350p
TDA3564	325p
TDA3565	275p
TDA3566	280p
TDA3567	350p
TDA3569	300p
TDA3570	375p
TDA3580	400p
TDA3586	750p
TDA3590	300p
TDA3591	360p
TDA3592A	350p
TDA3601Q	375p
TDA3602	225p
TDA3611	450p
TDA3640	350p
TDA3645	400p
TDA3651	200p
TDA3652	500p
TDA3652-TX10	800p
TDA3653	150p
TDA3654	90p
TDA3654Q	120p
TDA3710	300p
TDA3720	175p
TDA3724	500p
TDA3725	500p
TDA3730	400p
TDA3740	480p
TDA3750	400p
TDA3755	425p
TDA3760	350p
TDA3765V	225p
TDA3771	460p
TDA3780	400p
TDA3791	300p
TDA3800	350p
TDA3803A	350p
TDA3810	200p
TDA3825	225p
TDA3827	200p
TDA3840	300p
TDA3842	400p
TDA3843	200p
TDA3845	325p
TDA3856	400p
TDA3857	350p
TDA3950	225p
TDA4001	325p
TDA4050	150p
TDA4052	500p
TDA4060	500p
TDA4092	350p
TDA4100	275p
TDA4173AF	325p
TDA4180	145p
TDA4190	180p
TDA4200	360p
TDA4210	250p
TDA4260	250p
TDA4280	320p
TDA4282	360p
TDA4283T	450p
TDA4290	200p
TDA4400	175p
TDA4420	120p
TDA4421	300p
TDA4426	170p
TDA4427	200p
TDA4431	150p
TDA4433	150p
TDA4437	300p
TDA4439	220p
TDA4440	180p
TDA4442	240p
TDA4443	250p
TDA4445	220p
TDA4450	225p
TDA4452	250p
TDA4453	275p
TDA4480	280p
TDA4481	350p
TDA4482	350p
TDA4500	300p
TDA4501	400p
TDA4502	550p
TDA4503	300p
TDA4505A	300p
TDA4505E	300p
TDA4505K	450p
TDA4505M	500p
TDA4510	270p
TDA4532	200p
TDA4555	400p
TDA4556	370p
TDA4557	450p
TDA4560	270p
TDA4565	200p
TDA4566	325p
TDA4568	225p
TDA4570	300p
TDA4580	650p
TDA4600	200p
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JAPANESE TRANSISTORS

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Part	Price
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2SD1289	250p
2SD1291	280p
2SD1292	60p
2SD1293	70p
2SD1297	300p
2SD1302	20p
2SD1306	45p
2SD1308	80p
2SD1309	140p
2SD1310	140p

Part	Price
2SD1311	65p
2SD1313	1000p
2SD1326	200p
2SD1327	150p
2SD1328	60p
2SD1330	50p
2SD1347	70p
2SD1348	65p
2SD1350	150p
2SD1376	60p
2SD1378	60p
2SD1379	100p
2SD1380	100p
2SD1382	60p
2SD1384	50p
2SD1390	350p
2SD1391	250p
2SD1392	85p
2SD1395	80p
2SD1396	120p
2SD1397	100p
2SD1398	120p
2SD1399	300p
2SD1400	280p
2SD1402	120p
2SD1403	225p
2SD1405	80p
2SD1406	60p
2SD1407	60p
2SD1408	125p
2SD1409	170p
2SD1411	85p
2SD1412	75p
2SD1413	60p
2SD1415	190p
2SD1417	125p
2SD1425	260p
2SD1426	135p
2SD1427	160p
2SD1428	180p
2SD1430	280p
2SD1431	200p
2SD1432	400p
2SD1433	400p
2SD1438	100p
2SD1439	165p
2SD1441	220p
2SD1442	80p
2SD1445	200p
2SD1446	300p
2SD1450	60p
2SD1451	200p
2SD1452	275p
2SD1453	140p
2SD1455	250p
2SD1457	165p
2SD1458	50p
2SD1459	80p
2SD1468	40p
2SD1487	225p
2SD1494	200p
2SD1496	300p
2SD1497	230p
2SD1497-02	350p
2SD1505	90p
2SD1506	50p
2SD1508	60p
2SD1509	100p
2SD1511	100p
2SD1519	250p
2SD1521	70p
2SD1525	600p
2SD1526	100p
2SD1541	350p
2SD1545	275p
2SD1546	350p
2SD1548	400p
2SD1554	170p
2SD1555	170p
2SD1556	300p
2SD1565	75p
2SD1571	170p
2SD1572	100p
2SD1575	200p
2SD1576	200p
2SD1577	250p
2SD1579	120p
2SD1589	60p
2SD1590	100p
2SD1591	310p
2SD1593	125p
2SD1595	100p
2SD1608	210p
2SD1609	45p
2SD1632	400p
2SD1637	50p
2SD1647	40p
2SD1649	260p
2SD1650	150p
2SD1651	150p
2SD1656	250p
2SD1663	350p
2SD1666	60p
2SD1667	120p
2SD1668	120p
2SD1669	85p
2SD1677	300p
2SD1680	225p
2SD1683	45p
2SD1684	70p
2SD1706	325p
2SD1707	400p
2SD1708	375p
2SD1710	200p
2SD1718	275p
2SD1729	230p
2SD1730	275p
2SD1732	325p
2SD1739	225p
2SD1740	125p
2SD1748	90p

Part	Price
2SD1756	275p
2SD1758	75p
2SD1760	80p
2SD1761	60p
2SD1762	50p
2SD1763A	60p
2SD1764	70p
2SD1765	70p
2SD1769	110p
2SD1773	160p
2SD1776	70p
2SD1783	100p
2SD1785	160p
2SD1789	210p
2SD1796	180p
2SD1802	75p
2SD1806	75p
2SD1812	60p
2SD1815	100p
2SD1825	60p
2SD1827	120p
2SD1843	100p
2SD1846	350p
2SD1847	350p
2SD1849	280p
2SD1850	325p
2SD1853	40p
2SD1856	40p
2SD1857	75p
2SD1858	40p
2SD1863	35p
2SD1864	85p
2SD1877	175p
2SD1878	160p
2SD1879	275p
2SD1880	360p
2SD1881	350p
2SD1884	300p
2SD1886	450p
2SD1887	300p
2SD1894	300p
2SD1895	225p
2SD1910	280p
2SD1911	300p
2SD1913	50p
2SD1929	50p
2SD1930	50p
2SD1933	75p
2SD1939	75p
2SD1941	500p
2SD1944	50p
2SD1958	80p
2SD1959	210p
2SD1978	50p
2SD1984	450p
2SD1991	50p
2SD1994	300p
2SD1996	45p
2SD2006	75p
2SD2010	250p
2SD2011	60p
2SD2012	50p
2SD2018	65p
2SD2033	80p
2SD2061	100p
2SD2066	250p
2SD2125	180p
2SD2136	85p
2SD2144	35p
2SD2151	175p
2SD2255	175p
2SD2331	250p
2SD2333	200p
2SD2340	225p
2SJ48	425p
2SJ56	700p
2SJ74	60p
2SJ76	220p
2SJ77	350p
2SJ79	225p
2SJ103	75p
2SJ109	200p
2SJ113	1050p
2SJ114	1150p
2SJ116	1200p
2SJ117	550p
2SJ119	700p
2SJ162	680p
2SJ175	200p
2SJ182	150p
2SJ200	625p
2SJ307	175p
2SK19	45p
2SK33	40p
2SK40	50p
2SK55	100p
2SK68	100p
2SK73	75p
2SK97	200p
2SK106	40p
2SK107	40p
2SK109	150p
2SK117	50p
2SK118	50p
2SK125	100p
2SK133	650p
2SK147	160p
2SK152	40p
2SK161	30p
2SK163	40p
2SK168	40p
2SK170	50p
2SK184	35p
2SK192	45p
2SK193	40p
2SK195	150p
2SK197	140p
2SK212	35p
2SK214	170p
2SK216	200p
2SK223	50p

Part	Price
2SK240	140p
2SK241	30p
2SK246	30p
2SK300	25p
2SK301	40p
2SK303	40p
2SK304	25p
2SK312	750p
2SK315	70p
2SK320	120p
2SK323	130p
2SK332	175p
2SK359	40p
2SK363	50p
2SK364	40p
2SK367	40p
2SK369	30p
2SK373	40p
2SK374	45p
2SK386	600p
2SK389	115p
2SK400	700p
2SK405	450p
2SK414	550p
2SK415	500p
2SK423	75p
2SK427	50p
2SK430	200p
2SK511	450p
2SK513	325p
2SK526	160p
2SK531	350p
2SK534	700p
2SK537	900p
2SK538	350p
2SK539	1100p
2SK544	30p
2SK552	250p
2SK553	225p
2SK555	320p
2SK556	500p
2SK557	400p
2SK559	600p
2SK560	580p
2SK566	475p
2SK606	70p
2SK612	80p
2SK684	950p
2SK685	1150p
2SK699	100p
2SK719	300p
2SK724	500p
2SK725	550p
2SK726	425p
2SK727	475p
2SK739	400p
2SK758	300p
2SK769	500p
2SK786	200p
2SK787	800p
2SK791	225p
2SK792	300p
2SK793	300p
2SK794	315p
2SK796	600p
2SK809	850p
2SK812	150p
2SK817	325p
2SK851	550p
2SK872	650p
2SK875	475p
2SK903	500p
2SK904	500p
2SK951	275p
2SK952	275p
2SK955	750p
2SK956	600p
2SK962	700p
2SK1023	550p
2SK1036	450p
2SK1057	600p
2SK1058	800p
2SK1081	700p
2SK1082	450p
2SK1102	375p
2SK1117	250p
2SK1118	225p
2SK1120	550p
2SK1190	350p
2SK1191	800p
2SK1217	700p
2SK1221	200p
2SK1275	275p
2SK1296	350p
2SK1299	450p
2SK1317	900p
2SK1338	250p
2SK1341	500p
2SK1342	500p
2SK1350	200p
2SK1356	225p
2SK1357	350p
2SK1358	400p
2SK1377	150p
2SK1400	250p
2SK1404	290p
2SK1461	220p
2SK1462	425p
2SK1487	250p
2SK1507	475p
2SK1529	700p
2SK1537	400p
2SK1544	900p
2SK1767	275p
2SK2038	295p
2SK2039	750p
2SK2134	300p

REPLACEMENT VIDEO HEADS

Model	Price
AKAI	
VS105, 112, 115, 116, 120, 125, 126, 201, 202, 205, 220, 240, 244, 245, 247, 248, 250, 301, 303, 304, VSP8, VSP82	1000p
VP7100, VS9300, VS9500	650p
VP7200, VS9700, VS9800	1200p
VS1	1250p
VS2	1200p
VS3	1350p
VS10	1350p
VSP1	2100p
VS33,35, 37, 38, 38EOG MKII, 53, 55, 66, 765, 766, 767, 768, 865, 867, VSF30, 33, 4, 400, 410, 420, 430, 440, 441, 450, 455, 480, 490, 497, VSG51, 54, 55, VXS450, VXS470	2250p
VS512, VS515, VS516	2250p
VS462, 465, 467, 467EOG2, VSF12, 15EK, 15EOH, 300, 301, 310, VSF320, 330, 340, 350, VSG30, 33, 34, 35	2300p
VS11, VS12	1200p
VS6, VS8, VS9	2400p
VSX9	2250p
VSA1100, 1110, 650, VSF500, 510, 550, 560, 580, 590, 600, 650, VSG60, 64, 65, VSG70, 73, 74, 75, VSX560, 580	3600p
VS155, VS165	2300p
VS20, 22, 23, 24, 25, 26, 27, 422, 425, 426, 427, 485, VSF10, 11, 180, 190 VSF200, 210, 220, 221, 222, 230, 240, 260, 261, 262, 265, 270, 275, 280, VSF290, 510, 550, VSG20, 204, 205, 206, VSG21, 211, 212, 215, VSG217EOG, 23, 24, 25, 405, 411, 415, 417, VSP 100, 100EM, 110, VSP88, 88KC, 8111, VSP9, VSR100, 100EDG, 100EM, 110, VSX400	1250p
VSR9	1300p
VS 109, VS603, VS606, VS607	2500p
VS75	2500p
VS965, VC967	3450p
VSF400, 410, 420, 430, 440, 441, 450, 45S, 480, 490, 497, VSX450, 470	2850p
VSG20, 204, 204, 205, 206, 20, 21, 211, 212, 215, 217, 225, 23, 24, 25, VSP100, 110, 88, VSR100, 110, VSX400	1950p
VSG415, VSG415EA, VSG425	2800p
VS75, VSA77	3500p
VSF1000, VSF1010, VSF1030	5800p
ALBA	
VDR3000, VCR4000, VCR5000, VCR6000	1650p
VTV10	1000p
VCR7000, 7800, 8000, 8800	1100p
AMSTRAD	
VCR4500, VCR5200, VCR9000, TVR1	900p
VCR7000	1000p
VCR1000, 2000, 6000, 61000, 62000, 8600, 8602, 8700, 9005, DD8900, DD8904, TVR4	1100p
TVR2, TVR3, VCR4600, VCR4600 MKII, VCR400	1100p
VCR8800, VCR8804, VCR9340	2100p
VCR8603, VCR8604, VCR8704, VCR8714	1350p
VCR9140, VCR9142	2550p
VCR9340	3650p
VCR9244	3450p
UF020, 22, VCR3000, 3002, 9500	1750p
FISHER	
FVHP420, 510, 520, 530, 615, 618, 620, 622, 710, 711, 715, 716, 720, FVHP721, 722, 730, 830, 905, 906, 907, 908, 910, 911, 915, 916, 918, FVHP5000, 5001, 5005, 5050, 5075	1100p
VBS3500, 7100, 7500, 7600, 9900, VBR330	1800p
VBS7000, VBS7100, VBS9000	2000p
FVHP500, 711, 715, 721, 722, 730, 830, 5100, FVHD720	1100p
FVHP725, FVHP830, FVHP980	2500p
FVHP990	2700p
FVHP975	2400p
FVHD407, FVHD140, FVHP1, FVHP10, FVHP20	1150p
FVHD230, FVHP1100, 1200, 130, 1340, 1410, 2000, 200, 210, 300, FVHP310, 410, 420	1800p
FVHD250, 270, 370, FVHP1500, FVHP250	2700p
FVHP132, 1400, 1440, 320, 440, 445	3550p
FVHP470S, FVHP475HV	4800p
FVHP1250, FVHP430S	1950p
GOLDSTAR	
8000 3HSSDB, GHV121, RQ2011, 2031, 2051	1900p
GVH51, GVH122, VCP4000, VCP4100, VCP4200	1100p
GHV1232, 1233, 1241, 1242, 1243, 1244, 1245, 1246, 1266, 1290, 1291 GHV1295, 1296, 1891, 8210, 8215, 1221, 1240, 1241, 1247, 1248, 2145 VCP400, VCP4130, 4300, 4301, 4305, 4306, 4310, 4311, 4315, 4316, VCP4320, 4321, 4325, 4326	1100p
C211, GHV1392P, 1393P, 19OOP, 1290, 1291PQ, 12931Q, 1295P, GSE1295PQ, GSE1296, 1297, 1891, 1910, 20005, 2000, GSEC200, GSEC205, 211, 2301, GSEG2301, GSEQ12, 204, 20, 22, P416P, P500P QUISY22, QUISY24, RC205P, RG11P, RG20, RG2001, RQ20, RQ204HP, RQ241, VCP100P, GSEG10	1600p
GHV4400, 4400, GSE-Q404P, QUISY40, RC405P	2350p
GSEQ121, RQ2011, RQ2031, RQ2051	1950p
G.E.C.	
4000H, 4001H, 4002H	1200p
V4001H, V4004, V4100	1200p
V4005H	1500p
GRANADA	
CSI, DS2	1600p
VHSAH1	1100p
VHSAH3	2400p
VHSAN3	800p
VHSAY3	1200p
VHSBH1, VHSCH1	2100p
VHSBP1	850p
VHSBY3	2600p
VHSD52	1600p
VHSEH2, VHSDH2	1600p
VHSEY1, VHSEY2	1400p
VHSFS1, VHSFS2	1300p
VHSFG2, VHSFG4, VHSF63, VHSFB3	1300p
VHSTJ1, VHSTJ2, VHSTJ3, VHSWJ3, VHSYJ2	700p
VHSVH4, VHSWH1, VHSXH1, VHSYH2	1600p
VHSWJI VHSXJ3	700p
GRUNDIG	
VS410, 415, 435, 450, 456, 460, 500, 505, 510, 520, 521, 530, 546	1600p
BARCELONA, MVS5400, 440, 500, 600, SE5100, 6100, 6110, 9100 TVR4500, 4510, 5510, VS400, 440, 441, 500, 505, 510, 518, 600, 610, VS5180, VS6190, 700, 900, 901, 902, 9091, GV200, 201, 2092, SE2100, 5110	1400p
MADRID, SE5140, VS540, VS5480	3000p
MVS550, 620, VS550, 620, 630, 640, 790, 930, 940	2400p
VS120	2300p
VS680, GV280	4600p
VS160, VS740	4400p
VS170	4600p
MVS660, SE6160, VERONA, VS660, VS6690	3500p
GRUNDIG	
MVS710, 720, 910, SE7120, 9120, VS710, 716, 720, 800, 810, 910, 920, VS922, 9291, GV210, 211, 220, 2292, MV2105, 2115, SE2120	1700p
HINARI	
VXL2, 3, 4, 20, 25, 35	1000p
VXL5, V20H	1050p
VXL6	1200p
VXL7	1300p
VXL8, 9, 10, 11, 19, 90, VCR34H, VTV 100, 200	1100p
HITACHI	
VT11, 14, 15, 16, 30, 33, 34, 330, 340, 503, 640, 5030, VTP10, 30	1000p
VT7, VT17, VT18, VT19	2000p
VT35, VT350, VT38, VT39	2300p
VT100, 110, 111, 112, 113, 115, 118, 120, 125, 128, 220, 225, 400, 405, VT410, 413, 414, 415, 416, 418, 510, 515, 517, 518, 520, 525, 526, VTM625, 626, 725, 210, 211, 215, 726, 727, 728, 820, 821, 825, 920, 921	1400p
VT3000	650p
VT4000, VT4200, VT5000, VT5500, VT5600	1100p
VT77, 680, 6500, 6700, 6800, 7000, 8000, 8030, 8040, 8100, 8300, 8500 VT8700, 9000, 9300, 9500, 9700, 9900	1000p
VT8, 9, 56, 57, 570, 575, 576, 580, 585, 588	3200p
VT65	2400p
VT130, 135, 138, 145, 250, 255, 258, 420, 425, 426, 428, 430, 431, 435 VT438, 535, 536, VTL30, 301, VTM630, 635, 636	1900p
VT52, VT60, VT61E, VT62E, VT63, VT64, VT640	1100p
VT168, VT150, VT260, VT450, VT498 (4 HEAD)	2200p
VT530	2050p
VT522, VTM212, 620, 622, 720, 722, 822, 922, 925	1650p
VT660E	2600p
VT570, VT575, VT580, VT585, VT588, VTF70	3100p
VT540, 545, 546, 548, VTD660, 665, VTM598, 640, 645, 646, VTM730, 731, 735, 736, 740, 745, 746, 748, 753, 754, 830, 831, 835, 838, 840, VTM841, 845, 930, 931, 935	2600p
VTF770, 774, 775, 860, 861, 865	4100p
VT85, VT86, VT88	2600p
VTF780, VTF785	4800p
VTF180, VTF185, VTF280	8500p
VTF350, VTF351	5150p
VTM220, VTM220E, VTM220UK	5150p
VTS390E	5150p
J.V.C. & FERGUSON	
HR2200, 3300, 3320, 3330, 3350, 3360, 3660, 3750, 3860, 4100 3292, 8900, 8901, 8902, 8903, 8906, 8922, 8928, 3V01, 3V06, 3V22	600p
HR3660, 7600, 7610, 7650, 7700, HRD110, 111, 120, 121, 220, 225, HRS100, 8904, 8923, 8924, 8925, 8929, 8935, 8941, 8943, 8944, 3V16, 3V233V24, 3V31, 3V35, 3V36, 3V38, 3V39, 3V49	625p
BR1600, HRD140, 141, 142, 143, 150, 152, 156, 157, 158, 160, 5101 HRS10, 8947, 8948, 3V42, 3V44, 3V45, 3V46, 3V47, 3V52, 3V54, 3V55, 3V56, 3V57	1150p
HRD154, 170, 171, 210, 211, 217, 310, 320, 321, 350, 521, 522, 525, 526. HRD527, 540, 550, 560, 590, 770, HRDX20, HRDX22, 8950, 8951, 3V64, 3V65, FV10, FVII, FV20, FV21, FV26	1300p
HRD565, HRD566, 3V48	2200p
HRD725, HRD755, 3V43, 3V53	2850p
8930, 8931, 8933, 8940, 3V29, 3V30	700p
8945	2400p
3V00, 8902, 8903, 8909, 8912, 8922	1000p
FV31, FV41R	1500p
FV37, FV43H, HRD860	3100p
BR7000E, BR7000S, BR7030, BR7030/40H, BR7040	2600p
HR7200, 7300, 7350, 2650, BR6200	700p
HRD455	2000p
HRD520	1400p
HRD300, 400, 580, 600, 620, 640, 650	2000p
HR4100	1000p
HRD750, HRD830, HRD860	3300p
HRD250, HRD257	2300p
3V32, 8942, HR7655	2200p
HRD180, 190, 230, 610, 3V59, FV12L, FV20B, 26, 30, 32, 33, VC141L	2050p
HRD370, HRD430, HRD470, 3V58, FV13H	2300p
HRD530, HRD700, HRD840, HRD870, HRD910, FV14T, FV57H	3100p
GRC1, GRC2, 3 V41	2800p
BR9060, HRD330, 337, 440, 441, 637, 641, 660, 670, 720, 730, 740, 820 HRFC100, SR3300MS, FV44L	2100p
HRD950, HRD960, HRD980, FV46	5000p
HRS5000, HRS5500, 5800, 9000, FV395.BRS600, SRS368E	5550p
FV22L	1400p
FV42	2600p
VR182LV, VR202LV	1950p
FV67HV, FV68TX, FV77	3800p
R2000 SERIES	4500p
FV61LV, FV62LV, FV67HV	4000p
FV42L	£101.00p
VP160L, VR172L	1950p
HRJ200, HRJ205	3300p
HRJ600EG, HRJ600EK, HRJ605EG, HRJ605UK, HRJ610EK	7100p
HRJ300, HRJ305, HRJ315, HRJ316EG,HRJ318E	3750p
HRJ615, HRJ715, HRJ815	9200p
HRJ400, HRJ405, HRJ407MS, HRJ41 OEK, HRJ415, HRJ416	5850p
MATSUI	
VX500E, 800A, 810A, 820, 80A, 770B, 773B	1200p
VCRL3, VX730, VX750	1450p
VX735, VX755, VX990	1500p
VX735A, VX765, VX850	1750p
VX600	1100p
VX900	2650p
MITSUBISHI	
HS303, HS304, HS320, HS700	1400p
HS306, HS318, HS710	1400p
HS307	2300p
HS319	1900p
HS330	2300p
HS400	2800p
HS349, HSE27, 31, 32, HSB27, 31, 32, HSM33, 34, 35, 37G	2150p
HS411	1900p
HSE30, HSB30	2000p
HS338	1900p
HSE10, HSE11, HSE20, HSE21, HSE41, HSB10, HSB20	2100p
HS300, HS301, HS302, HS310, HS273, HS550Q	1350p
HS200	650p
HS337, HS347	1400p
HSB12, HSE12, HSE22, HSM16G, 18, 23, 25, 30, MX1	2100p
HS411EZ, HS411GZ	2600p
HSB11, HSB21	2000p
HSB52, HSE50, 52G, HSM36, 50, 54, 55, 57, 58, 60	3300p
HSE51	3000p
HS410	3250p
HS412, HS421GZ	4000p
HS5300, HS5424, HS5600	3050p
HSM20, HSM55	2250p
HSM40	2850p
HSM59, HSM68E	6050p
NV300, 322, 332, 333, 340, 390, 2000, 2010, 3000, 7000, 7200.7500, NV7800, 7850, 8170, 8200, 8400, 8600, 8610, 8620	625p
NV777, NV330	1150p
NV8050, NV8051	2800p
NATIONAL PANASONIC	
AG1000, 1050, NV250, 260, 280, 450, 460, 465, 470, 480, 650	1600p
AG6010, AG6015	2500p
AG6840	2400p
NV100, NV200, NV370, NV380, NV630	725p
NVD80, NVH65	3400p
AG5150, AG5250, NVF65, NVH75, NVH77	3200p
NVF51	4200p
NVGI9	2300p
NVJ30, NVHJ33, NVL10, 20, NVL21, NVG30, 31, 40, 130, NVJ37, 40, 42, NVSD30, 10EE, 11, 2, 30, 35	1450p
NVJ35, NVG46	1700p
NVM1, NVM3, NVM5	4200p
AG2100, AG2200	700p
NV430, NV431, NV433, NVSD2, NVSD22, NVSD25, NVSD3	1000p
NV730, NV730F, NV770 4 HEAD	1450p
NV366	1850p
NV21 HQ, NV 180, NVD48	2000p
NV7881	2500p
NV810, NV8301	2400p
NV850, NV950	2750p
NV870, NV890, NV970	3200p
AG6024, NVG33, 46, NVL23, 25, 28, NVJ47, 49, 700PX, NVSD20EE, 400, 44, 45	1450p
NVG10, 11, 12, 14, 16, 120, NV250, 280, 450, 465	1500p
NVG18	1800p
NVG20, 21, 22, 25, 28, 200, NVD48	1700p
NVG50, NVG300	2000p
NVG45	1450p
NVH70	3600p
NV688	2400p
NV600	1050p
AG6800, AH6810, AG6820	2600p
AG6100, AG6200, AG6300	2600p
NVG7, NVG9, NV230	1050p
NV780	2400p
NVG 15, NVG400	2600p
NVM7, NVMC20	3800p
NVF70	5200p
NVJ45, NVJ47	2000p
NVSD40	2250p
NVF75, NVF77	4750p
NVF55	4000p
NVFS200, NVFS88, NVSF90, NW8000	4600p
NVHD90, NVHD 100, NV HD 101, NVHF 100	3100p
NVSD1	1400p
AG7330, AG7350, AG7355, AG7450	5000p
NVFS 100	5000p
NVFS1	4850p
N.E.C.	
N9011, 9012, 9013E, 9014E, 9014G, 9015, 9016, 901A, 902A, 9033, N9034, 9040, 9053, 9054, 9055, 9056, 9063, 9065, 9066, 906, 9077, N9096, DX1000, 1600, PX1200	1150p
N911A, 914C, 915A, 916A, 917, 9110, 9120	2400p
PVC600, 740, 744, 754, 763E, 764, PV2300, 2400, 760, 794, 770, 774	1650p
N380, N381, N830, N831, N832, N833, N834, N835, N836	700p
82611AH1 (FOR MODEL DX3000), DX4000, N9610, NS7000	3000p
N895	3150p
N9052, N9530, DX2000	3400p
VCP1	1700p
PVC2300, 2400, 740, 744, 760, 764	1400p
DS6000	3500p
D5600	3500p
VH3, VH555, VH600, VH700, VH844, VH900, VH1000 (ALL MODELS)	1100p
VH1, VH2A	700p
D1000, D1100	1600p
D1000X, D1500X, D4500, VPCD100, D1200, D2000X, D5000	1600p
VR6460, VR6520, 64VR60, VR6420	725p
VR6711 4 HEAD	1800p
VR6440	2500p
VR6441, VR6540, VR6541, VR6640, VR6642	1300p
DV761, VR512, 522, 5229, 63SB7, VR6760, VR6761, VR6762, VR63SB7 7172	7200p
VR6920	2750p
41DV2, 4SB11BVR412, 415, 6485, 6490, 6880	1600p
VR6948	4850p
20DV1, 20DV2, 20RW7, 21DVI, 21DV2, 21DV3, 2SB01, 02, 11, 12, 30DV2, 31DVI, 31DV2, 31DV3, 3SB02, 03, 05, 11, 12, 13, 68SB4, 71SB4, 86SBI, 91SB2, 92SB2, DV186, 190, 291, 292, 468, 471, VR201, 202, 203, 2115, 212, 213, 223, 231, 232, 302, 303, 305, 311, 312, VR313, 3210, 3219, 322, 3229, 323, 501, 6180, 6182, 6185, 6290, 6291, VR6293, 6362, 6367, 6467, 6468, 6470	4600p
VR3260, 6349, 6442, 663, 6448, 6449, 6542, 6643	1250p
VR601	1800p
49SB6, VR6548, VR6648, VR6843	2750p
SAISHO	
VR100, 605, 705, 805, 905, 1000, 1100, 1200, 1600	1200p
VR3300X, VR3600X, VR3650X, VR3800	1400p
VR3200, VR3500	1400p
VR2000, VR3300, VR3600	1400p
VR2500	2650p
VRS5000X, VX6000A, VXL12X	1500p
SALORA	
6500, 6600	1600p
SV7300, SV8200, SV8300, SV9200	1500p
SV7400, SV8400	1600p
SV8100	1200p
SV900, SV9900	3450p
SV601, SV611, SV6910	1500p
SV800, SV810	2800p
SV6700, SV8710, SV8750	1500p
623N, SV6800, SV6900, SV8850, SV8870, SV8970	1750p
SV88110, SV8910	2650p
823N, SV8920	3500p
923N	4500p
SV8600, SV8700	1550p
SV8420	2400p
SV8620	2100p
SV9300	2500p
SV8830	2200p
SV8720	2250p
SV8520	1900p
SAMSUNG	
SV8500	1500p
SVX301, VB900, 910, VVT510, VT320, 5600, VX510, 511, 520.616, VX626, 627, 717, 614, 619, 629, 710, 712, 720, 730, 970, 971, 972, SV716, 717, SVX303, 305, VB510, 520, 610, 616, 617, 619, 620, 626, 627, 629, 710, 971, V1520, 616, 621, 626, 900, 910	1200p
SVX319, VB770, V1710, 730, 731, 735, 750, 751, 770, VB750, VK8220, VX750, VX7330, VK770, VK8225, VR1730, 1735, XR20	1900p
V11560, VN1560, VN1561, VX1530, VX1560, VX1561, VX1580	2200p
PL30LR, PX3031, 31R, 32R, 990, 992, 991, PXP30, PXR30, VX 1260, SVX503, SX3230, 3231, 3260, 3261, VK30, 300, 1230, 1260, 1261, VK30R, 31R, 32R, VXK300, 301, 306, 320, 321, 326, 336	1900p
S11230, 1240, SVX600, SX1230, 1231, 1260, 1261, 7120, 7121, 7220, SX7221, 7230, 7301	4600p
SANYO	
VTC5000, 5400, 600, 6000, 6010, 6500, VPR5000, VTC 1500, VTCM 10, 11, 20, 21 VTCM25, VTC2000, 5100, 5150, 5300, 5400, VTC5350, 5370, VTCNX10, VTCNX15, 20, 30, VPR5800	1800p
VTC5500, 5550, 9100, 9300, 9350, 9355, 9455, 9500	1900p
VHR1110, VHR1150, VHR1300, VHR1700, VHR2300, VHR2370	1200p
VHR3200, 3270, 3100, 3110, 3150, 3300, 3400, 3310, VHRD500	1500p
VHR1500, VHR2500, VHR3330	2100p
VHR2700	2450p
VHR7900	3000p
VHR5700, VHR7700E, VHRD4710	2700p
VHR150E, 153, 154, 1501R, 240, 250, 251, 27, 350, 474, 5350E, 7500, VHR7530, 7540, 8500SP, 8800, VHRD5350E, 5450E, 6550	3850p
TLS1000P, TLS1001P, TLS1100	3100p
VHR120, 130, 14, 141, 143G, 14SP, 151, 15, 16, 171, 220, 23, 244, 274, VHR310, 330, 4100, 4105, 4200, 430, 4300, 4400, 4500, 5080, 5100, VHR5200, 5600, 6850, 7100, 7200, 7250, 7300, 8070, 8100, 8101, 8200, VHR7800, 7810, 8000SP, 8801SP, VHRD4400, 4410, 4500, 4600, VHRD4610, 6700, 4800	3100p
TLS2000	4250p
VHR5300, VHR6500, VHR7400	4500p
VHR3500EX	2150p
VHR16, 235, 335E, 4150, 4160, 4350, 7250, 7260, 8250	1950p
VTC3000	1400p
SHARP	
VC390, VC393, VC496	2750p
VC488	4200p
VC779	1800p
VC789, VC790	2900p
VC200, 220, 300, 381, 383, 384, 385, 386, 387, 388, 471, 477, 481, 482, VC483, 486, 3300, 8381, 9100, 9300, 9400, 9500, 9600, 9700	1100p
VC108, 208, 382, 402, 405, 408, 500, 550, 571, 573, 581, 582, 583, VC5W20E, 600, 651, 674, 681, 684, 6V3, 750, 780, 781, 683, 684, 402, VC500, 571, 573, 580, 584, 600, 682, 693, 700, 772, 7810, 782, 7822, VC783, 8481, 8581, VCA10, 100, 102, 103, 1031, 103, 104, 105, 106, VCA111, 113, 116, 131, 140, 202, 203, 211, 234, 244, 254, 255, 30, 35, VCA40, VCB311N, 320, VCD801, 802, VCM73, VCT212, 310, 410, VCT510, 72, VCT1314, VCTS313	1100p
VC6000, 6200, 6300, 7300, 7700, 7750, 8000, 8300	1800p
VC793	3000p
VC473, VC785, VC786	2200p
VC699, VCA501, VCA602	2800p
VC585, VC685	2000p
VC90ET	3900p
VFH815	2800p
VC800, VCH851, VCH852, VCH882	2700p
VCH80, VCH81, VFH815	2800p
VCA33, VCA36, VCA43, VCA44, VCA46, VCA49	1500p
VCA55, VCA63	2200p
VC570	2800p
SONY	
DSR-19R FOR SL-T 9ME	3100p
DSR-21 R FOR SLC 8-C9	2600p
DSR-35R FORC20, C30, C40, SLF1UB, SLF1E2 PIN, SLC24PS, 33E, 34, 44PS, SLF11, 30PF, 35, 60PS, SLK85, SLT20ME, 30ME, SL100	1500p
DSR-43R FOR SLC7 RANGE, SL5000, SL5100, SL3000 1 PIN, SLC6E, SL36ES, SL37E	1300p
SL3000, SL8000, SL8080, SLC5E, SLT7ME	1600p
SLV201, SLV202	2000p
SLK95, SLT50ME	2900p
SLV275, SLV373VB, SLV410, SLV412, SLV427, SLV474	2200p
DSR49R, SLHF100P, SLHF100UB	3850p
SLV656, SLV715, 725, 727, 757, SLV777, SLV815, SLV825	4600p
SLV353UB	2600p
CCDF340E, CCDF500E, CCDV90E, CCDV95E, CCDSP5E	4800p
SLV801, SLV802	3550p
SLV310, SLV315, SLV325, SLV335	1600p
SLV210, SLV212, SLV270, SLV273, SLV285, SLV300	1150p
SLV125, 213, 225, 252, 255, 262, 280, SLVX1, 20, 3	1750p
SLV363, SLV416, SLVX50, SLVX55	2750p
SLVX75, SLVX90, SLVX95	3000p
SLV282, SLVX30, SLVX35	2025p
SLHF100P, SLHF100UB	3850p
SLVE7, SLVE8, SLVE9	5150p
SLVE90	5150p
SLV615, SLV625, SLVE600, SLVE700, SLVE800	3450p
TOSHIBA	
V63	1500p
V9680	3400p
V8600, V8650, V8700	3000p
V21, V31, V32, V33, V50, V51, V52, V53, V9600	1450p
V55, V57	700p
V71, V73, V74, V75, V77, V80, V81, V82, V83, V841V85, V86, V87, V88	1200p
DV90, 96, 97, NM3, V108, 109, 199, 200, 202, 205, 207, 209, 80, 93, 94	1450p
V5470, V5480	1300p
V600	2350p
V880MS	2600p
V700G	3700p
V500G, V509G	2500p
V9680	2900p
V300G, V301, V305, V306, V309G	2550p
V61, V63	1700p
V110, V120, V130, V140, V210, V211, V212, V220, V221, V222	1500p
V711, V880	3850p
VCPB1E, VCP2C2	1200p
V65, V66, V6	1250p
V312, V322, V412	2600p
V91G	4600p
V609, V610V610B, V610UK, V611, V659F, V660, V660F	3200p
V312, V403T, V413G	9200p
V703W, V813G	5200p
V95G	8000p

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PINCH ROLLERS/VCR BELT KITS

Model	Price
AKAI	
VS10, VS9300, VS9500, VS9700, VS9800, VP7100, VP77	165p
VS1, VS2, VS3, VS4, VS5, VS6, VS8, VS9, VS12, VS15	165p
VS105, 112, 115, 116, 120, 125, 126, 155, 165, 205, 220, 240, 244, 245, VS247, 248, 250, 512, VS515, 516, VSX9	165p
VS201, 301, 303, 304, 603, 606, 607, VSP8, VSP82, VP58, VP82	165p
VS125, VS155, VS165, VS220, VS240, VS250, VS512	165p
VS22, 23, 25, 35, 37, 38, 53, 66, 75, 422, 425, 426, 427, 462, 465, 467, VS485, 765, 766, 767, 768, 865, 867, 965, 967, VSA77, VSA650, VSF10, 11, 12, 15, 180, 190, 200, 210, 220, 221, 222, 230, 240, 30, 33, VSF330, 4, 500, 550, VSP88, VSR100, VSX400, 450, 470	165p
VSF260, 261, 262, 265, 270, 274, 275, 280, 290, 340, 350, 410, 420, 43C, VSF441, 440, 450, 455, 480, 490, 497, 510, 560, 580, 590, 599, 600, VSG20, 21, 23, 24, 25, 30, 33, 34, 35, 51, 54, 55, 60, 64, 65, 70, 73, 74, 75, VSP110, VSX560, VSX580	165p
VS17, 20, 22, 23, 24, 25, 26, 27, 35, 37, 38, 53, 55, VSA77	775p
PINCH ROLLER ASSEMBLY	
VS422, 425, 426, 427, 462, 465, 467, 485, 498, 765, 766, 767, 768, 865, 867, 965, 967, VSA650, VSF10, 11, 12, 14, 15, 180, 190, 200, 210, 220, 221, 222, 230, 240, 30, 300, 301, 310, 320, 33, 330, 4, 500, 510, 600, VSR110, VSX100, 400, 450, 470	800p
PINCH ROLLER ASSEMBLY	
VSS99	165p
ALBA	
VCR3000X, VCR4000	165p
VCR5000, VCR6000	165p
VCR161, VCR222	180p
VCR7000, VCR7800, VCR8000, VCR8800	165p
VTV10	165p
AMSTRAD	
VCR1000, 2000, 4500, 4600, 4700, 5200, 6000, 6100, 6200, 8600, VCR8602, 8603, 8604, 8700, 8704, 8714, 8800, 8804, 9000, 9005, VCR9244, 9340, DD8900, 8904, TVR1, 2, 3, 4	165p
VCR7000	165p
DD8900, DD8904, VCR6000, 6100, 6200, 8600, 8602, 8603, 8604, VCR8700, 8800, 900>9, 9140, 9244, 9340	700p
PINCH ROLLER ASSEMBLY PART NO: 153148	
TX3650, UF20, VCR3000, VCR3002, VCR4000, VCR9500	300p
PINCH ROLLER ASSEMBLY PART NO: 2554966	
DD9900, 9904, TX3650, UF20, 22, 24, VCR3000, 3002, 9500	165p
VS1004 VS1104	165p
FERGUSON	
3V00, 3V01, 3V16, 3V22, 3V23, 3V24, 3292, 8900, 8901, 8902, 8903, 8904, 8906, 8909, 8912, 8922, 8923, 8924, 8925, 8929	165p
3V29, 3V30, 3V31, 3V32, 3V52, 8930, 8931, 8933, 8940, 8941, 8942	165p
3V35, 3V36, 3V38, 3V39, 3V42, 3V43, 3V44, 3V45, 3V48, 3V49, 3V53, 3V54, 3V55, 3V56, 3V57, 3V58, 3V59, 3V65, FV10, FVII, FV12, FV14, 8943, 8944, 8945, 8947, 8948	165p
3V52	165p
8950, 8951, FV10B, 11R, 13H, 14T, 20B, 21R, 22L, 26D, 31R, 32L, FV33H, 39S, 41R, 42L, 50B, 51R, 52L, VC141L	165p
FV37H, FV44L, FV46T, FV43H, FV57H	165p
3V35, 3V36, 3V38, 3V39, 3V49, 8943, 8944	1100p
PINCH ROLLER ASSEMBLY	
3V42, 3V43, 3V44, 3V45, 3V48, 3V53, 3V54, 3V55, 3V56, 3V57, 8945, 8947, 8948	1350p
PINCH ROLLER ASSEMBLY	
FV37, FV57, FV58	350p
PINCH ROLLER ASSEMBLY	
FV31R	165p
FV41L, FV42L	925p
PINCH ROLLER ASSEMBLY	
3V58, 3V59, 3V64, 3V65, FV10, 11, 12, 13, 14, 20, 21, 22, 26, 30, 32, 33, FV39, VC141L	875p
PINCH ROLLER ASSEMBLY	
FV43H, FV44L, FV45X, FV46T	700p
PINCH ROLLER ASSEMBLY	
FV61, FV62, FV67, FV68, FV70, FV71, FV72, FV74, FV77	775p
PINCH ROLLER ASSEMBLY	
FISHER	
FVHP420, 520, 530	165p
FVHP615, 618, 620, 622, 710, 711, 715, 716, 720, 721, 722, 725, 730, FVHP810, 830, 840	165p
FVHP905, 906, 907, 908, 910, 911, 915, 916, 918, 970, 975, 980, 990, FVHP 5000, 5005, 5050, 5075, 5100	165p
VBR330, VBS3500, 7000, 7100, 7500, 7600, 9000, 9900	165p
FVHD230, 250, 270, 370, 2000D, FVHP3, 210, 250, 300, 310, 1100, FVHP1200, 1250, 130, 132, 1340, 1340, 1400, 1410, 1440, 1500, 200, FVHP320410, 420, 430, 440, 445, 470, 475, FVSP290S, 495, 2905	165p
FVHD140, FVHD40, FVHD55, FVHP1, FVHP10,	

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Model	Price
FVHP20	165p
FVHD140, 40, 55, FVHP1, 10, 25, 30, 40, 4000, FVHS10, 30	1350p
PINCH ROLLER ASSEMBLY	
GOLDSTAR	
GHV51, 1221, 1232, 1233, 1240, 1241, 1242, 1243, 1244, 1245, 1246,	165p
GHV1247, 1248, 1250, 1266, 1290, 1291, 1295, 1296, 1392, 1393, GHV1891, 1900, 2145, 3000, 3010, 4400, 4410, 51, 8000, 8200, GHV8210, 8215, 8430GHVP1240, 1241, 1247, 1248, 1290, 1291, GHVP1295, 1296, VCP4000, 4100, 4130, 4200, 4300, 4301, 4305, VCP4306, 4310, 4311, 4315, 4316, 4320, 4321, 4325, 4326, 4350, GSE1290, 1291, 1295, 1296, 1297, 1891, 1910, 20005, 2000	165p
HITACHI	
VT7, 11, 14, 16, 17, 18, 19, 33, 34, 35, 350, 38, 39, 88, 330, 680, 4200, VT5000, 5030, 5500, 6500, 6800, 7000, 8000, 8300, 8500, 8700, 930, VT9500, 9700, 9900, VM600	165p
VT8, 52, 57, 61, 62, 63, 64, 65, 85, 86, 88, 100, 110, 111, 113, 115, 118, VT120, 122, 125, 128, 130, 135, 138, 145, 150, 168, 170, 175, 220, 225, VT250, 255, 258, 260, 400, 405, 410, 413, 414, 415, 416, 418, 420, 425, VT426, 428, 430, 431, 435, 438, 450, 498, 510, 515, 517, 518, 520, 525, VT526, 530, 535, 536, 540, 545, 546, 548, 570, 575, 576, 580, 585, 588, VT640, 830, VTF660, 665, 70, 770, 774, 775, 780, 785, 860, 861, 865, VTL30, 1000, 2000, VTLC50, VTM598, 620, 622, 625, 626, 630, 635, VTM636, 640, 645, 646, 720, 722, 725, 726, 727, 728, 730, 731, 735, VTM736, 740, 745, 746, 748, 753, 754, 820, 821, 822, 825, 830, 831, VTM835, 838, 840, 841, 845, 920, 921, 922, 925, 930, 931, 935, VTS80, 85, 890, 895VM200, 2300, 2380, 3200, 3280, 500, VMS7200	165p
VT3000	165p
VT410, 420, 428, 430, 450, 498, 518, 520, 522, 530, VTF770, 780, VTM598, 622, 722, 740, 748, 753	650p
PINCH ROLLER ASSEMBLY	
VTF150, 155, 180, 185, 250, 255, 260, 265, 280, 285, 350, 351, 355, VTF360, 365, VTM140, 141, 145, 145, 210, 211, 212, 215, 220, 221, VTM230, 231, 235, 284, VTS390	165p
HINARI	
V20H, VXL5, VXL6, VXL7, 8, 9, 10, 11, 19, 90, H13V, VTV100, 200	165p
VXL2, VXL3	165p
VXL4, VXL20, VXL35	165p
VTV100, VXL10, VXL11, VXL 19, VXL90	700p
PINCH ROLLER ASSEMBLY	
V20H, VXL5, VXL6 MOD KIT	275p
J.V.C.	
HR2200, 3300, 3330, 3360, 3660, 4100, 7700	165p
HR2650, 7200, 7300, 7350, 7600, 7610, 7650, 7655	165p
HRD110, 111, 120, 121, 140, 141, 142, 143, 150, 152, 156, 157, 158, HRD160, 220, 225, 250, 257, 445, 455, 565, 566, 725, 755, HRP50, BP5000, BR7000, BRS611, 811	165p
HRD520, 540, 550, 560, 580, 600, 610, 620, 637, 640, 641, 650, HRD670, 720, 730, 740, 770, 820, 830, 840, 860, 870, 880, 910, 960, HRD980, HRDX20, 22, 25, HRJ200, 205, 210, 215, 300, 315, 316, 318, HRJ400, 405, 407, 410, 411, 415, 416, 507, 600, 605, 610, 615, 715, 815, HRJ97, HRS4700, 5800, 5900, 6800, 6900, SR3200, 330, 368	165p
HRD170, 171, 180, 210, 211, 217, 230, 300, 320, 321, 330, 337, 350, HRD370, 400, 430, 440, 441, 470, 500, 530, 700, 750, 950, HRS5000, 5500, 8000, 9000, BR7030, 7040, 9060,	
BRS600, 605, 747, 777, 920, 925	165p
HRS10	165p
BP5000, HRD110, 111, 120, 220, 225, 455	1100p
PINCH ROLLER ASSEMBLY	
HRD140, 141, 142, 143, 150, 152, 157, 158, 160, 565, 566, 725, 755, HRP50	1350p
PINCH ROLLER ASSEMBLY	
HRD1520, 510, 520, 521, 522, 525, 527, 560, 600, 610, 620, 637, 641, HRD650, 720, 830, 840, 910, HRJ205, HRS5800	350p
PINCH ROLLER ASSEMBLY	
BR7030, BRS600, HRD160, 170, 171, 180, 190, 210, 211, 217, 227, HRD230, 271, 300, 310, 320, 321, 330, 337, 350, 400, 430, 440, 441, HRD470, 500, 530, 700, 750, 950, HRS5000, 5500, 9000	875p
PINCH ROLLER ASSEMBLY	
HRD540, HRD550, HRD580, HRD660, HRD860, HRD960	700p
PINCH ROLLER ASSEMBLY	
HRJ600, HRJ605, HRJ815, HRS9200	875p
MATSUI	
VX6000, 730, 735, 750, 755, 765, 800, 850, VS888	165p
VX1000, VX2000, VX2500, VX3000, VX6000A	180p
MITSUBISHI	
HS12, 5300, 5424, 5600, HSB11, 12, 16, 21, 27, 31, 32, 41, 51, 52, 82, HSE12, 16, 17, 21, 22, 27, 31, 32, 41, 51, 52, 82, HSM1000, 110, 120, 15 0, 16, 170, 190, 210, 23, 25, 250, 27, 33, 34, 35, 36, 37, 370, 380, 45, 450, 5 4, 55, 555, 57, 58, 59, 68, HSMS2, 9, HSS11, 14, 15, 17, 19, 25, 5600, HV F125, 150, 303, 85, SV8900, 8930	850p

Model	Price
PINCH ROLLER ASSEMBLY PART NO: 948D020010	
HSE11, 12, 16, 17, 21, 22, 27, 31, 32, 41, 51, 52, 5300, 5424, 5600, HSB11, 12, 16, 21, 27, 31, 32, 41, 51, 52, 82, HSM1000, 110, 120, 150, HSM16, 170, 18, 190, 210, 23, 25, 250, 27, 30, 33, 34, 35, 36, 37, 370, 38, HSM380, 40, 45, 450, 50, 54, 55, 555, 57, 58, 59, 60, 68, HSMS2, 9, HSMX1, 18, 19, 2, HSS11, 12, 14, 15, 17, 19, 21, 25, 5600, HVF125, HVF150, 303, 85, SV8900, 8930	165p
HS200, HS300, HS301, HS302, HS303, HS304, HS310, HS320, HS330, HS360, HS700	165p
HS306, HS307, HS318, HS319, HS337, HS338, HS347, HS349, HS400, HS410, HS411, HS412, HS421, HS480, HS710, HSB 10, HSB20, 30, HSE 10, 20, 30, 70	165p
NATIONAL PANASONIC	
NV100, 180, 300, 330PX, 332, 333, 340, 366, 600, 688, 777, 788, 3321, AG6010, 6015, 6100, 6200, 6400, 6800, 7450	165p
NV230, 250, 260, 280, 370, 380, 430, 431, 433, 450, 460, 465, 470, 480, NV630, 650, 730, 770, 780, 810, 830, 850, 870, 890, 2000, 2010, 3000, NV7000, 7200, 7800, 8050, 8150, 8170, 8200, 8300, 8400, 8500, 8600, NV8610, 8620, NVG11, 14, 16, NVG7, 10, 12, 15, 18, 30, 130, 400, AG 1000, 1050, 1200, 1500, 2100, 2200, 6500, 6810, 7500, 7510,	
NVH70	165p
NVG9, NVG120	165p
AG6840, 6720, 7150, 7330, 7350, 7355, 7650, NVH65, 75, NVJ30, NVL20, 23, 25, 28, NVG300, NVF65, NVF70, NVFS1 NVFS 100, NVG 19, 20, 25, 33, 40, 50, NVV8000	165p
NVD48, NVD80, NVG21 NVG45	165p
NVJ700PX	165p
NVHD100, NVHD101, NCHD90, NVSD30, NVSD40	1125p
PINCH ROLLER ASSEMBLY	
AG5150, 5250, 5700, 6024, NVD38, 48, 80, NVF55, 65, 70, 75, 77, NVFS1, 100, 200, 88, 90, NVG 19, 20, 21, 22, 25, 28, 300, 33, 40, 45, 46, NVG50, NVH65, 75, 77, NVJ30, 33, 35, 37, 40, 42, 45, 47, NVL20, 23, 25, 28, NVW 1	350p
PINCH ROLLER ASSEMBLY	
N.E.C.	
N830, 831, 832, 833, 895	165p
PVC2300, 2400, 740, 744, 746, 760, 764, 766	165p
DX1000, 1600, 1800, 2000, 3000, N9012, 9013, 9014, 9016, 9033, N9034, 9053, 9054, 9055, 9056, 9066, 9096, 9110, 9120, 9510, 9520, N9530, 9610, PX 1200	165p
DS6000G, DX4000, N9077, NS7000	165p
ORION	
VH1, VH2	165p
VC150, 180, VH3, 33, 200, 201, 205, 212, 250, 254, 288, 300, 303, 312, VH404, 555, 700, 704, 712, 770, 780, 844, 900, 1000, 2948, 3030, 3312, VHF2A, VP2948	165p
COMB 15000, 16000, HV03, LVH50, NEVH, NEVHM, NEVHML, TVP230RC, VCP, VH04, 30, 103, 300, 358, 360, 362, 400, 416, 512, VH530, 532, 535, 536, 600, 630, 635, 640, 666, 730, 735, 744, 774, 790, VH800, 820, 850, 888, 893, 900, 930, 940, 942, 974, 1012, 1040, 1050, VH1060, 1070, VH1100, 1120, 1204, 1440, 1500, 1660, 1800, 2004, VH2151, 2308, 22042400, 2500, 2600, 2700, VH2960, 2970, 3050, VH3060, 4000, 4008, 4010, 4012, 4015, 4015, 4020, 4300, 5020, VP 10, 200, 220, 225, 245, VR821, 925, 1032, 2949, 2959, 2957, 2966, 2979, 2980, VTV300, VXL20, 25, 30	165p
PHILIPS	
VR6460 VR6920	165p
VR2020, VR2021, VR2022, VR2023, VR2024	165p
VR6711	165p
VR6540	165p
DV856, 586, VR702, 703, 6485, 6585, 6589, 6785, 6880, 6948	165p
VR445, VR6442, VR6542, VR6643, VR6843, VR6943, 44SB9	165p
DV464, 662, VR2220, 2300, 2324, 2330, 2334, 2340, 2350, 2414, VR2480, 2485, 2486, 2489, 2490, 2498, 2840, 6462, 6463, 6464, 6560, VR6660, 6860, 6861, 6862, 6863	165p
N-1700, VR2870	165p
VR2025, VR6580, VR6581	165p
49SB6, VR3260, 6349, 6448, 6449, 6548, 6648	165p
PRESSURE ROLLER ASSEMBLY PS403-40205	
DV186, 190, VR211, 2115, 212, 213, 223, 286, 291, 292, 311, 312, 313, VR3210, 3219, 322, 3229, 323, 535BO, 486, 471, 562, 582, 571, 761, VR201, 202, VR203, 302, 303, 305, 6180, 6182, 6185, 6285, 6290, VR6291, 6293, 6362, 6367, 6390, 6391, 6393, 6467, 6468, 6470, 6561, VR6570, 6581VR6670, 6676, 6710, 6760, 6761, 6762, 6870, 6970, VR6975, 86BI, 63SB7, 68SB4, 71SB4, 71SB5, 72SB8, 72SB8, 92SB31, 20DV1, 20DV2, 20RW7, 21DVI, 21DV2, 2SB01, 2SB02, 2SB11, 2SB12, 30DV2, 31DVI, 31DV2, 31DV33SB02, 3SB03, 3SB05 3SB11 3SB12 3SB13	300p
VR231, 232, 332, 422, 4229, 512, 5229, 722, 7229, 723	165p
VR501	PR38 165p
SANYO	
VHR1100, 1110, 1150, 1200, 1300, 1500, 2100, 2300, 2370, 2500,	

Model	Price
VHR2700, 3330, MVR220	165p
VTC5000, 5150, 5300, 5350, 5400, 5500, 6000, 6010, 6500, 9100, VTC9300, VTCM10, 20, 11, 21, 30, 31, 40, 50, VPR5800	165p
VHR3100.3300, 3310, 3400, 3500, 3700, 3800, VHRD500, 700	165p
VTC3000	165p
VHR120, 130, 14, 141, 143, 14, 150, 151, 153, 154, 15, 16, 171, 194, 22 0VHR23, 235, 240, 244, 250, 251, 274, 27, 297, 310, 330, 335, 350, 390, VHR4100, 4105, 4150, 4200, 430, 4300, 4350, 4400, 474, 4770, 5080, VHR5100, 5200, 5300, 5350, 5600, 5700, 6850, 7100, 7200, 7250, VHR7260, 7300, 7400, 7440, 7500, 7520, 7530, 7540, 7700, 774, 780, 0VHR7810, 8000, 8070, 8100, 8200, 8250, 8500, 8800, VHRD4400, 4410, 4500, 4600, 4610, 4710, 4890, 6700, VHRS700	165p
VCR100	165p
VHR120, 135, 150, 190, 4150, 4160, 4350, 5200, 5240, 5350, 7200, 7250, 7260, 7700, VHRD4410, 4610, 4710, 4890, 5450, VHRS700	975p
PINCH ROLLER ASSEMBLY	
VHR3100, 3200, 3300, 3310, 3400, 3700, 3800, VHRD500, 7000	1350p
PINCH ROLLER ASSEMBLY	
SHARP	
VC200, 381, 383, 384, 385, 386, 388, 390, 393, 800, 2300, 3300, 6000, VC6200, 6300, 7300, 7700, 7750, 7800, 8300, 838, 9100, 9300, 9400, VC9500, 9600, 9700, 9800	165p
VC300, 387, 402, 471, 473, 477, 481, 482, 483, 486, 488, 496, 500, 571, 573, 581, 582, 583, 584, 585, 8481, VC5F3, VC5W20E, VCA1031	165p
VC108, 208, 405, 408, 550, 600, 651, 671, 674, 681, 682, 684, 685, 693, VC699, 700, 772, 750, 779, 780, 781, 7810, 782, 782MK2, 7822, 783, VC785, 786, 787, 793, 800, 7810, 7822, VCT72, VC6F3, VC6V3, VCA 100, 102, 104, 131, 140, 170, 202, 203, 211, 234, 303, 501, 502, VCA602, 5011, VCD801, 802, 851, 852, 881, 882, VCM73, VCT73, VCT72, VCB361	165p
VC220	165p
VCA10, 30G, 60, 103, 105, 106, 111, 113, 131, 211, 244, 254, 33, 35, 36, VCA37, 39, 40, 42, 454, 46, 47, 48, 50, 505, 51, 52, 53, 54, 55, 57, 58, 505, VCA60, 605, 615, 62, 63, 67, 68, 1031, 11613, VCB311, 320, VCBS97, VCD805, 806, 810, 815, VCH80, 81, 865, 910, VCS 1000, VCT310, VCT410, 610, VCT 1314, 5313, VC790	165p
VC780, 790, VCA10, 103, 1031, 105, 106, 211, 244, 254, 255, 30, 35, VCA340, 43, 47, 50, 60, 605, 615, VCD806, 815, VCH80, 81, 83, 85, VCH865, 87, 910, VCS 1000, VCT212, 310, 410, 510, 610, VCTI314, VCTS313	525p
PINCH ROLLER ASSEMBLY	
SAISHO	
VHL3, VR1000, 2000, 2500, 3200, 3300, 3500, 3600, 3650, 3800, VRS4400, VRS5000	165p
VR3400	180p
SAMSUNG	
SV716, 717, VB510, 520, 610, 616, 617, 619, 620, 626, 627, 629, 900, V910, V1510, 520, 611, 616, 621, 626, 900, 910, VX510, 520, 616, VX617, 619, 626, 627, 629	165p
SVX301, 303, 305, 307, 319, 322, VB710, 713, 750, 770, 971, 8220, VB8225, V1710, 730, 750, 770, 790, 8220, 8225, 970, VX710, 712, VX720, 730, 750, 770, 790, 825, 8225, 970, 971, 972, 8225, PX980, 981, 982, SE9000, 9001, SX7120, 7121, 7220, 7221, 7230, SX7301, VK8220, VPX31	165p
VX9880	165p
PX31 R, 32R, PXR30, SV80, SX3230, 3231, 3260, 3261, VS390, VX30, 31, 32, 3560, 3561, 370, 375, 380, VXK300, 301, 306, 307, 320, VXK321, 326, 330, 331, 336, 337, 350, 351, 356	165p
PX990, 991, 992, S11230, 1240, SVX4000, 503, 504, 600, SX1230, SX1231, 1260, 1261, 1566, V11560, VPK43, VX1230, 1260, 1261, VX1560, 1561, 1850	165p
SONY	
SLC5, 6, 7, SL3000, 8000, 8080, 8200, SLJ 10, SLT6ME, SLT7ME	165p
SLC9, 20, 24, 30, 33, 44, SLHF100, SLF1, 11, 20, 25, 30, 35, 60, 100, SLF200, SLF60PS, SLF90E, SLFH150, 850, SLK88, 95, SLT20ME, SLT30ME, SLT50ME	165p
BMC 100, BMC200, BMC500	165p
SLV201, 202, 301, 302, 401, 402, 801, 802	165p
SLV210, 270, 273, 275, 300, 353, 373, 410, 415, 474, 656, 715, SLV757, 777	165p
SLV255	165p
SLV275, 282, 315, 325, 353, 363, 373, 410, 415, 416, 474, 625, 656, SLV715, 725, 727, 757, 777, 815, 825, SLVX30, 50, 55	165p
SLV125, 213, 225, 252, 255, 262, SLVXI, 20, 3	165p
SLV215, 216EE, 275, 282, 315, 325, 353, 363EE, 373, 393, 410, 415, SLV416EE, 474, 494EE, 555UC, 559, 575UC, 579, 585HF, 595HF, SLV60W, 615, 625, 656, 676UC, 686HF, 696HF, 715, 725, 727, 757, SLV767B, 777, 815, 825, SLVE7, 8, 9SLVX30AS, SLVX30AF, SLVX50AS, SLVX55DH, SLVX65BR, SVO140, 160	1250p
PINCH ROLLER ASSEMBLY PART NO: X37277701	
SLV210, 212, 270, 273, 275, 285, 300, 310, 335, 425, 427	350p
PINCH ROLLER ASSEMBLY	
SV6700.8750, 9700, VHR3100, 3200, 3300, 3310, 3400, 3700, 3800, VHRD500, 700	1350p
PINCH ROLLER ASSEMBLY	

Model	Price
SL100, 200, SLC20, 30, 33, 34, 40, 44, 80, 88, 9, SLF1, 20, 25, 30, 35, 45, SLF60, 65, 73, 90, SLHF100, 150, 950, SLK85, 95, SLO1700, SLS550, SLT0, 30, 50	300p
PINCH ROLLER ASSEMBLY	

VCR BELT KITS

Model	Price
AKAI	
VP7100, VS9300, VS9500, VS9700, VS9800	120p
VS1, VS2, VS3, VS5, VS12, VS15, VP88	100p
VS10	65p
VSX9, VS105, 112, 115, 116, 120, 125, 126, 155, 165, 205, 220, VS24, 240, 244, 245, 247, 248, 250, 512, 515, 516	300p
VS22, VS23, VS25, VS35, VS37, VS38, VS53, VS55, VS66	80p
VS4, VS6, VS8, VS9	120p
VSA77	140p
VSS99	105p
ALBA	
VCR40000	130p
VCR5000, VCR6000	105p
VCR161, VCR222	100p
VCR3000X, VCR4000, VCR4000X	75p
VCR7000, VCR7800, VCR8000, VCR8800	110p
VTV10	105p
AMSTRAD	
TVR123, VCR4600, VCR4700, VCR5200	110p
VCR7000	80p
VCR1000, 2000, 6000, 6100, 6200, 8600, 8602, 8603, 8604, VCR8700, 8704, 8714, 8800, 8804, 9000, 9005, 9244, 9340, DD8900, DD8904, TVR4	110p
TX3650, UF20, 22 24, VCR3000, 3002, 4000, 9500	75p
VS1004	105p
BLAUPUNKT	
RTV100	200p
RTV200, RTV222, RTV224	90p
RTV202, RTX200	150p
RTV322, RTV248	100p
RTV306, 307, 309, 310, 311, 312, 328, 414, 434, 444, 707	135p
RTV211, RTV214	140p
RTV324, RTV325	65p
RTV315, RTV316, RTV319, RTV320, RTV317	50p
RTV301, RTV333, RTV338, RTV404, RTV424	85p
FERGUSON	
3292, 3V00, 3V01, 3V16, 3v22, 8900, 8901, 8902, 8903, 8904, 8906, 8909, 8912, 8922	120p
3V23, 8923, 8924, 8929	65p
3V29, 3V30, 8930, 8931, 8933, 8940	75p
3V31, 3V32, 8941, 8942	75p
3V35, 3V36, 3V38, 3V39, 3V49, 8943, 8944	75p
3V42, 3V43, 3V44, 3V45, 3V48, 3V53, 3V54, 3V55, 3V57, 8945, 8947, 8948	55p
3V58, 3V43, 3V44, 3V59, 3V64, 3V65, 8950, 8951, FV10, FV11, FV12, FV13, FV14, FV20, FV21, FV22, FV26, FV32, FV39, VC141L	55p
FV31R	110p
FV61L, FV62, FV67, FV68, FV70, FV71, FV72, FV74, FV77	50p
FV43H, FV44L, FV46T, FV57H	100p
FV37H	80p
3V52	55p
FV41R, FV42L	100p
FIDELITY	
HOS200, VCR1000, 2000, 600, 6000, 6100	180p
VCR100	160p
VTR1000, VTR1001	100p
TX3650, VCR3000, VCR3002, VCR9500	75p
FISHER	
VBS7000	245p
VBS9000	120p
FVHP520, FVHP530, FVHP420	60p
FVHP615, 618, 620, 622, 710, 711, 715, 720, 721, 722, 725, 730, FVHP830, 840	75p
FVHP905, 906, 907, 908, 910, 911, 915, 916, 918	75p
VBR330, VBS7500, VBS7600, VBS9900	100p
VBS3500	75p
FVHD140, FVHD40, FVHD55, FVHP1, FVHP10, FVHP20	110p
FVHD230, 250, 270, 370, FVHP1100, 1200, 1250, 130, 132, FVHP1340, 1400, 1410, 1440, 1500, 2000, 200, 210, 250, 3, 300, 310, 320, 2000, 410, 420, 430, 440, 445, 470, 475, FVSD2905	85p
FVHP5000, 5005, 5050, 5075, 5100, 975, 980, 990	95p
G.E.C.	
4005	150p
V4004	100p
V4007	80p
GOLDSTAR	
GHV1221, 1232, 1233, 1240, 1241, 1242, 1243, 1244, 1245, GHV1246, 1247, 1248, 1250, 1266, 51, 8000, 8200, 8210, 8215, VCP4100, VCP4130	80p
GHV1290, 1291, 1295, 1296, VCP4000, 4200, 4300, 4301, VCP4305, 4306, 4310, 4311, 4315, 4320, 4321, 4325, 4326	120p
GRANADA	
VHSH1, VHSAH3	100p
VHSVH4, VHSWH1, VHSXH1	60p
VHSYH2	50p
VHSBH1, VHSCH 1	150p
VHSBP1	135p
VHSAN3	110p
VHSDS2	125p
VHSAY3	125p
VHSBY3	100p
VHSEY1, VHSEY2	70p
VHSCC1	100p

VCR BELT KITS/VIDEO LAMPS & SWITCHES

Model	Price
GRANADA	
VHSDP1, VHSFV2	80p
VHSTJ1, VHSTJ2	150p
VHSTJ3	65p
VHSWJ1, VHSWJ2	120p
VHSXJ3	85p
VHSYJ2	80p
VHSFJ2	140p
VHSFS1, VHSFS2	130p
VHSFG1, VHSFG2, VHSFG3, VHSFG4, VHSF63	180p
GRUNDIG	
MVS400, 440, VS400, 410, 415, 435, 440, 441, 450, 456, 460	55p
VS180, 200, 220, 226, 262, 265, 267, 2X40800, 0850, 0880, 1600, 2000, 2080, 2200, 2280, MVS200RC	90p
VS150	160p
VS310, 311, 315, 320, 326, 340, 345, 380, 385, 445	85p
VS150	75p
LC290N, LC295SN, SVS 180, VS 170	70p
VS 160, BARCELONA, FLORENZ, GV4000, 4000, 4001, GV4002, 400, 401, 4010, 402, 403, 404, 405, 406, 407, 4092, 410, GV411, 412, 414, 415, 416, 417, 4192, 4200, 420, 430, 434, 435, GV437, 440, 450, 4592, 460, 464, 470, 500, 501, 5050, 5095, GV5105, 511, 530, 5395, 540, 560, 5695, MV4005, 4105, SE4100, 4104, 4120, 5102, 5104, 5106, TVR37001	70p
HINARI	
VXL2	80p
VXL7, VXL8, VXL9, VXL10, VXL11, VXL19, VXL90, VCR34, VTV 100, 200	180p
VXL4, VXL35, VTV300	70p
VXL5, VXL6	160p
VXL3, VXL20	90p
HITACHI	
VT11, 14, 16, 17, 19, 33, 330, 34, 35, 350, 38, 39, 88, 165, 5030	85p
VT5000, VT5500, VT18	120p
VT7000, VT8000, VT8030, VT8040, VT8300, VT8500, 8700	60p
VT680, VT6500, VT6800, VT9300, VT9500, VT9700, 9900	75p
VT52, VT57, VT61, VT62, VT63, 64, 65, 85, 86, 640	90p
VT3000	120p
VT100, 110, 111, 113, 115, 118, 120, 125, 128, 130, 135, 138, VT145, 150, 168, i70, 175, 220, 225, 250, 255, 258, 260, VTL30	90p
VM500 VM600	90p
J.V.C.	
HR3300, HR3330, HR3360, HR3660, HR4100	130p
HR7200, HR7300	70p
HR7350, HR7600, HR7610, HR7650, HR7655	75p
HR7700	75p
HRD110, 111, 120, 121, 220, 225. BP5000	90p
HRD140, 141, 143, 150, 152, 157, 158, 160, 190, 250, 257, 310, HRD455, 565, 566, 725, 755, HRP50	55p
HRD170, 171, 180, 210, 21 1, 217, 230, 300, 320, 321, 330, 337, HRD350, 370, 400, 430, 440, 44 1, 500, 530, 700, 750 950, HRS5000, 5500, 8000, 9000, BR9060, BRS600, 605, 920, 925	50p
HRD227, 520, 52 1, 522, 527, 600, 610, 620, 637, 641, 650, 830, HRD840, HRDX20, 22, HRJ200, 205, 300, 305, SR330, HRS10	80p
HRD840, 550, 560, 580, 590, 640, 660, 670, 720, 730, 740, 770, HRD820, 860, 870, 880, 910, 960, 980, HRDX20, 25, HRJ2 10, HRJ215, 315, 316, 318, 400, 405, 407, 410, 411, 415, 416, 507, HRJ6 10, 615, 715, 97, HRS4700, 5800, SR3200, SRS368E	60p
HRJ600	40p
LOGIK	
VR955	180p
MATSUI	
VX600, 730, 735, 750, 755, 765, 850, 6000, VS888	75p
VX1000, VX2000, VX2500, VX3000, VX6000	100p
VX800	70p
MITSUBISHI	
HS200	200p
HS300, 301, 302, 307, 310, 337, 338, 347, 349, 411, 412, 421, 480, HSB10, 20, 30, HSE10, 20, 30, 70	110p
HS303, HS304, HS306, HS307, HS330, HS400, HS700	110p
HS318, HS319, HS410	110p
HSM1000, 16. HSM23, 25, 33, 34, 35, 37, 54, 55, 57, 58, 59, 68	55p
N.E.C.	
N830, N831, N832, N833	100p
N895	80p
PVC2300, PVC2400	180p
DX1000, 1600, 1800, 2000, 3000, N9012, 9013, 9014, 9016, N9033, 9034, 9053, 9054, 9055, 9056, 9066, 9096, 9110, 9120, N9510, 9520, 9530, 9610	85p
NATIONAL PANASONIC	
NV300, NV330PX, NV332, NV333 NV340, NV366	100p
NV777, NV788	100p
NV2000, NV2010, NV3000	100p
NV7000, NV7200, NV7800	95p
NV8600, NV8610, NV862	145p
NV230, 250, 280, 430, 431, 433, 450, 460, 465, 470, 650, 730, NV770, 810, 870, 890, 970, AG 1000, 1050	110p
NV370, NV380, NV480, NV630, NV780, NV830, NV850	70p
NV600, NV688, AG6010, AG6015	100p
NVG7, 9, 10, 11, 12, 14, 15, 16, 18, 30, 130, 400, NVH70	50p
NVFV1, NVM10, 3000, 3300, 40, 7, 9000, 9900, NVMS1, 4	70p
NVM 1, NVM3, NVM5	70p
PHILIPS	
VR6460, VR6920	170p
VR6540	100p
VR6442, VR6542	70p
VR2025, VR2580	100p
DV186, 190, 286, 291, 292, 468, 471, 562, 571, 761, VR201, 202, 203, 211, 2115, 212, 213, 223, 311, 312, 313, 3210, 3219, 322, 32. 29, 323, 535, VR20DV1, 20DV2, 20RW7, 21DV1, 21DV2, 21D, V3, 25BO1, 25BO2, 11, 12, 302, 303, 305, 31DVI, 31DV2, 31D, V3, 3SB11, 3SB12, 3SB13, 72SB8, VR30DV2, 35BO2, 35BO3, 635B7, 715B4, 715B5, 715B8, VR865B2, 915B2, 925B3, VR6180, 6182, 6185, 6285, 6290VR6291, VR6293, 6362, 6367, VR6390, 6391, 6393, 6467, 6468, 6470, 6561, 6570, 6581, 6670, VR6676, 6710, 6760, 6761, 6762, 6870, 6970, 6975, VR68SB4, 86SBI, 92SB3	85p
VR445B9, VR445B920, VR445B922, VR6443, 6843, 6843, VR6943	100p
VR3260, 6349, 6448, 6449, 6548, 6648, 49SB620, 644869S, 49SB6	110p
VKR6850, VKR6855	70p
VR501	110p
VKR6800, VKR6810, VKR6820	70p
SE4104, VR231, 2310, 2319, 231, 232, 2329, 237, 23, 241, 2410, 2419, 242, 243, 245, 2469, 247, 2479, 251, 252, 256, 257, 258, 33, 19, 332, 3329, 333, 337, 339, 3419, 342, 343, 3469, 347, 3479, 35, 1, 352, 357, 358, 422, 4229, 432, 437, 442, 4229, 432, 437, 442, 44, 5, 4469, 447, 4479, 451, 452, 457, 458, 459, 512, 522, 5229, 6379, 642, 647, 722, 7229, 723, 7379, 747, 8389, 948, 9489	70p
SAISHO	
VR2000, VHL3	90p
VR3800, 3200, 3300, 3500, 3600, 3650, VRS4400, 5000	75p
VR3400	100p
SAMSUNG	
SV716, 717, V1616, V~621, V1626, VX616, VX617, VX619, X626, VX627, VX629, VX714	85p
VB520, 510, 610, 616, 617, 619, 620, 626, 627, 629, V1510, 520, V1611, 616, 621, 626, VX510, 511, 520, VT320, 5600	100p
VB900, VB910, V1900, V1910	110p
PX980, 981, 982, SE9001, SV9001, SVX307, 319, 322, VB750, 770, 8220, 8225, V1770, 790, 8220, 8225, VK8220, VPX31, VX750, VX770, 790, 8220, 8225, SE9000, 9001	90p
SVX301, 303, 305, SX7301, VB710, 971, V1710, 730, 750, 970, VX710, 712, 720, 730, 970, 971, 972	100p
VX9880	110p
SX7121	95p
SANYO	
VTC5000, 5150, 6000, 6500, VTCM10, 11, 20, 21, 30, 31, 50	75p
VTC5300, VTC5350, VTC5400, VPR5800	80p
VTC5500	70p
VTC9100, VTC9300	140p
VTC1100, 1300, 1500, VHR1100, 1110, 1150, 1200, 1300, VHR1500, 2370, MVR220	90p
VHR2100, VHR2300, VHR2500, VHR2700	100p
VHR3100, 3110, 3150, 3300, 3310, 3400, 3500, 3700, 3800, VHRD500, 700, TLS1000, TLS1001	80p
VHR120, 130, 14, 141, 143, 14, 150, 151, 153, 154, 15, 16, 171, VHR194, 220, 23, 235, 240, 244, 250, 251, 274, 297, 310, 330,VHR335, 390, 4100, 4105, 4150, 4200, 430, 4300, 4350, 474, VHR4770, 5080, 5100, 5200, 5300, 5350, 5700, 6850, 7100, VHR7200 7250, 7260, 7300, 7400, 7500, 7520, 7530, 7530, VHR7540, 7700, 774, 7800, 7810, 8000, 8100, 8200, 8250, 8500,VHR8800, 8801, VHRD4400, 4410, 4500, 4600, VHRD4610, 4710, 4890, 6700	75p
VMD66, VMD68P	80p
VTR1000	70p
VTC6010	75p
SHARP	
VC200, 381, 384, 385, 386, 388, 390, 393, 838, 9100, 9300, 9500, VC9700	100p
VC7300, VC7700, VC7750, VC7800, VC8000	110p
VC8300	115p
VC300, 387, 471, 473, 481, 482, 483, 486, 488, 496, 8481	80p
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VC108, 405, 408, 550, 600, 651, 674, 681, 682, 682, 684, 685, 693	
VC700, 750, 783, VC6F3, VC6V3	70p
VC208, 671, 772, 779, 780, 781, 782, 785, 786, 787, 793, 800,VC7810, 7822, VCA100, 102, 103, 104, 131, 140, 170, 202, 03, VCA234, 501, 502, 602, 5011, VCB311, 361, VCD801, 802, VCH851, 852, 882, VCM73, VCT72	75p
VCA10, 103, 105, 106, 113, 11613, 211, 234, 244, 254, 30, 33, 35, VCA36, 37, 40, 43, 454, 48, 50, 505, 51, 52, 53, 54, 55, 56, 57, 58, VCA60, 605, 615, 67, 68, 1031, VCB320, VCBS97, VCD805, VCD806, 810, 815, VCH80, 81, 85, 865, 910, VC51000, VCT212, 310, 410, 610, VCT1314, VCTS312, 313, VC790ET	80p
VCC10	70p
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SLC5, SLC7, SLJ7, SLJ9, SLT7ME	140p
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SL8000E, SL8080E, SL8200, SL8600	175p
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V33, V31, V32, V51, V52, V53, V9600, V9680	85p
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V108, 109, 110, 120, 130, 140, i99, 209, 210, 211, 220, 221, 411,V421, 609, 610, 611, 659, 660, 711, 880	120p
V91 G, V95G	115p
V212, 213, 22-2, 3i2, 322, 403, 412, 413, 610, 703, 813	50p
VCPB1E	110p

Model Price Model

Models & Description	Order Code	Price
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PANASONIC VIDEO LAMPS	VL02	30p
SHARP VIDEO LAMPS	VL02	30p
HITACHI 5381682 (VT63, VT64) VIDEO LAMPS	VL04	135p
AIWA, AKAI, ALBA, AMSTRAD, BLAUPUNKT, FERGUSON, FIDELITY FISHER, FUJITSU, FUNAI, G.E.C., GOLDSTAR, GRANADA, GRUNDIG, HINARI, HITACHI, ITT, JVC (HRD SERIES), MATSUI, MITSUBISHI, NEC, ORION, NATIONAL, PHILIPS, SAISHO, SALORA, SAMSUNG, SANYO, SHARP, SIEMEN, SONY, TELEFUNKEN, THOMSON,TOSHIBA	VL05	100p
AKAI, GRANADA (VHSTJ2), HITACHI (VT3000), ITT (VR3912, VRP3833), JVC (HR2200, 3300, 3330, 3660), MITSUBISHI (HS200), TELEFUNKEN (VR510, 519, 610),THOMSON (VK300, 305, 306, 3301), FERGUSON (3V00, 16, 22, 24, 3292, 8900, 8901, 8902, 8903, 8909, 5912, 8922, 8925)	VL01	25p
BLAUPUNKT,ORION (VH1, 2A), NATIONAL (NV200,2010, 3000, 7000, 8150, 8200, 8400, 8600, 8610, 8620), SHARP (VC2300, 6000, 6200, 6300, 7300, 7700, 8300)	VL02	30p
AKAI IVS10),GRANADA (VHSXJ3), TT (VR3993,3994), JVC (HR2650, 7600, 7610, 7650, 7655), TELEFUNKEN (VR530, 535, 539, 550, 630, 650), THOMSON (V309, 316, 357, VK309, 411,TX8000), FERGUSON (3V31, 8941, 8942)	VL06	40p
AUTHENTIC (N850), DECCA (VR8300),GRANADA (VHSTJ3, WJ1, WJ3), ITT (VR3913, 3914, 3963) JVC (HT7200, 7300, 7350, 7700) TELEFUNKEN (VR450, 520, 529, 540, 549, 620, 640, 920, 1920), THOMSON (V4100, VK308, 309, 312, 410), FERGUSON (3V23, 29, 30, 8923, 8924, 8929, 8930, 8931, 8940)	VL07	40p
GRANADA (VHSAY3),SHARP (VC200, 381, 384, 385, 386, 388, 390, 393, 9300, 9500, 9700)	VL08	45p

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Price Model Price

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USED ON: KV1612, MK1, KV1612, MK2, KV1614, KV2052, KV2056, KV2062, KV2068, KV2212, KV2216, KV2252, KV2256, KV2704 KV2705,KV2706, KV2752PE3, KX20PS1, KX20PS2, KX27PS1
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USED ON: KV2022, KV2024
PRICE: 200p
PART NO: (POWER SWITCH 26mm)
USED ON: KV1400, KV1440, KV2040, KV2060
PRICE: 125p
PART NO: (POWER SWITCH 21 mm + REMOTE SWITCH)
USED ON: KV2020
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PART NO: 2 PIN (FUNCTION SWITCH)
USED ON: KV1612, MKK, V1612, MK2, KV2052, KV2056, KV2212, KV2215, KV2216, KV2252, KV2256, KV2704, KV2705, KV2706, KV275PE3, KV2756PE3 **35p**

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	MZ366960J2	IT02
GOLDSTAR	VXP0521	IT17
HITACHI	6861471	IT03
	6861482	IT04
	6886971	IT05
JVC/ FERGUSON	PU 48967B	IT06
	PU 51380	IT07
	PU 51402A	IT08
	PU 55373	IT09
	PU 55374	IT10
NATIONAL	VXP 0329	IT11
PANASONIC	VXP 0343	IT12
	VXP 0344	IT13
	VXP 0401	IT14
	VXP 0433	IT15
	VXP 0463	IT16
	VXP 0521	IT17
	VXP 0581	IT18
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3V58/59/64/65
HRO170/180/210/230/300/320/370/400/430/530/700/750
HRS5000
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3V29/3V30
HR7200/7300/7350
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3V35/36, 38/39/49
HRO110/111/120/225
Contents
BELT SET, PINCH ROLLER, TENSION BAND, IDLER TYRES
Order Code: SK04 £5.00

3V31/3V42
HR7600/7610/7650/7655

Contents	*Economy Kit Contents*
BELT SET, T/U REEL TABLE TYRE. PINCH ROLLER. REEL IDLER. T/U CLUTCH. T/U IDLER. TENSION BAND. VIDEO LAMP	BELT SET, T/U REEL TABLE TYRE. PINCH ROLLER. REEL IDLER TYRE. T/U IDLER TYRE. T/U CLUTCH
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3V35/36/38/39/49
HRO110/111/120/121/225

Contents	*Economy Kit Contents*
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3V29/3V30
HRO7200/7300/7350

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HRO250/257/565/566/755

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VIDEO SERVICE KITS *(Cont.)*

VT11/VT33

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VT52/61/62/63/64/65/85/86/640

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Contents
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VT100/110/111/113/115/118/120/125/128/130/135/138/145/150/175/220/225/250/255/258/260/VTL30
Contents
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PANASONIC

NV2000/NV2010 *Contents*	NV7000/NV7200/NV7800 *Contents*
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NV300/NV330/NV333/NV340/NV366
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BELT SET. PINCH ROLLER. TENSION BAND. IDLER TYRE
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NV2000/NV2010

Contents	*Economy Kit Contents*
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NV7000/NV7200/NV7800

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Contents	*Economy Kit Contents*
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NV332

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NV600/NV688

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NV730/NV770

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NV370/NV380/480/630/780/830/850/AG2100PK/AG2200PK

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NV777/NV788

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VIDEO SERVICE KITS *(Cont.)*

SHARP
VC381

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VC681/VC682/VC684/VC685/VC693/VC699/VC6F3/VC700

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PACE PRD800, PRD900	SATPSU1	650p
PACE SS9000, 9200, 9010, 9210, 9220	SATPSU2	650p
AMSTRAD SRD510, SRD520	SATPSU3	650p
AMSTRAD SRD500	SATPSU4	650p
AMSTRAD SRX340, SRX345, SRX350	SATPSU5	650p
PACE D100/150	SATPSU6	650p
CHURCHILL D2MAC	SATPSU7	650p
PACE MSS100	SATPSU8	730p
PACE MSS200/300 APPOLL	SATPSU9	900p
PACE MSS500/1000	SATPSU10	1230p
FERGUSON SRD4	SATPSU11	835p
ECHOSTAR SR5500	SATPSU12	1735p
ECHOSTAR 6500/7700/8700	SATPSU13	3125p
AMSTRAD SRD600	SATPSU14	3125p
MIMTEC (Surensen)	SATPSU15	775p
AMSTRAD SRD700/SR950/SRX100/301 SRX501/1002/2001/SRD2000 SAT250	SATPSU16	730p

PACE 9000 SWITCH MODE TRANSFORMER
Order Code: **PACE 9000** Price: **800p**
PACE PRD800/PRD900 SWITCH MODE TRANSFORMER
Order Code: **PRD800** Price: **550p**

SATELLITE TUNERS
PACE PRD800/MSS200 2Ghz
Order Code: TUNER 01 Price: **1650p + VAT**
PACE PRD900/MSS1000 2Ghz
Order Code: TUNER 02 Price: **1650p + VAT**

★★★★
JUST ARRIVED
★★★★

POWER SUPPLY REGULATOR
ALBA CTV10 TRAVELLER
NIKKAI BABY 10
ORDER CODE: BABY 10
PRICE: 1200p + VAT

Audio Control Head

AMSTRAD ORIGINAL NO: 150751
Used on: AMSTRAD TVR1, 2, 3, VCR4600, 4600MKII, 4700, 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, GOLDHAND, GRANADA, HINARI, MARQUANT, OMEGE, 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
VBR 0091	NVG7 etc	875p
VBR0050	NV300, NV340 etc	875p
VBR0061	NV777 etc	875p
VBR0103A	NV250, NV450 etc	625p
VBR0125		625p

8 way Preprogrammed Universal Remote Control

A single remote control to operate Televisions, Videos and Satellite Receivers. Plus Auxiliary Options!

- Replaces up to 8 remotes with one • Simple 4 digit setup routine
- Controls 1000s of models • Teletext functions with Fastext
- Clear (large key) layout • Code Search Facility
- Stylish and easy to operate • Replace broken or lost remotes
- Original remote not required

Order Code: 8 WAY PRICE: 14.50p + VAT

Cassette DC Motors

MOTOR TYPE	PRICE
6V MOTOR	170p
9V MOTOR	170p
12V CW MOTOR	170p
12V CCW MOTOR	170p
13.2 CCW MOTOR	290p

Replacement Video Cassette Housings

NAME	MODELS	CODE	PRICE
AKAI	VS35, VS53, VS55, VS56, VS75	CH18	3200p
GRANADA	VHSDP1	CH05	1100p
	VHSYJ2	CH01	2800p
GOLDSTAR	GHV1290P, 1291P, 1295P, 9400, 73401, GSE1295P, GSE1891P, 20001Q, 20051Q, VCP4200, 4300, 4301, 4305, VCP4306, 4311, 4315, 4316, 4320, 4321, 4325	CH25	2000p
	GHV51, 1221, 1232, 1240, 1241, 1242, 1244, 1246, 1248, GHV8000, 8200	CH26	2900p
FERGUSON & J.V.C.	3V38, 3V39, 8943, 8944, 8951, 3V35, 3V36, 3V49, HRD 110, 111, 120, 121, 225	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
	8948, 8950, FV10B, 12L, 13H, 14T, 20B, 21R, 22L, 26, 395, HRD230, 430, 530	CH03	2800p
	3V58, 3V59, 3V64, 3V65, FV11R, 8950, 8951, HRD170, HRD180, HRD370	CH04	2800p
	FV31R	CH19	4300p
	HRD515, 520, 527, 540, 550, 580, 600, 610, 620, 660, 670, HRD830, 840, 850, 860, 4050, 6600, FV37H	CH20	2200p
	HRD540, 580, 830, 860, 910, 960, HRD970, HRDX20, FERGUSON FV57H	CH27	2400p
I.T.T.	VR3605, VR3905	CH01	2800p
	VR3916, 3926, 3946, 3948, 3976, 3986, 3995, 3997, 6948	CH02	2800p
	VR3916, 3926, 3946, 3948, 3976, 3986, 3995, 3997, 6948	CH02	2800p
NATIONAL PANASONIC	NV730	CH06	4300p
N.E.C.	N830EG, N831EG, N831EG, N832, N833EG	CH01	2800p
	N895	CH02	2800p
PHILIPS	CASSETTE LIFT ASSEMBLY (69120366) DV186, 190, 286, 471, 562, 761, VR6180, 6182, 6185, 6285, VR6290, 6291, 6293, 6362, 6367, 6393, 6467, 6468, 6470, VR6561, 6670, 6760, 6761, 6870, 6970	CH05	1100p
	VR6443	CH22	2900p
	VR6448	CH23	2500p
	49SB6	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
TELEFUNKEN	VR2970	CH02	2800p
THOMSON	V320, 321, 323, 326, 4200, 4300	CH01	2800p
	V342, 343, 352, 353, 360, 364, 368, 4210, 4230, 4260, 4400, V5500, 6000, 8540	CH02	2800p
TOSHIBA	V55, V57	CH01	2800p
	V65, V66	CH02	2800p

Service Aids

DESCRIPTION	VOLUME	CODE	PRICE
VIDEO HEAD CLEANER	75ML	SP01	180p
SWITCH CLEANER	176ML	SP02	180p
SILICONE GREASE	200ML	SP03	210p
FREEZE IT	170ML	SP04	320p
FREEZE IT	400ML	SP16	600p
FOAM CLEANER	400ML	SP05	200p
ANTI-STATIC	150ML	SP06	190p
AEROKLEANE	135ML	SP07	220p
AERO DUSTER	150ML	SP08	310p
AERO DUSTER	400ML	SP17	550p
PLASTIC SEAL	200ML	SP09	250p
GLASS CLEANER	250ML	SP10	160p
COLDKLENE	250ML	SP13	230p
EXCEL POLISH 80	250ML	SP18	150p
ADHESIVE 120	400ML	SP19	190p
LABEL REMOVER 130	200ML	SP20	240p
REFURB 140	400ML	SP21	240p
TUBE SILICON GREASE	50 GRAMMES	SP11	210p
TUBE SILICON SEALANT WHITE	75ML	SP22	280p
TUBE SILICON SEALANT CLEAR	75ML	SP23	280p
TUBE HEAT SINK COMPOUND	25 GRAMMES	SP12	150p
DRIVE CLEANER	200ML	SP24	150p
SCREEN CLEANER	200ML	SP25	150p
COMPUTER CARE KIT	–	SP26	2100p

All the above items are manufactured by Servisol
If you purchase more than one Servisol Product, postage & package will be charged as follows:
300p for 5 cans **450p** for more than 5 cans

Cassette Tape Heads

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

Soldering Accessories

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

FAULT FINDING GUIDE 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.

Video Recorders Edition 4
Lists more than 4500 faults for 43 different brands
Price £12.75 – No VAT. Order Code: BOOK01

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 CLEANING STICKS

Order Code: SP14
Price 17p each 15p each pack of 10pcs
13p each pack of 25pcs

VIDEO MAINTENANCE TOOLS
Set of 8 Allen keys packed in a plastic wallet
Order Code: TOOL9
Price 125p
Specifically designed for video maintenance

UNIVERSAL HEAD EXTRACTOR TOOL
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 brand heads.
PRICE – 600p

GRANDATA LTD
Tel: 0181-900 2329
Fax: 0181-903 6126

REPLACEMENT LINE OUTPUT TRANSFORMERS/CD PICK UPS

REPLACEMENT LINE OUTPUT TRANSFORMERS

Part No.	Code	Price
AKAI		
45150344	LOT56	**1650p**
101-214017-03	LOT278	**1600p**
101-220005-03A	LOT72	**1600p**
D 050/37	LOT27	**1450p**
D 053/37	LOT207	**1550p**
D 056/37	LOT56	**1650p**
D 059/37	LOT200	**1600p**
D 069/37	LOT56	**1650p**
FCM 2015 AL	LOT78	**1500p**
FERGUSON		
00 D-3-508-001	LOT38	**1650p**
00 D-3-508-002	LOT38	**1650p**
00 D-3-508-003	LOT276	**1550p**
00 D-3-515-001 PL1	LOT276	**1550p**
00 D-4-208-001	LOT79	**1800p**
00 D-4-208-002	LOT79	**1800p**
00 D-4-235-002	LOT240	**1250p**
00 D-4-235-002 HTI	LOT81	**1600p**
00 D-4-235-00201G	LOT81	**1600p**
00 D-4-260-004 HTI	LOT38	**1650p**
00 H-0-701-2400	LOT182	**1550p**
06 D-3-083-001	LOT82	**1400p**
06 D-3-083-002	LOT82	**1400p**
06 D-3-084-001	LOT23	**1400p**
06 D-3-087-001	LOT23	**1400p**
06 D-3-088-001	LOT84	**1450p**
06 D-3-093-001	LOT204	**1600p**
06 D-3-095-001	LOT87	**1450p**
06 D-3-095-002	LOT87	**1450p**
06 D-333-512-001	LOT204	**1600p**
FETX 100 90 DEG	LOT04	**1500p**
FETX 90 WHITE	LOT06	**1650p**
FETX 100 100 DEG	LOT34	**1500p**
GRUNDIG		
29201.008.01	LOT153	**1750p**
29201.014.01	LOT140	**1850p**
29201.015.01	LOT149	**1400p**
29201.017.01	LOT60	**1250p**
29201.018.01	LOT163	**1300p**
29201.018.02	LOT61	**1700p**
29201.019.01	LOT62	**1250p**
29201.019.02	LOT62	**1250p**
29201.022.01	LOT63	**1700p**
29201.022.02	LOT166	**1800p**
29201.022.03	LOT165	**1750p**
29201.022.04	LOT165	**1750p**
29201.022.04A	LOT165	**1750p**
29201.024.01	LOT65	**1700p**
29201.024.04	LOT164	**1800p**
HINARI		
154 138 K	LOT24	**1500p**
51 13914 1	LOT24	**1500p**
51 14184 1	LOT24	**1500p**
CF 44 A	LOT24	**1500p**
HM51-1411834-1	LOT24	**1500p**
HITACHI		
2424593	LOt44	**1250p**
2432101	LOT79	**1800p**
2432461	LOT169	**1500p**
2432611	LOT80	**1800p**
2432651	LOT80	**1800p**
2432761	LOT169	**1500p**
2432981	LOT37	**1300p**
2432981	LOT37	**1300p**
2432982	LOT37	**1300p**
2433011	LOT171	**1650p**
2433012	LOT171	**1650p**
2433014	LOT171	**1650p**
2433212	LOT168	**1500p**
2433291	LOT172	**1700p**
2433301	LOT246	**1600p**
2433441	LOT188	**1900p**
2433442	LOT191	**1600p**
2433451	LOT81	**1600p**
2433452	LOT82	**1400p**
2433453	LOT82	**1400p**
2433455	LOT234	**1600p**
2433521	LOT85	**1600p**
2433581	LOT22	**1500p**
2433721	LOT83	**1600p**
2433751	LOT01	**1500p**
2433752	LOT01	**1500p**
2433752	LOT250	**1600p**
2433891	LOT23	**1400p**
2433892	LOT84	**1450p**
2433893	LOT23	**1400p**
2433952	LOT33	**1200p**
2434002	LOT200	**1600p**
2434141	LOT33	**1200p**
2434274	LOT44	**1250p**
2434453	LOT86	**1600p**
2434455	LOT234	**1600p**
2434593	LOT44	**1250p**
2435062	LOT296	**1600p**
2435121	LOT87	**1450p**
2435131	LOT251	**1600p**
2435141	LOT282	**1450p**
2435301	LOT88	**1450p**
2435671	LOT89	**1600p**
2436201	LOT109	**1450p**
2436202	LOT109	**1450p**
2432101-2	LOT79	**1800p**
2433451H	LOT81	**1600p**
2433453H	LOT82	**1400p**
2433891H	LOT23	**1400p**
2433892G	LOT84	**1450p**
I.T.T.		
4515 01 08	LOT113	**1400p**
4515 01 15	LOT136	**1600p**
4515 01 16	LOT139	**1675p**
4515 01 17	LOT139	**1675p**
4515 01 19	LOT169	**1500p**
4515 01 24	LOT137	**1600p**
4515 01 46	LOT136	**1600p**
4515 03 01	LOT169	**1500p**
4515 03 02	LOT180	**1550p**
4515 03 04	LOT169	**1500p**
4515 03 05	LOT180	**1550p**
4515 03 06	LOT168	**1550p**
4515 03 08	LOT22	**1500p**
4515 03 09	LOT178	**1500p**
4515 03 10	LOT168	**1550p**
4515 03 13	LOT30	**1500p**
4515 03 14	LOT174	**1700p**
4515 03 15	LOT22	**1500p**
4515 03 18	LOT192	**1550p**
4515 03 19	LOT30	**1500p**
4515 03 20	LOT190	**1650p**
4515 03 22	LOT196	**1550p**
4515 03 24	LOT194	**1550p**
4515 03 25	LOT22	**1500p**
4515 03 26	LOT198	**1550p**
4515 03 28	LOT27	**1450p**
4515 03 29	LOT193	**1550p**
4515 03 30	LOT179	**1550p**
4515 03 31	LOT207	**1550p**
4515 03 34	LOT56	**1650p**
4515 03 35	LOT193	**1550p**
4515 03 38	LOT27	**1450p**
4515 03 40	LOT200	**1600p**
4515 03 41	LOT56	**1650p**
4515 03 43	LOT196	**1550p**
4515 03 44	LOT56	**1650p**
4515 03 46	LOT201	**1550p**
4515 03 50	LOT27	**1450p**
4515 03 51	LOT27	**1450p**
4515 03 75	LOT56	**1650p**
4516 16 01	LOT22	**1500p**
MITSUBISHI		
731003	LOT51	**1650p**
276-16399	LOT49	**1800p**
334 B 07803	LOT50	**1700p**
334 B 078030	LOT50	**1700p**
334 B 08104	LOT74	**1600p**
334 B 08108	LOT295	**1600p**
334 P 18506	LOT51	**1650p**
334 P 18507	LOT75	**1600p**
5908-05008A-AA	LOT70	**1500p**
D 108/37	LOT49	**1800p**
DCF1577	LOT273	**1700p**
DCF2077A	LOT272	**1550p**
KFS 60226B	LOT279	**1550p**
MSH-1FBW08	LOT78	**1500p**
NIKKAI		
BABY10	LOT67	**1450p**
ORION		
3714002	LOT02	**1500p**
PANASONIC		
TLF 14512 F	LOT39	**1850p**
TLF 14520 F	LOT40	**1500p**
TLF 14521 F	LOT39	**1850p**
TLF 14567 F	LOT39	**1850p**
TLF 14568 F	LOT40	**1500p**
TLF 14584 F	LOT41	**2000p**
TLF 14586 F	LOT42	**1800p**
TLF 15606 F	LOT256	**2500p**
TLF 70012	LOT78	**1500p**
TLF 70012 F	LOT78	**1500p**
TLF 70012A	LOT78	**1500p**
TLF 70018	LOT274	**1550p**
TLF 70018 F	LOT274	**1550p**
TLF 70161	LOT278	**1550p**
TLF 70162	LOT72	**1600p**
TLF 70162A	LOT72	**1600p**
TLF 70162B	LOT72	**1600p**
TLF 70162G	LOT72	**1600p**
TLF 77001 B	LOT274	**1550p**
PHILIPS		
4822 140 10142	LOT142	**1800p**
4822 140 101145	LOT134	**1450p**
4822 140 10146	LOT112	**1700p**
4822 140 10151	LOT102	**2150p**
4822 140 10161	LOT103	**1250p**
4822 140 10171	LOT104	**2150p**
4822 140 10176	LOT114	**1150p**
4822 140 10194	LOT105	**1750p**
4822 140 10198	LOT116	**1750p**
4822 140 10201	LOT104	**2150p**
4822 140 10236	LOT118	**1750p**
4822 140 10246	LOT111	**1750p**
4822 140 10247	LOT105	**1750p**
4822 140 10254	LOT107	**1600p**
4822 140 10263	LOT117	**1750p**
4822 140 10269	LOT210	**1650p**
4822 140 10271	LOT208	**1650p**
4822 140 10274	LOT123	**1600p**
4822 140 10282	LOT122	**1600p**
4822 140 10283	LOT104	**1450p**
4822 140 10294	LOT125	**2150p**
4822 140 10306	LOT110	**1600p**
4822 140 10325	LOT132	**1300p**
4822 140 10326	LOT122	**1850p**
4822 140 10328	LOT124	**1450p**
4822 140 10349	LOT106	**1450p**
4822 140 10353	LOT284	**1450p**
4822 140 10356	LOT284	**1400p**
4822 140 10367	LOT286	**1400p**
4822 140 10369	LOT109	**1450p**
4822 140 10381	LOT128	**1450p**
4822 140 10384	LOT127	**2150p**
4822 140 10395	LOT116	**1750p**
4822 140 10406	LOT73	**1500p**
4822 140 10421	LOT109	**1450p**
4822 140 17078	LOT103	**1250p**
SANYO		
094-00020/0.9	LOT113	**1400p**
094-00035/0.2	LOT162	**1350p**
094-01020/0.7	LOT59	**1750p**
094-01021/0.6	LOT59	**1750p**
094-01027/0.0	LOT186	**1825p**
094-01038/0.7	LOT245	**1900p**
094-01052/0.8	LOT186	**1825p**
094-01057/1.1	LOT285	**1450p**
610.018.6620	LOT189	**1650p**
610.018.6637	LOT215	**1800p**
SHARP		
RTRNF 1220 CEZZ	LOT39	**1850p**
RTRNF 1783 BMZZ	LOT202	**1800p**
RTRNF 1783 CEZZ	LOT202	**1800p**
RTRNF 1786 BMZZ	LOT211	**1850p**
RTRNF 1786 CEZZ	LOT211	**1850p**
RTRNF 2000 BMZZ	LOT214	**1750p**
RTRNF 2002 BMZZ	LOT307	**1450p**
RTRNF 2002 CEZZ	LOT307	**1450p**
RTRNF 2003 BMZZ	LOT308	**1425p**
RTRNF 2004 BMZZ	LOT307	**1450p**
RTRNF 2005 BMZZ	LOT308	**1425p**
RTRNF 2006 BMZZ	LOT308	**1425p**
RTRNF 2007 BMZZ	LOT307	**1450p**
RTRNF 2023 BMZZ	LOT310	**1500p**
SONY		
3753100	LOT275	**1700p**
1-439-243-00	LOT91	**1700p**
1-439-243-11	LOT91	**1700p**
1-439-243-12	LOT91	**1700p**
1-439-243-31	LOT229	**1700p**
1-439-243-32	LOT229	**1700p**
1-439-243-41	LOT229	**1700p**
1-439-244-00	LOT48	**1800p**
1-439-244-11	LOT48	**1800p**
1-439-244-21	LOT48	**1800p**
1-439-244-31	LOT48	**1800p**
1-439-256-00	LOT45	**1800p**
1-439-256-11	LOT45	**1800p**
1-439--256-21	LOT45	**1800p**
1-439-256-22	LOT45	**1800p**
1-439-276-21	LOT230	**1700p**
1-439-280-00	LOT92	**1700p**
1-439-280-13	LOT92	**1700p**
1-439-286-00	LOT46	**1800p**
1-439-286-11	LOT46	**1800p**
1-439-286-12	LOT46	**1800p**
1-439-286-13	LOT46	**1800p**
1-439-286-21	LOT46	**1800p**
1-439-288-00	LOT228	**1750p**
1-439-288-12	LOT228	**1750p**
1-439-289-00	LOT47	**1800p**
1-439-289-21	LOT47	**1800p**
1-439-289-22	LOT47	**1800p**
1-439-289-31	LOT47	**1800p**
1-439-294-00	LOT93	**1550p**
1-439-294-11	LOT93	**1550p**
1-439-294-21	LOT269	**1550p**
1-439-303-00	LOT94	**1700p**
1-439-303-11	LOT94	**1700p**
1-439-303-31	LOT94	**1700p**
1-439-303-32	LOT94	**1700p**
1-439-311-00	LOT95	**1550p**
1-439-311-11	LOT95	**1550p**
1-439-311-13	LOT95	**1550p**
1-439-311-31	LOT95	**1550p**
1-439-311-32	LOT95	**1550p**
1-439-331-22	LOT96	**1550p**
1-439-331-41	LOT98	**1550p**
1-439-332-00	LOT99	**1700p**
1-439-332-11	LOT9	**1700p**
1-439-332-21	LOT99	**1700p**
1-439-332-41	LOT100	**1700p**
1-439-332-42	LOT101	**1700p**
1-439-332-52	LOT100	**1700p**
1-439-333-00	LOT270	**1550p**
1-439-333-11	LOT270	**1550p**
1-439-333-12	LOT270	**1550p**
1-439-363-11	LOT268	**1550p**
1-439-363-21	LOT268	**1550p**
1-439-387-11	LOT311	**1600p**
1-439-387-21	LOT311	**1600p**
1-439-416-11	LOT255	**1750p**
1-439-416-12	LOT255	**1750p**
1-439-416-21	LOT255	**1750p**
1-439-416-23	LOT255	**1750p**
1-439-416-41	LOT255	**1750p**
1-439-416-51	LOT255	**1750p**
1-439-430-21	LOT271	**1550p**
154125A	LOT275	**1700p**
TOSHIBA		
37010	LOT131	**1450p**
37011	LOT131	**1450p**
37012	LOT131	**1450p**
37013	LOT131	**1450p**
37014	LOT131	**1450p**
37D15	LOT131	**1450p**
37016	LOT131	**1450p**
37017	LOT131	**1450p**
37018	LOT131	**1450p**
37019	LOT131	**1450p**
1810951	LOT55	**-1700p**
2433751	LOT01	**1500p**
2433752	LOT250	**1600p**
23236023	LOT281	**1550p**
23236052	LOT131	**1450p**
23236098	LOT288	**1400p**
23236198	LOT288	**1400p**
23236255	LOT289	**1500p**
23236424	LOT129	**1500p**
23236425	LOT288	**1400p**
23236428	LOT289	**1500p**
3122113837011	LOT131	**1450p**
150F6D	LOT131	**1450p**
TFB 4039 AD	LOT293	**1550p**
TFB 4048 AD	LOT281	**1550p**
TFB 4048 BD	LOT281	**1550p**

CD PICK UPS

Models & Description	Order Code	Price
AIWA		
XC007	KSSS151A	**1900p**
DX-990A, DX-DIA	KSS152A	**1600p**
CXL60, CXL66G, CXL80, CXN3100, CXN320, CXN3300, CXN360, CXN400, CXN430, CXN540, CXN550G, CXN990, CXN999, CXNV20, CXSL70, DXZ9100M, FDN636, FDN6636, FDN939, LCX60, LCX66G, LCX70M, LCX80, M7400, M75, NSX320, NSX360, NSX400, NSX430, NXS990, NSX992, NSX999, NSXD636, NSXD939, NSXV20, SXFN550 SXFN520, XC300, XC550, XC750, XC900, XC950, XCN992, XG320, XG360, XG400, XG990, ZD3000M, ZD3100M	KSS152A	**1600p**
CXAP1, CXL7, CXL8G, CXLC50P, CXZ58, DXM740, DXM75, DXM76, DXM77, LCX50, LCX7, LCX8G, LCXAP1, XC002, XC004, XC005, XC777	KSS210B	**2000p**
XP31, XP33, XP55, XP80G	KS220A	**2500p**
XP6,XP7	KSS331A	**3400p**
AKAI		
CD73, DC93	KSS151A	**1900p**
CD25, CD26, CD27, CD32, CD36, CD37, CD52, CD55, CD57, CD650, CD670, CD69, CD750, CD79, CDM480, CDM600, CDM670, CDEM770, CDM959, MX550, MX570, MX650, MX670, MX750, MX950	KSS210A	**2000p**
DENON		
DCD1500II, DCD1520, DCDE3520	KSS151A	**1900p**
DCD1400, DCD600, DCD800	KS152A	**1600p**
DCD1420, DCD520, DCD610, DCD620, DCD660, DCD810, DCD820, DCD860, DCD910, DCD920	KSS210A	**2000p**
DCD1015, DCD1290, DCD2060, DCD2060G, DCD315, DCD480, DCD580, DCD615, DCD715, DCD625, DCD890, DCD895, DN2000F	KSS240A	**2600p**
GOLDSTAR		
CD952A, CD952AJ, CD952LJ, CD952SJ, FFH101KL, FFH101WL, FFH222A/L, FFH272L, FFH333L, FFH373K, FJ606, FR606L	KSS210A	**2000p**
CD320A/L, CD630S/L, FFH212A/L.FFH212E	KSS210B	**2000p**
GRUNDIG		
CD360, CD435	HOPM3	**2150p**
CCD300, CD101MCD904, MC10, NEW ORLEANS CD	KSS210A	**2000p**
KRCD100, RR1900CD, RR3100CD, RR4000CD, RR610CD, RR700CD	KSS210B	**2000p**
CDP60, CDP90	KSS220A	**2500p**
CDP65	KSS331A	**3400p**
CD905	OPTIMA5	**3600p**
HITACHI		
DAW560	HOPM3	**2150p**
FX-10	KSS210A	**2000p**
AXC10	KSS210B	**2000p**
J.V.C.		
1990-1992, LATE 1987-1988 – XLE300BK, XLE31BK, XLE51BK, XLE900BK, XLME91BK, XLV101BK, XLV211BK, XLV222BK, XLV311BK, XLV333BK, X-Z1010TN, XLZ411BK, XLZ444BK, XLZ555BK, XLZ611BK	OPTIMA3	**4000p**
CDRADIO CASSETTE, MINI SYSTEMS – MODELS 1990-1992	OPTIMA4S	**5000p**
CA-C33, CA-MX30BK, CA-MX33BK, UX-A5, UX-A6, XL-M309, XL-M408, XL-M409, XL-M504BK, XL-M505TN, XL-M508, XL-M509, XL-M705TN, XL-V131BK, XL-V151TN, XL-V221BK, XL-V241TN, XL-242BK, XL-V251TN, XL-V252BK, XL-Z1050TN, XL-Z551TN, XL-Z552BK	OPTIMA5	**3600p**
1994 ONWARDS – CAE48BK, CAMCG7, CAMXG9, CAS20BK, CAS30BK, VAS50, CAS60RBK, MXS20, MXS30, MXS60, PCX105, PCX130, PCX95, RCX230, RCX320, RCX520, RCX620, RCX720, UXA4, UXA5, UXA55, UXC7, UXT1, UXT3, XLF115, XLF116, XLF215, XLF216, XLMC100/M, XLMXG7, XLMXG9, XLV163TN, XLV164BK, XLV174, XLV263TN, XLV264BK, XLV274BK, XLZ463TN, XLZ464BK, XLZ574, XLZ674, XTMXG7, XTMXG9, XTS60	OPTIMA6S	**3300p**
KENWOOD		
DP47, DP660SG, DP8020, DP87, L1000D	KSS152A	**1600p**
DP1030, DP1510, DP2010, DP2030, DP3010, DP3030, DP3050, DP4030, DP491, DP5010, DP5030, DP5040, DP520, DP7030, DP7040, DP7050, DP730, DP920, DP930, DP950, DPM650,DPM6630, DPM7730, DPM850, DPM991, DX6620, M225, M25, M450, M850, PD3030, PDM991, RDX25, RXDC3, RXDC3L, UD202, UD302	KSS210A	**2000p**
DPC42, DPC72, DPC77, DPC80, DPC92	KSS220A	**2500p**
DP1050, DP2050, DP3060, DP501, DP5060, DP722, DP76, DPB5, DPB9, M77A, PD3060, UD502, UD70, UD701, UD90, XE5	KSS240A	**2600p**
DPC321, DPC521, DPC531, DPC631K, DPC721, DPC731	KSS331A	**3400p**
DP1060, DP2060. PART No: RCTRH8136AFZZ	RH8136A	**4500p**
PANASONIC		
SLP177A, SLP202A, SLP212A, SLP222A, SLP277A, SLP377A, SLP477AK, SLP477A, SLPG100A, SLPG200A, SLPG400A, SLPG500AK, SLPG500AS, SLPJ24A, SLPJ26A, SLPJ27A, SLPJ28A, SLPJ325A, SLPJ325A, SLPJ37A, SLPJ38A, SLPJ46A	691-30209	**5500p**
SAD30, SLCH9, SLP150, SLP170, SLP200, SLP202, SLP222, SLP230, SLP250, SLP333, SLP370G, SLP400C, SLP555, SLP777, SLP999, SLPA10, SLPC20, SLPC25, SLPJ25, SLPJ26, SLPJ27, SLPJ37, SLPJ45, SLPK25, SLPK26, SLPS50, SLPS70, SLPS700, SLPS840, SLPS900	SOAAD70A	**2350p**
PHILIPS		
AZ8304, CD070, CD080, 690, 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, CD960, CDF104, CDM4/19, FCD185	691-30209	**5500p**
AS440, AS445, AS540, AZ8048, AZ8640, CD070, CD080, CD091, CD163, CD165, CD690, CD710, CD720, CD732, CD740, CD750, CD910, CD920, CD935, FW17, FW21, FW26, FW330, FW36, FW360, FW380I, FW40, FW41, FW46, FW56, FW66, FW68	CDM12.1	**2200p**
CD1210/40	CDM12.4	**2200p**
AZ8006	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, PD65,I PD6500, PD6700, PD7700, PD8700, PD970, PDCP420, PDCP520M, PDCP520T, PDJ400T, PDJ500T, PDJ800M, PDJ900M, PDM430, PDM450, PDM550, PDM630, PDM650, PDM750, PDM901, PDP710T, PDP720T, PDP910M, PDP920M, PDS501, PDS601, PDS701, PDS701G, PDS901, PDT310, PDT510, PDZ, PDZ570T, PDZ74T, PDZ84M, PDZ970M, PXA1349, S125CDT, S135CDT, S303CDM, S303CDT, S505DM, S505DT, S707DM, S707DTM, S909DM, S990DT, XCP410M, XCP410T, XDZ54T, XDZ55T, XDZ64M, XDZ84T, XRP310, XRP320	PEA1030	**5300p**
PDM400, PDM410, PDM500, PDM510, PDM600, PDM610, PDM700, PDM710, PDM730, PDT303, PDT403, PDT503, PDX940M, PDX950M, PDZ560T, PDZ72T, PDZ73T, PDZ81M, PDZ82M, PDZ83M, PDZ960M, XDZ53T, XDZ54T, XDZ55T, XDZ62, XDZ62M, XDZ630, XRZ82	PWY1009	**4800p**
SAMSUNG		
CD20	HOPM3	**2150p**
CD1200, CD1310, SCM-6000, SCM6900	KSS210A	**2000p**
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	**2000p**
DCD10, DCD11U, DCD20, DCD30, DCD30AT, DCD6, DCD8U, DCMS1, DCX110, DCX120, DCX210, DCX220, DCX993, DCX994, MCDMS40L, MCDMS50L, MCDMS660L, MCDZ1L, MCDZ2L, MCDZ3L. PART No. 6142391303	614239	**3300p**
DCD12. PART No. 6450055966	645005	**3700p**
MCDZ31L, MCDZ41L, MCDZ61L, MCDZ71L	KSS210B	**2000p**
SHARP		
CD-111, CD-301, CD-302, CD-304, CD-310, CD-C3, CD-L700, CD-L800, CD-U1, CD-U10, CD-X10, CD-X12, CD-X15, CD-X16, CD-X17, CD-X20, CD-X9, CKL650, CMS95CD, DX-150, DX-160, DX-450, DX-460, DX-461, DX-650, DX-660, DX-999, DX-A3, DX-N45, DX-R554, DX-R7, DX-R75, DX-R750, DX-R77, DX-R770, DX-R820, DX-R840, DX-Z100, DX-Z1000, DX-Z1500, GFCD55, QT-30CD, QT-33CD, QT-350CD, QT-37CD, QT-38CD, QT-CD20, QT-CD33, RS95, SC-77CD, SC-99CD, SC-RS95, SG-A1, SG-W1CD, SG-W2CD, SYS302, ZCD7CD. PART No. RCTRH8122AFZZ	RH8122A	**5750p**
QT-50CD, QT-60CD, QT80CD. PART No. RCTRH8124AFZZ	RH8124AF	**2900p**
DXR-840B. PART No. RCTTRH8130AFZZ	RH8130AF	**2900p**
CDS360E, 360H, 370, 450H/E, CMS150CDH, CMSR400CDH, CP150, CPR400, CPS360, 370. PART No. RCTRH8136AFZZ	RH8136AF	**4500p**
SONY		
KSS240A	KSS240A	**2600p**
KSS121A	KSS121A	**3500p**
KSS151A	KSS151A	**1900p**
KSS210A	KSS210A	**2000p**
KSS210B	KSS210B	**2000p**
KSS220A	KSS220A	**2500p**
KSS331A	KSS331A	**3400p**
KSS360A	KSS360A	**2600p**
TECHNICS		
SLP200, SLP230, SLP250, SLP333, SLP555, SLP777, SLP999,SLPA10, SLPC20, SLPJ25, SLPJ45, SLPS700, SLPS900	SOAD70A	**2350p**

VIDEO RECORDER POWER SUPPLY REPAIR KITS

PHILIPS

For ES7047 Chassis: CP110

Order Code: VCRPSU1 **Price: 675p**

PANASONIC

For ES 7054 Chassis: HSM

Order Code: VCRPSU2 **Price: 1125p**

For ES 7053 Chassis: JSM

Order Code: VCRPSU3 **Price: 900p**

For ES 7050 Chassis: KSM

Order Code: VCRPSU4 **Price: 1500p**

For ES 7051 Chassis: LSM

Order Code: VCRPSU5 **Price: 1500p**

For ES 7055 Chassis: MSM

Order Code: VCRPSU6 **Price: 1650p**

For ES 7052 Chassis: NSM

Order Code: VCRPSU7 **Price: 1750p**

NEW NATIONAL PANASONIC VCR SERVICE KITS

This Service Kit consists of the parts for the upperside of the G deck, G rev. deck and G2 deck.

Suitable for the following models:

AG5150, AG5250, AG5700, AG6024, NVF55, NVF55F, NVF65, NVF75, NVF77, NVJ30, NVJ35, NVJ36, NVJ40, NVJ42, NVJ45, NVJ46, NVJ47, NVJ48, NVL20, NVL21, NVL23, NVL25, NVL28, NVW1, NVFS100, NVFS200, NVFS88, NVFS90

This kit consists of the following:

Pinch Roller Unit, Mode Switch, PS Pull Out Gear, Sub Loading Arm Unit, Pinch Cam, Pinch Cam Cap, PS Unit, Cut Washer, Connection Gear, Cut Washer

Order Code: SK134 **Price: 1100p**

This Service Kit consists of the parts for the lowerside of the G deck, and the G rev. deck.

Suitable for the following models:

AG6024, NVF55, NVF55F, NVJ30, NVJ33, NVJ35, NVJ36, NVJ37, NVJ40, NVJ42, NVJ45, NVJ46, NVJ47, NVJ48, NVL20, NVL21, NVL23, NVL25, NVL28, NVW1

This kit consists of the following:

Main Cam Gear, Ring Gear, Sub Cam Gear, Timing Belt, Centre Gear, Play Arm Unit, Clutch Disk, Loading Gear (take up), Centre Pulley Unit, Loading Gear (supply), Loading Cam Gear, Cut Washer, Retainer Gear Unit, C Ring, Detent Arm

Order Code: SK135 **Price 1000p**

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: Tool23 **Price: 500p**

VOLTAGE TESTER

A terminal screwdriver incorporating continuity and voltage detection supplied complete with batteries on blister card. With Eusoslot and instructions for use.

Order Code: Tool11 **Price: 220p**

SPRING HOOK

Spring Hook, to unlock springs in audio tape recorders and VCR's

Order Code: Tool20 **Price: 265p**

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 meter with powering the LNB as well as in loop. Through operation with satellite RX powering the LNB.

Acoustical signal	:	On signal strength
LED indicator	:	Vertical/horizontal
Frequency range	:	900 to 2050 MHz
Input impedence	:	70 OHM
Power amplifier	:	18 DB
Detection range	:	–60 to –10 DBM
Max. Input Single	:	–10 DBM

Order Code: Tool22 **Price: 8500p**

DIGITAL MULTIMETERS

CM2300 DIGITAL MULTIMETER

Features:

- 3.5 LCD Display
- Height 12mm
- Max Reading 1999
- HV Indication for High Voltage
- Single Manual Rotary Switch for Function and Range Operation
- All Ranges Overload Protected
- 10A DC Current Test
- DC Voltage 2V/20V/200V/500V
- AC Voltage 200/500V
- DC Current 200mA
- Resistance 2kΩ/20kΩ/200kΩ/2MΩ
- Supplied with test probes

Order Code: CM2300 **Price: 975p**

CM2400T DIGITAL MULTIMETER WITH TEMP MEASUREMENT

Features:

- 3.5 LCD Display
- Height 12mm
- Maximum Reading 1999
- 10A DC Current Test
- DC Voltage 200mV/2V/20V/200V/1000V
- AC Voltage 200/750V
- DC Current 0.2mA/200mA/20mA/200mA/20A
- Resistance 200Ω/2kΩ/20kΩ/200kΩ/2mΩ
- Supplied with Test Probes
- Temperature measurement
- Continuity Test
- Diode Test and Continuity Check
- All Ranges Overload Protected

Order Code: CM2400T **Price: 1450p**

CM2900 PACKET DIGITAL MULTIMETER

Features:

- 3.5 LCD Display
- Compact and Lightweight Pocket Size
- Maximum Reading 1999
- DC Current and Resistance Overload Protected
- Slide Switches for Function and Range Operation
- Supplied in Wallet with Test Probes
- DC Voltage 2V/20V/200V/500V
- AC Voltage 200V/500V
- DC Current 200mA
- Resistance 2kΩ/20kΩ/200kΩ/2MΩ

Order Code: CM2900 **Price: 1150p**

CM2700 AUTORANGING DIGITAL MULTIMETER

Features:

- 3.75 LCD Display with Decimal Point
- 33 Segment Bargraph display
- Override Indication
- Rotary Switch for Function Selection
- Auto Power off (approx 15 mins)
- Auto Polarity with Indication
- Diode Test and Continuity Test with Buzzer
- All ranges overload protected
- Low Battery Indication
- Supplied with Test Probes
- DC Voltage: 320mV/3.2V/32V/320V/600V
- AC Voltage: 320mV/3.2V/32V/320V/600V
- DC Current A: 320µA/3200µA/32mA/320mA/10A
- AC Current A: 320µA/3200µA/32mA/320mA/10A
- Resistance: 320Ω/3.2kΩ/32kΩ/320kΩ/3.2MΩ/32MΩ

Order Code: CM2700 **Price 4050p**

CM3230 DIGITAL CAPACITANCE METER

Features:

- 3.5 LCD Display
- Height 18mm
- Maximum Reading 1999
- Capacitance 9 Ranges from 200pF–20000µF
- Measuring from 1pF–20000µF
- Single Manual Rotary Switch for Function and Range Operation
- Zero Adjust Knob

Order Code: CM3230 **Price: 3950p**

CM3900A DIGITAL MULTIMETER

Features:

- Large LCD Display
- Height 18mm
- Maximum Reading 1999 + Unit
- Single Manual Rotary Switch for Function and Range Operation
- Auto Power off (approx 15 min)
- Diode Test Function
- All Ranges Overload Protected
- Supplied with Test Probes
- DC Voltage: 200mV/2V/20V/200V/700V Accuracy ±0.5%
- AC Voltage: 200mV/2V/20V/200V/700V
- DC Current A: 200µA/20mA/200mA/2A/20A
- AC Current A: 200µA/20mA/200mA/2A/20A
- Resistance Ω: 200Ω/2kΩ/200kΩ/2MΩ/20MΩ/200MΩ

Order Code: CM3900A **Price: 2900p**

CM3920 DIGITALMETER WITH TEMP MEASUREMENT

Features:

- Temperature Measurement
- Diode and Transistor HFE Test
- Large LCD Display
- Height 18mm
- Maximum Reading 1999 + Unit
- Single Manual Rotary Switch for Function and Range Operation
- Auto Power off (approx 15 min)
- Diode Test Function
- All Ranges Overload Protected
- Supplied with Test Probes
- DC Voltage: 200mV/2V/20V/200V/1000V Accuracy ±0.5%
- AC Voltage: 200mV//2V/20V/200V/700V
- DC Current A: 2mA/20mA/200mA/20A
- AC Current A: 200mA/20A
- Resistance Ω: 200Ω/2kΩ/200kΩ/2MΩ/20MΩ/200MΩ
- Capacitance: 2nF/20nF/200nF/2µF/20µF

Order Code: CM3920 **Price: 4100p**

REPLACEMENT IDLERS & PULLEYS

Make	*Models*	*Description*
Hitachi	VT11, 14, 17, 19, 33, 34, 35, 38, 39, 52, 57, 61, 62, 63, 64, 65, 85, 86, 330, 350, 640, 16S, 5030	FF Rew Idler 6886792
Order Code: IDL01		**Price 100p**
Make	*Models*	*Description*
Hitachi	VT680, 6500, 6800, 9300, 9500VT9700, 9900	Play Idler 6861482 6861481
Order Code: IDL02		**Price: 180p**
Make	*Models*	*Description*
Blaupunkt	RTV301, 306, 307, 309, 311, 312, 315, 316, 317, 319, 320, 404, 414, 424, 434, 444, 478, 707	Idler
Goldstar	GHV1221, 1232, 1240, 1241, 1242, 1243, 1244, 1245, 1246, 1247, GHV1248, 8000, 8200, 8210, 8215, GVHP51, VCP4100, 4130	Idler
Grundig	MVS400, 440, VS400, 410, 440VS450, 460	Idler
National	NV230, 250, 260, 280, 370, 380, NV430, 431, 433, 450, 460, 465, 470, 480, 630, 650, 730, 780, NV810, 830, 850, 870, 890, NVG7, 9, 10, 11, 12, 14, 15, 16, 18, 30, 130, 400, AG1000, AG1050, 1200, 1500, 1810, AG2100, 2200, NVH65, 70	Idler Arm VXP 0521
Philips	VR6460, VR6520, VR6920	Idler Arm 40340162
Order Code: IDL08		**Price 100p**
Make	*Models*	*Description*
Amstrad	VCR7000	Idler 150280
Sharp	VC200, 381, 383, 384, 385, 386, VC388, 390, 393, 3300, 8381, 9100, 9300, 9500, 9700	Idler NIDL0005GEZZ
Order Code: IDL10		**Price: 100p**
Make	*Models*	*Description*
Philips	VR6540	Idler
Sharp	VC300, 387, 402, 471, 473, 477, VC481, 482, 483, 486, 488, 496, 500, 571, 573, 581, 582, 583, 584, 585, 8481, 5F3, 5W20E	Idler NIDL0006GEZZ
Order Code: IDL11		**Price: 100p**
Make	*Models*	*Description*
Akai	VS10	Reel Idler
Ferguson	3V23, 3V29, 3V30, 3V31, 3V323V35, 8923, 8924, 8929, 8930, 8931, 8940, 8941, 8942	Reel Idler PU48967
J.V.C.	HR7200, 7300, 7350, 7600, 7610, 7650, 7655, 7700	Reel Idler PU48967
Order Code: IDL20		**Price: 175p**
Make	*Models*	*Description*
Ferguson	3V39, 3V30, 3V31, 3V32, 3V353V36, 3V38, 3V39, 3V49, 8930, 8931, 8933, 8940, 8941, 8942, 8943, 8944	Take Up Idler PU 51402
J.V.C.	HR7200, 7600, 7650, 7655, 7300, 7350, 7610, HRD110, 111, 120, 121, 225	Take Up Idler PU 51402A
Order Code: IDL22		**Price 100p**
Make	*Models*	*Description*
Ferguson	3V39, 3V30, 3V31, 3V32, 3V353V36, 3V38, 3V39, 3V49, 8930, 8931, 8933, 8940 8941, 8942, 8943, 8944	Take Up Clutch PU 51380
J.V.C.	HR7200, 7600, 7650, 7655, 7300, 7350, 7610	Take Up Clutch PU 53462A PU 51380
Order Code: IDL23		**Price: 200p**
Make	*Models*	*Description*
Philips	DB532, VR6520, 6843, 644	Reel Idler
Sharp	VC600, 651, 681, 682, 684, 685, 693, 699, 700, 783, 6FR, 6V3, 6F3	Idler Assembly NPLYV0107GEZZ
Order Code: IDL88		**Price: 615p**
Make	*Models*	*Description*
Philips	VR6843, 6943, 44SB9, VR44SB920, 44SB922, 6943	Reel Drive Unit
Sharp	VC772, 780, 781, 782, 785, 786, VC787, 800, 793, 799, 7810, 7822, VCA100, 102, 104, VCA131, 140, 170, 202, 203, 234, 501, VCA602, 5011, VCD801, 802, VCH851, 852, VCH882, VCM73, VCT72, VC782MK11	Idler NPLTV0111GEZZ
Order Code: IDL90		**Price: 700p**
Make	*Models*	*Description*
N.E.C.	N911, 915, 916, 917, 9012, 9013N9014, 9016, 9033, 9034, 9053, N9054, 9055, 9056, 9066, 9096, N9110, 9120, 9510, 9520, 9530, N9610, DX1000, 1600, 2000, DX3000, PX1200	Idler Arm Assembly
Order Code: IDL245		**Price: 270p**
Make	*Models & Description*	
Philips	**Pressure Roller Assembly PS403-40205** DV186, 190, VR211, 2115, 212, 213, 223, 286, 291, 292, 311, 312, 313, 3210, 3219, 322, 3229, 323, 535BO, VR486, 471, 562, 582, 571, 761, 201, 202, VR203, 302, 303, 305, 6180, 6182, 6185, 6285, 6290, 6291, 6293, VR6362, 6367, 6390, 6391, 6393, 6467, 6468, 6470, 6561, 6570, 6581VR6670, 6676, 6710, 6760, 6761, 6762, 6870, 6970, 6975, 86B1, 63SB7, 68SB4, 71SB4, 71SB5, 72SB8, 72SB8, 92SB31, 20DV1, 20DV2, 20RW7, 21DV1, 21DV2, 2SB01, 2SB02, 2SB11, 2SB12, 30DV2, 31DV1, 31DV2, 31DV, 33SB02, 3SB03, 3SB05, 3SB11, 3SB12, 3SB13	
Toshiba	V91, V95 Pressure Roller Assembly – PS403-40205	
Order Code: PR232		**Price: 300p**

REMOTE CONTROLS

Description	Code	Price
AKAI		
RC-V10A	RC876	750p
RCV 37 B	RC891	750p
V25A	RC896	750p
DECCA		
RC70	RC894	750p
FISHER		
RC905B	RC879	750p
GRANADA		
UNIVERSAL TEXT	RC309	750p
MK4 TEXT, 70155G, 70115G, 70133G	RC880	750p
95288E	RC882	750p
94490D	RC884	750p
GRUNDIG		
TP160E	RC107	900p
TP200, TP300	RC380	750p
TP400	RC401	675p
TP590-600	RC600	750p
TP390, TP610	RC610	750p
TP621	RC612	800p
TP630, TP650	RC650	750p
TP666	RC660	750p
TP661	RC661	750p
HITACHI		
CLE800-CLE830	RC140	700p
A617402/655602	RC1920	800p
A512120/230	RC900	750p
A514790	RC901	750p
A5088470	RC902	800p
A518612	RC903	750p
SCL002	RC904	750p
C2096	RC905	800p
A511940	RC906	750p
655602H	RC1920	800p

Description	Code	Price
ITT		
IFB13, 14, 15	RC143	800p
FS4	RC148	750p
RG305	RC305	675p
RG306	RC306	750p
FS9/1-10/1	RC307	750p
VS5 RUK	RC308	750p
VS4-1	RC308	750p
MULTICONTROL (17C20)	RC311	750p
LOEWE		
DC11	RC146	800p
MATSUI		
010270601	RC889	750p
VX770	RC892	750p
NOKIA		
SATELLITE	RC550	750p
ORION		
RC53	RC892	750p
PANASONIC		
EUR51200	RC200	800p
TC2200	RC204	750p
VSQ0357/NV730	RC202	750p
TNQ1621	RC203	750p
PHILIPS		
RC5002,5154	RC134	750p
KT3 NON TEXT	RC135	750p
69117032	RC178	800p
69117194	RC180	750p
RC5991-UNIV	RC300	580p
RC38	RC301	750p
KT3 TEXT	RC5301	750p
RC5352	RC5352	750p
RC5375	RC5375	750p
RC5 STANDARD	RC300	580p
RC5903	RC5903	700p

Description	Code	Price
SALORA		
SERIES L	RC190	750p
86173	RC882	750p
SANYO		
RC218, RC222, RC228, RC238	RC140	700p
JXGE	RC878	800p
JXDE	RC884	750p
VHR2300	RC890	750p
RC628	RC865	750p
SHARP		
G0121CESA, 123CESA, 204, 251	RC140	700p
SONY		
RM604, RM605, RM606	RC140	700p
32 CHANNEL	RC140	700p
RM613	RC141	750p
RM632, RM636	RC160	675p
TATUNG		
FXA	RC877	750p
RC70	RC883	750p
FX70 FASTTEXT	RC894	750p
TELEFUNKEN		
FB632	RC632ST	750p
FB639	RC639	750p
THORN/FERGUSON		
3V35-42	RC342	650p
3V31-32	RC344	750p
3V57-58	RC628	750p
TX10 TEXT	RC732	575p
TX10 STEREO TEXT	RC738	575p
TC9-90-100	RC740	675p
3V55, FV11	RC783	750p
TX100 FASTTEXT	RC789	650p
TX100 ST, FASTTEXT	RC789	650p
PROFESSIONAL	RC790	650p
TOSHIBA		
CT937	RC950	750p
CT9117	RC951	750p

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STK 7308	350p	310p
STK 7309	400p	360p
STK 7348	400P	350p

	WAS	NOW
HITACHI OUTPUT MODULE HM 6232	800p	700p

MAKE	MODELS	ORDER CODE	WAS	NOW
FERGUSON & JVC	3V42,3V43,3V44,3V45,3V48,3V53,3V54,3V55,3V57,8945,8947,8948,HRD140,141,150,152,157,158, 160,250,257,455,HRD565,566,725,755 LOADING MOTOR (PU 48854T)	VM12	800p	600p
FERGUSON & JVC	3V29, 3V30, 3V31,3V32,8930,8931,8933,8941,8942,HR7200,7300,7600,7610,7650,7655, REEL DRIVE MOTOR (PU 51381V)	VM05	1200p	600p
HITACHI	VT510,515,518,520,522,525,526,530,535,536,540,545,546,VT548,VTD660,665,VTF770,774,775,860,861, 865,VTM598,VTM620,622,625,626,630,635,636,640,645,646,730,731,735,VTM736,753,754,820,821, 822,825,830,831,832,835,840,841,VTM845,920,921,922,925,930,931,935,CAPSTAN MOTOR (5571471)	VM113	3700p	3400p
SONY	SLC5,7,37,3000 CAPSTAN MOTOR (BHF 1100D)	VM09	2000p	1500p
TOSHIBA	V61,V63,V65,V66,V67 LOADING MOTOR	VM12	800P	600p

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HELP WANTED

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

Wanted: TC9002P digital control IC (or complete PW1165 selector board) and a UF721 UHF tuner for the Toshiba Model C1480B. E.A. Coleman, 13 Hazelmere Close, Bedfont, Middx TW14 9PX. 0181 890 6796.

Wanted: Circuit diagram (photocopy OK) for the Sony STR333L tuner-amplifier. Phil Cooke, 12 Garnett Drive, Sutton Coldfield B75 6AG. 01213 292 923.

Wanted: TFMS4300 IR receiver/amplifier IC for the Grundig CUC5301 chassis. D. Firth, 20 Chestnut Avenue, Stocksbridge, S. Yorkshire S36 1AT. 01142 888 152.

Wanted: UHF tuner type 204UEC for the Fidelity Model CTV140R. Dan Kenney, 45 Bicton Avenue, St. Peters, Worcester WR5 3TF. 01905 351 905.

Wanted: Side chassis (L) assembly for the Hitachi VT88E VCR, part no. 7395241; TDA8153 chip for the Goodmans CTV14XRT portable; and a function switch for the Sharp GF6565E radio/cassette recorder. Jim Lynch, WIES, Old School, Balivanich, Benbecula, Western Islands HS7 5LA. 01870 602 035.

For disposal: Philips VR2022 free to caller. Brand new boxed Sharp XC30 colour camera for sale – must be collector's item now. Michael Dranfield, 6 Calesdale Close, Off London Road, Buxton, Derbyshire SK17 9RH. 0129 873 492 (evenings).

Wanted: M53216P IC for the Panasonic NV333. Keith Patton, 1 Glenvale, Duneaney Road, Glarryford, Ballymena, Co. Antrim BT44 9QB. 01266 685 531.

Wanted: Power/syscon panel containing IC5 and, if possible, operation panel containing IC7 for the Akai VS2 VCR. Colin Tapsell, 57 Elm Park, Tramore, Co. Waterford, Ireland. Phone 00 353 51 843 930 or fax 00 353 51 843 931.

Wanted: Pre- and post-war service manuals for Dynatron TV sets, especially the TV19. Leslie Hine, 9 Well Street, Ulverston, Cumbria LA12 7EG. 01229 582 557.

Wanted: BBC B microcomputer basic instruction manual, BBC disc drive manual and floppy utilities disc, disc formatting and verify. Copy will do (5·25in.). BBC B service manual. Full service manual for the series 3 Microvitec Cub RGB monitor Model 1431 (photocopy of circuit OK). D. Lee, 16 Devonshire Place, Claughton, Birkenhead, Merseyside L43 1TU16.

Wanted: Service information for the Akai UCW5 midi hi-fi stereo system which consists of a separate tape deck, tuner, preamp and main amp. Manual or circuit diagrams, photocopies OK. G. Wright, Kimberly Electrics, Ludchurch, Narberth, Pembs SA67 8JE. 01834 831 280.

Wanted: Following issues of *Television*: May 1981; November 1982; April 1985, July 1986, March, May, August, October 1987; January and November 1992; February, March, April, September 1993. Donald Bullock, Buzon 226, Ambolo 2, Costa Nova, Javea, Alicante, Spain. 00 346 647 1357.

Wanted: Main PCB for the Amstrad TFX500 fax; instructions for the Panasonic NV830 VCR; and a non-trade source for Ero blue 1841 capacitors. Stephen Furley, 3 Ivy Place, Tantobie, Stanley, Co. Durham DH9 9PT. 01207 282 988.

Wanted: Circuit diagram or information for the Excelerator + 5·25in. disc drive Model FCC1D D8Z6 EWTH409 (made in Taiwan). Circuit diagram for the Philips Model 22CS1234/50T (K30 chassis edition II with teletext and remote control). G. Cannon, 16 St. Cuthberts Road, Holy Cross, Wallsend, Tyne and Wear NE28 7JF. 01912 620 712.

Wanted: M51390ASP chip (IC351) for the Hinari Model CT16, new or used or will buy whole set. Steve Taylor, 30 Bland Road, Leicester LE3 9PB. 01162 312 923.

For disposal: *Television* magazines dated November 1981-October 1991, all complete in good condition. Offers to Paul Byrne, 99 Bro Deg, Ruthin, Denbighshire LL15 1XY. 01824 705 810.

Wanted: Source of spares and service information for the Soundwave Model CTV1405R. A. Robertson, 261 Warrington Road, Abram, Wigan WN2 5RQ. 01942 865 621.

Wanted: Viewfinder PCB (or complete viewfinder) for the Panasonic NVG3 camcorder. Richard Godden, 2 Fieldfare Avenue, Yateley, Hants GU46 6PD. 01252 872 928.

Wanted: Luminance/chroma board for the Saisho VXL12X/Matsui VX765; front membrane switch control panel for the Ferguson TV Model 51K3. Mike Haslam, 477 Warrington Road, Abram, Wigan, Lancs WN2 5XY. 01924 865 766.

Wanted: LOPTs for the following old mono TV sets: Pye 169 chassis (20in.); Bush A774S chassis (24in.); Bush Model TV161U (24in.). Or does anyone do an exchange service for these old TVs? M.G. Elliott, 39 Lyngford Square, Taunton, Somerset TA2 7ES.

Wanted: Front panel and display PCB for the Bush VCR820VP VCR; and a service manual for the Brother FAX370 fax machine. P. Redpath, 47 Corbett Road, Waterlooville, Hants PO7 5TA. 01705 253 595.

Wanted: LOPT type 355-502M (4L2943) for the Escom EM1448LR monitor. Ian Jeffery, 275 Monks Road, Lincoln LN2 5JY. Tel/fax 01522 540 521.

Wanted: JVC HRD470EK VCR, any condition. Also Toshiba video projector tube no. 8618 E2292 (blue) AR2, or a complete set (RGB). Brian Barron, 55 Henderson Avenue, Belfast BT15 5FN. 01232 715 826.

Wanted: Colour output and decoder panels for the Pye 693 chassis; complete power supply PCB for the Saisho VR1600 VCR; front PCB for the Akai VS5EK VCR; pin connections for the CRT base, Teleton Model TVC20; April and May 1975 issues of *Television*. Circuit diagrams (photocopies OK) required for the following: Pye 693 chassis; Saisho VR1600 VCR (power supply); Ekco TMB272 9in. 405-line portable; Pye PTV 14in. 405-line portable; Ferranti Model T1046; KB Royal Star 405-line set; Philips KT3 chassis. Philip Gay, 80A Milton Brow, Weston-super-Mare, North Somerset BS22 8DE.

Wanted: Service manual (photocopy OK) for the Canon E60E camcorder. J.D. Lee, 6 Lawson Close, Worsley, Manchester M28 2JQ. 0161 794 6288.

Wanted: Pin-out details and technical data for the RCA thyristor type 40379. Also any information on a pin-for-pin equivalent device. Mike Brett, 31 Eastfield Avenue, Watford, Herts WD2 4HH. 01923 224 951.

Wanted: Service manuals for the NEC N9014 VCR and the Barco 3200 series receiver/monitor. T. Martini, 122B Cannon Street Road, Whitechapel, London E1 2LH. Tel. 0171 702 8774, fax 0171 702 8216.

What a Life!

Don Bullock on the trade and his experiences with customers and their equipment

When I first fell into the clutches of this trade I thought that the servicing side was full of problems. Little did I know what lay ahead. Then, the number of different products you might have to deal with could be counted on one hand. There were radio receivers, record players and television sets. And as far as I can recall they were all British, which meant that spares and circuits were pretty close to hand.

There was the agency bugbear of course – for those of us who weren't agents. Manufacturers like Ekco and Murphy would supply spares and servicing information only to their officially appointed dealers. If we needed anything we would be told to approach one of these. They could usually be counted upon to be less than helpful, often condescending as well. But the number of sets involved was not great, and there were usually ways round the problem.

The majority of manufacturers didn't have strict agency arrangements and would sell to us all. They were also glad to give technical advice, and provided free service manuals. A phone call requesting one would often bring it by return, sometimes with a wad of other manuals as well.

Today it's all a jungle. There are thousands of different makes of scores of different products. Finding a source of spares can be impossible. And even when manuals are available, they can be prohibitively expensive.

Time and time again we find ourselves in need of technical data to diagnose the cause of a fault with a piece of equipment we've not seen the like of before. If it's a VCR, the manual might cost £15-£25. Do we fork out in the hope that the repair, and our payment, will be quick and easy? If we do, what happens should the customer decide "not to go on having it done"?

We've tried everything over the years, including asking the customer to pay for a manual. But after doing a few sums on their fingers they usually start asking questions.

"If I spend £20 on a manual, what if you find that expensive parts are required?" The upshot is that they decide against forking out on spec.

So we generally accept equipment for repair in the hope that we can carry out the work without embarking on a ruinous bout of spending.

Lately, while I was in Spain, two such jobs were brought to us. One was a Ferguson 3V44 VCR (similar to the JVC HRD140). The other was a Cambridge ARD200 receiver-decoder. Both had obscure faults, and we had no information on either of them. The VCR belonged to a friend, and we were anxious to help. Our usual suppliers couldn't supply manuals – because the VCR was "too old" and the ARD200 "too obscure".

After scanning the classified advertisement pages of *Television* I telephoned a small firm called Fryerns and left a message on the answering machine. Within an hour a bright and personable chap called Colin telephoned us – in Spain – to confirm that he could help with both items. The manuals arrived here shortly afterwards – at a total cost of £10. That's what I call service!

A Bush 2002

"Can you manage on your own this morning?" Steven asked, "I'm slipping out to buy a house." I was back in the UK.

"Right" I said. There was a dismantled Bush 2002 TV set on his side of the bench - which is nearest to the shop counter.

"Perhaps you'd go on with this one" he said. "According to the ticket it's dead, but it isn't. When I upped the setting of the first anode preset, paying no attention to its initial position, there was brightness with field collapse. If it's any help, the set is similar to the Matsui 2086T." Then he was off.

I soon found that there was no 12V supply because the 1W zener diode ZD401 was short-circuit. Its feed resistor was open-circuit. The input to this network is obtained from a line output transformer fed rectifier. A check here produced a reading of 45V off load, so all seemed to be well. Another easy job I thought, as I replaced the resistor and diode then switched on. The field opened out, and there was a good picture. I decided that life was fine – passable at any rate.

But after two minutes the field began to shrink and a smell of hot plastic filled the air. I disconnected the bits I'd fitted and checked for shorts. As there weren't any, I left them disconnected and checked the HT voltage. The reading was high, 127V instead of 114V. Then I saw that C909, a 47μF, 25V electrolytic that's the reservoir capacitor for the LT supply on the primary side of the chopper circuit, had swollen and stretched its jacket. It had also gone high in value – when checked it produced a reading of 82μF.

I fitted a replacement, rated at 50V, replaced ZD401 and its feed resistor once again, and switched on. Up came a picture. When I checked the HT voltage the reading was 118V. Slight adjustment of the +B preset VR901 reduced it to 114V. The set behaved well during a soak test.

Miss Drudge

The phone rang. "Will you come and help, Mr Bullock?" asked a strained, dry old voice. "This is Miss Drudge, number 86. Mother's set has gone again." At that she put the phone down.

Miss Drudge has no interest in watching television – or in anything else. She's a colourless soul who has ended up as her domineering mother's lackey. Her mother, now eighty, sits with a rug over her knees, issuing quiet demands to her daughter.

I asked Greeneyes to watch the shop as I popped along to number 86. The set is a Ferguson 22D1 (TX100 chassis). Its picture seemed to be all right to me, so I looked at Miss Drudge, then at the old woman. She was staring straight ahead.

"Tell him," she said.

"Tell him what?" asked her daughter.

"Tell him the picture flies around then turns into a line when the set's been on for an hour."

Miss Drudge turned to me. "After an hour the picture goes round and turns into a line Mr Bullco" she said. "Please mend it for us."

I took the set back to the workshop and gave it a soak test under a blanket. It failed, just as they had said. So I replaced the TDA3652 field output chip IC6, then gave the set another soak test. It failed again, just as before.

I let it cool down then tried again, only this time I left a digital meter connected to pin 5 of the line output transformer to measure the HT voltage. After half an hour the meter display started to flicker and the voltage reading began to rise from its normal 119V. When the voltage reached 155V the field began to roll. As the voltage rose further there was field collapse.

This time I replaced the TDA4600-2 chopper control chip IC7. Also R114 in the chopper transistor's base drive circuit. This resistor had risen to over twice its correct value of 0·39Ω. When the set was given another soak test it behaved itself.

As I walked in with the set Miss Drudge opened her purse and started to take out some notes. Her face had lost some of its doleful expression. I reconnected the set and told her that it was now all right. She lent over her mother.

"Mr Bullock has mended your set. It's all right now. That's good, isn't it?"

"Leave it on" her mother commanded, as Miss Drudge frantically pushed some money into my hand. I smiled at her and took my leave. Some people have a trying time.

The Commercial Traveller

Steven came in as I got back. "Did you buy a house?" I asked. "Yep" he said.

Just then a bright young fellow with a thick briefcase came in. He was obviously a commercial traveller. I got the impression that he'd come straight from a confidence course.

He switched on a winning smile and winked at me. "I've got something here that'll revolutionise your business" he said triumphantly as he dropped a 13A mains socket on to the counter.

"How come?" I asked.

"This socket ends all the drudgery of housewiring" he said. "Every ounce of the drudgery. Now, ask me why?!"

"But we don't do housewiring" I said.

His grin went and he looked at our floorful of TV sets. "Oh, right" he said, and was gone.

A minute later he was back. "Hey, I've got a set for repair in the boot. I was taking it to Snoddies, but since I'm here. . ." He brought it in and left it with us.

I hoisted it on to the bench. It was a Nokia Model FX6332 – the one with the Euro Mono chassis. When I switched it on there was an EHT rustle then the set tripped and shut down.

"That's the line output transistor" said Steven. So I dismantled the set and checked the transistor (5T10, type S2000A). It was leaky. A replacement restored normal operation.

"Are you suddenly psychic?" I asked Steven

"Nah" he replied, "just done one like it."

Old Abe

Just then I saw Old Abe standing by the door. He lives alone in a riverside hut with a couple of 14in. portable TV sets, a car battery and a screwdriver. While watching one set he messes about with the other one then brings it to us to repair. We mend it and charge him accordingly. Then he uses that one and messes about with the other one. When he brings us a set he walks the ten miles and carries it in a horrible old blanket. It was a warm day, and Abe was as high as his blanket.

"Morning Mr Bullock, Sir" he said. "I've 'ad a bit of good luck, Mr Bullock. Someone's given me a colour telly. Only 'e don't go for long."

"Right Abe" I said, slipping windwards. "Take your blanket back and call in next week."

"Thank 'ee kind, Mr Bullock. Bye, bye for now, Sir."

I gave the set some foam cleaning treatment and pulled it on to the bench. It was a Network NWC1410. When it was switched on it worked all right, but after an hour the picture slowly faded away, leaving the sound. I took the back off and the picture slowly returned. This kept on happening. The job turned out to be a slow one.

A smell of hot plastic filled the air.

I eventually saw what I suspected. The tube's heaters were going out. In the fault condition there was no voltage across the tube base panel pins for the heaters. But there was plenty of voltage at P451, which makes the connection to the main chassis. In this model the heater voltage is stabilised by a pair of wire-wound resistors (1Ω and 2Ω) which are connected in series. Both are on the tube base panel. They are designated R920.

When tested they read all right. Then, suspecting that they were dry-jointed, I took them out, cleaned off their leads and resoldered them to the board. This didn't make any difference. On closer examination I discovered that there was a hairline crack in the tiny bit of print that provides a link between these two resistors. A tiny jumper lead to bridge the break cured the trouble.

Test Report

Eugene Trundle has been trying out a new device from Pace. It has been designed to overcome Channel 5 reception problems caused by carrier clashes

Channel 5 Shifter and Booster

Problems caused by the Channel 5 carrier being at the same frequency as other carriers – primarily those generated by domestic VCRs and satellite tuners – are generally dealt with by moving the locally-generated carrier to a frequency away from UHF ch. 37, the spot allocated to the Channel 5 service in most areas. It can be a fiddly and exacting job, which very often requires the attention of a skilled technician. Where there is a VCR and a satellite box, it may be difficult or impossible to avoid interference of one sort or another.

An AV link, using a scart cable, will overcome mutual interference problems. But this is not always a practical solution: the TV set involved may not be fitted with a suitable socket, and it may be necessary to distribute locally-generated signals to one or more TV sets situated in various parts of the premises. The Pace device overcomes the problems by frequency shifting the Channel 5 signal.

Description

The Pace shifter/booster type CSB5C is a 'black box' that's shaped like a bulbous computer mouse. It is somewhat larger however, at 14 x 7 x 4·3cm. The device is mains powered (230V AC) via a fitted lead and plug, and consumes a maximum of 3W. It has two coaxial connectors: input, with a body-mounted socket, and output via a flying plug on a 700mm lead – you get a 1·5m coaxial lead as well.

The circuitry within the shifter/booster carries out three operations simultaneously. A ch. 37 notch filter with a very sharp response removes all vestiges of the incoming Channel 5 signal at the output. A superhet frequency converter produces a Channel 5 signal in double-sideband form in the UHF spectrum ch. 65-69. The output is set to ch. 65, 66, 68 or 69 by means of a four-way switch. And a boost of about 5dB is given to all the signals that pass through the unit.

Fig. 1 shows the response of the unit across the ch. 33-41 spectrum, while Fig. 2 provides a block diagram of the device. The ch. 37 input is not demodulated or processed in any way. After passing through a low-noise amplifier (LNA) followed by a bandpass filter (BPF) it's applied to a mixer stage along with the output from a precision, crystal-based, voltage-controlled local oscillator (VCO). As a result a new carrier is generated. This is selected by the ch. 65-69 bandpass filter and passed to an adder stage, where it's combined with the other UHF input signals (BBC/ITV/Ch. 4) from the aerial. The latter pass through a separate low-noise amplifier before arriving at the adder. Finally, the notch filter removes the ch. 37 spectrum from the output.

The local oscillator is voltage-controlled via a phase-locked loop (PLL). This works on the frequency-synthesis principle, using a custom-made, 16-pin surface-mounted chip. Many relay transmitters used for TV broadcasting work on the same principle – mixing two carriers to generate harmonics, with a frequency-selective filter to obtain the required output. The BCD (binary-coded decimal) channel select switch sets the new carrier frequency via the PLL.

When I looked inside the device I found that there's a mini 50Hz mains transformer, a three-leg 5V stabiliser and a very special filter block. Everything is surface mounted. The impression you get is that the unit is well built, strong and reliable.

On Test

The first thing I checked was the ch. 37 rejection. At this frequency the strongest signal I could muster had an amplitude of about 15mV. It was completely absent at the output. As a result it had no effect at all on a weak ch. 37 signal generated by a VCR modulator – there was no trace of patterning or interference.

Next I checked the frequency converted output – I selected ch. 66 for the purpose. The frequency was spot on, and the signal was clean, clear and at a level of about 66dBμF (2mV). I found that the unit faithfully converts the phase-modulated Nicam carrier as well as the frequency-modulated mono carrier.

The gain provided by the device is useful for amplifying a weak Channel 5 signal. The other broadcast channels also receive the benefit of low-noise amplification. This is no substitute for a high-gain aerial of course, because with a given signal input level the snow and gain visible on the screen depend not just on the gain provided but also on the noise figure of the LNAs. While the noise figure of the Pace unit's LNAs, about 5dB, beats some older VCRs and TV sets, it is not as good as many low-noise masthead, booster and distribution amplifiers. But the amplification provided certainly makes good the losses introduced by the unit's other circuitry and its connections.

Verdict

This is an impressive little device with excellent performance. It does its allotted duty very well. A great virtue is that the unit is easy to install and can be got going – with the help of the very good instruction sheet – by a completely unskilled user or installer: there is no twiddling, no fiddling – and no knowledge is required apart from the ability to tune in the TV set – or at least find and press its auto set-up key!

Whether people will be happy to pay the recommended price of £34-99 to obtain interference-free Channel 5 reception remains to be seen. Viewers are notoriously tight-fisted, and now that Channel 5 is available from Astra (transponder 63, at 10·92075GHz) those with a satellite receiver have a better alternative. Those with an older Astra installation can update for reception via satellite 1D by using a Global converter unit. BSkyB supply this to existing subscribers for £9-99. It can be obtained from other sources for about £20.

A ch. 35 version of the Pace unit it to be made available in time for the start of Channel 5 transmissions on this UHF channel.

For further details apply to Pace Micro Technology plc., Victoria Road, Saltaire, Shipley, West Yorkshire BD18 3LF. Phone 01274 532 000, fax 01274 532 010.

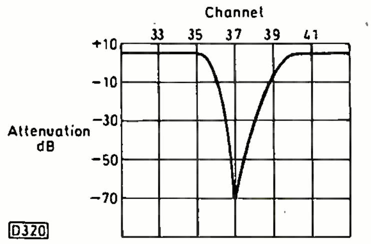


Fig. 1: The ch. 37 notch filter provides 70dB attenuation at the carrier frequency.

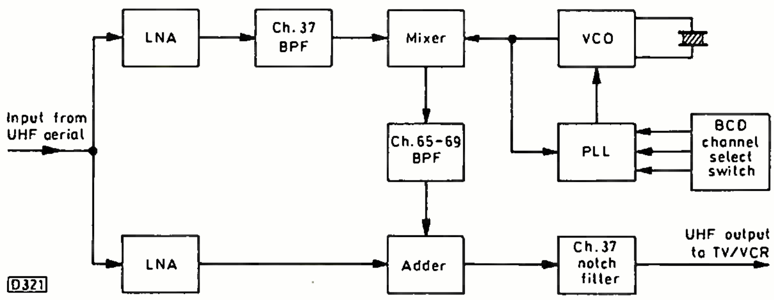
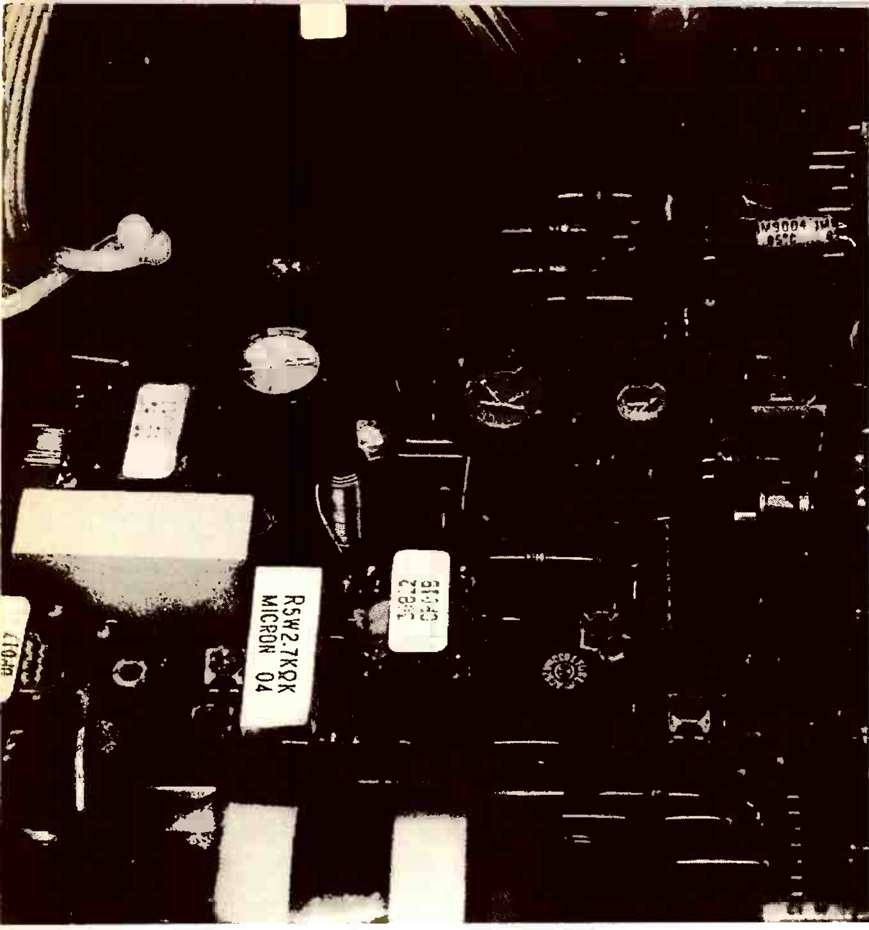


Fig. 2: Simplified block diagram of the signal electronics in the Pace CSB5C unit.



John Edwards' Service Notebook

Philips G110 Chassis

I have never been fond of this chassis. Whenever I've completed a power supply rebuild something else always seems to be wrong. In this case there was field collapse. Fortunately the cause was simply a bad joint at the collector of the upper transistor (Tr7502) in the field output stage.

Use of a multitude of miniature surface-mounted components is a great space saver, but the majority of the PCBs used by manufacturers are very thin and flimsy. As a result, only slight flexing while manoeuvring a board into the service position can lead to cracked components. Surely with such a high density of delicate components the boards should be thicker?

Now you see it, now you don't

A Matsui 1480A worked normally most of the time. But just now and again, perhaps for an instant, the screen would blank out. The sound was not affected. Eventually the set's owner got fed up and asked us to take a look. I have to confess that I wasn't too keen.

We left the set on test in the workshop, and don't know how many times it misbehaved while our backs were turned. After a few hours I saw the fault, which was exactly as described. The screen went blank for about five seconds, then the picture retuned.

Off came the back cover and, as luck would have it, the picture blanked out permanently. When I turned up the first anode control's setting there was a faint negative image. So I used the scope to trace through the luminance signal path, all the time wondering how long it would be before the set decided to work normally again.

In fact the signals were OK up to the RGB outputs from the AN5612 chip IC602, but there were no RGB signals at the CRT base panel. The only item in between is the teletext board. I found that the fault could be made to come and go by slightly flexing this PCB, and eventually traced the cause of the trouble to connector CD902. It looked perfectly OK, but the slightest touch would instigate the fault.

I cut the wires and soldered them directly to the board. After that no amount of prodding would bring back the fault.

Saisho CM250R

I was rather lucky with this set – well, perhaps mixed with a little skill! There was no sound and the screen was blank, so as far as the customer and the job card were concerned the set had been pronounced 'dead'. In fact it was very much alive however, as turning up the first anode control setting (it's on the line output transformer) proved by producing a field collapse display.

Now I don't have the circuit diagram for this model, but confidently started to look for the field output chip. I was stopped in my tracks by the familiar smell of a cooking resistor. To my surprise the smouldering item (R428, 1·2kΩ) seemed to have little to do with the field circuitry. As fellow colleagues out there know, apart from Toshiba, Aiwa and one or two others you can forget about asking manufacturers for technical help – it just isn't there. Unsoldering the field output chip's supply pin made no difference: the resistor still cooked.

I reached for paper and pen and started to draw the circuitry around R428. This approach can be tedious, with tracks that often divert all over the place, but with a little patience the drawing can start to make sense and a familiar circuit will begin to emerge.

It seems that R428 is part of a start-up circuit based around Q403, which was also cooking. At switch on Q403 supplies, via D401, about 12V to the timebase generator circuitry. This continues until the line output stage comes into operation. Once this happens pin 2 of the line output transformer supplies D405 via R408 (1Ω) and the running supply for the timebase generators is produced. D401 is then reverse biased.

R408 and D405 had both failed. Hence the overloaded start-up circuit, which isn't designed to remain in operation. When R408 and D405 had been replaced all was well – proved by a long soak test.

Toshiba 2500TBT

This set produced just a blue screen, with no sound. The on-screen displays, such as channel numbers and menu options, were OK. The blue mute transistor QA07 can be disconnected to assist with fault finding, hopefully producing a more readily recognisable symptom on the screen.

When I disconnected QA07 there was a blank grey raster and still no sound. A faulty tuner was the first suspect, so the voltages at its pins were checked. They were all present, including the 0-30V ramp which is produced when station search is selected. The only voltage that seemed to be wrong was at the AGC pin, where the reading was very low at 0·5V.

The manual doesn't quote the correct voltage here, but a low voltage would remove the output from the tuner.

Q101 (T51496P), the vision and sound IF chip mounted on the vertical board next to the tuner, is the source of the AGC voltage. Its pin voltage readings were all correct except for pin 1, where the reading hovered around 0·25V – the circuit says that the reading here should be 4·5V. Closer examination, using a magnifying glass, showed that the pin's soldering was grey and crumbling. Resoldering this pin – and all the others for good measure – produced a perfect picture and sound.

Grundig M95-490 (CUC3850 Chassis)

Three men and a hired van arrived at the workshop with this giant of a TV set, which was stuck in standby. The 2SD1432 line output transistor T572 was short-circuit, and a replacement quickly reached boiling point then followed its predecessor. A check at the base of the transistor showed that there was 12V here, because of a short-circuit within the TDA8140 line driver chip IC550 – between the 12V supply pin 2 and the output pin 1.

A new TDA8140 chip and 2SD1432 transistor produced a working set, but the transistor was far too hot and the raster's width gradually decreased. C574 (220μF) in the transistor's base drive coupling network was virtually short-circuit. When this item had been replaced the transistor ran normally. Strange that the faulty capacitor didn't seem to affect the base drive waveform when this was checked in the fault condition.

After refitting the chassis I switched on and found that the picture pulsed at random between normal and completely blanked out. The reason for this was found more by luck than judgement. Slight movement of the lead that connects the tube's Aquadag coating to its base panel made the symptom come and go – because this point is linked to the beam limiter circuit. I discarded the lead's end plug and soldered it direct to the PCB, curing the problem.

My troubles were not over however. I noticed that the picture was a little over-scanned horizontally. Slight adjustment of the width control R554 cured this, and the set worked normally for the rest of the day. When I switched the set on next day however it rustled up and went to standby. Why does this always happen when the invoice has been prepared and the set is ready for delivery or collection?

To cut a very long story short, I found that with the correct width setting the receiver wouldn't power up: it worked fine with slight over-scanning. Help was sought from various quarters, but no joy. I eventually noticed a small, vertical sub-board which is positioned between the chopper transformer and the chopper transistor. It had a preset on it, and a voice in my head was telling me to have a twiddle. Then the penny dropped. It's the standby circuit PCB: the preset adjusts the standing bias applied to the optocoupler diode. By experimenting with the preset adjustment I found a point where the receiver could be switched on reliably with the line scan set up correctly.

A word of warning. Although the BU508A is listed as an equivalent of the expensive 2SD1432 line output transistor used in the large-screen version of this chassis, don't be tempted to try using it. The BU508A isn't man enough and will fail.

I was pleased to see the back of this set when it was taken away!

There's money to be made from servicing the monitors used in arcade games machines. One of the most commonly enountered is the Hantarex 9000 series monitor. Andy Gallacher provides general guidance on its servicing requirements

Hantarex Games

Having read Peter Hubbard's excellent servicing guide to the Hantarex MTC9000 games monitor in the June 1994 issue of *Television* I managed to obtain a set of service manuals for this and other Hantarex chassis. I then contacted the owner of one of the large local arcades, and was able to come to a mutually satisfactory deal with him on servicing and maintaining his arcade's games monitors. Since then I have spent many happy hours in the workshop and out at various holiday camp sites repairing these units.

While it is true to say that you will not make a quick fortune out of games monitor repairs, you can generate a reasonable income if you are prepared to stick at it and do the job properly. In my experience arcade and leisure site owners are a genuine and friendly group of people who do not complain about paying a fair price for a good repair. Unlike so many domestic customers, they will not put up with shoddy repairs or with being charged twice to do the same repair.

One point to note is that, especially during the summer months, speedy diagnosis and repair is essential. After all, this is when these monitors really earn their keep.

Table 1 lists the basic technical characteristics of Hanatarex 9000 series monitors. The next thing to consider is spares.

Spares Kit

If you are thinking of providing a repair service for these units you would be well advised to carry a small stock of the following items – in addition to your general spares kit.

(1) Line output transformers. The most commonly used one is the TFHR7025, which is available from CPC.

(2) 330Ω, 30W wire-wound resistors. Buy several.

(3) Type 96009 degaussing posistors.

(4) TIPL762 transistors. These are used for series regulation in the power supply.

(5) 1N4007 and BYD33G diodes.

(6) TDA2595 and TDA1670A integrated circuits.

(7) 4·7Ω, 9W wire-wound resistors.

(8) 22μF, 200V electrolytic capacitors.

Although this list of components is small it should, when added to a good general spares kit, enable you to complete most of the repairs you are likely to need to carry out.

Installation and Setting up

Supplies: Check that the HT voltage is 130V ±3% at TP10. The field timebase supply should be 26V ±5% at TP13. The supply to the video amplifier should be 24V ±5% at TP1. The supply to the video output stages should be 200V ±5% at TP14.

Line oscillator: Remove the incoming sync pulses (SW4) then adjust RV5 for a stationary image. Reconnect the sync pulses.

Field oscillator: Adjust RV1 to obtain a slow image rollover in the downwards direction. Then turn RV1 back until the image locks.

Bridge coil adjustment: Bridge coil B3 should not normally need adjustment as it is factory preset. If adjustment is for any reason required, carry it out as follows:

(1) Adjust RV4 on board CG for minimum width.

(2) Adjust B3's ferrite core for minimum width.

(3) Adjust RV4 for the correct width.

RGB gain: Apply equal-amplitude RGB signals to the video amplifier inputs. Turn RV206 (blue gain) on the CRT base board to mid position, then adjust the contrast control P1 for a 100V peak-to-peak amplitude video signal checked with an oscilloscope connected to the blue cathode.

Finally set the signals at the red and green cathodes to the same p-p value by adjusting RV202 and RV201 respectively.

White level: Remove the video input signal, then adjust RV7 (CRT grid 1) for maximum brightness. Turn the black-level controls on the CRT base board to minimum (clockwise) – these are RV203 red, RV204 green and RV205 blue. Next, use the first anode (G2) preset to reduce the brightness until the predominant colour is just visible. Finally adjust the black-level controls to obtain the best white possible. Note that the first anode/G2 preset acts as the brightness control.

Focus: With the monitor displaying a medium-brightness dot pattern, adjust the focus control on the line output transformer for the best possible focus.

Line linearity: With the monitor displaying a crosshatch pattern, adjust B1 so that the last square on the right is equal in size to the first square on the left.

Common Faults

Here's a list of common faults I have encountered with 9000 series monitors:

Dead with F1 (2AT) blown, D19 leaky and D21 short-circuit: Replace all four mains bridge rectifier diodes D19-22 using nice new 1N4007s. I used to use 1N4004s, as suggested by Peter Hubbard, but have found that they have not always been reliable.

Dead, tries to start then nothing: Check the line output transformer for signs of overheating or leakage. Replace as necessary.

Table 1: Basic technical specification

Supply: 128V AC + 10/20%, 50/60Hz. The supply must be provided by an isolating transformer with the following specification: primary 220/240V AC, secondary 128V AC at 100VA. Power consumption is 100W maximum.

Degaussing: 220/240V AC automatic at switch on.

Video input: RGB, positive going. Input impedance 2·2kΩ. Input sensitivity 1-5V peak-to-peak. An interface board is available for use with negative-going input signals.

Video bandwidth: 12MHz at the –3dB points.

Blanking: Line 12μsec, field 1msec.

Sync input: Positive- or negative-going, composite or separate, 1·5-5V peak-to-peak. Input impedance 2·2kΩ. SW4 provides selection of positive or negative inputs.

Scan frequencies: Line 15·625kHz ± 0·5kHz adjustable. Field 45-65Hz adjustable.

Dead with B1 (line lin.) whistling and only 60-70V at the scan plug link: Replace C53 (470μF, 200V).

Dead with 125V across the 330Ω, 30W dropper resistor R105 which glows (not surprising really!): Pin 1 of the line output transformer short-circuit to pin 5.

Dead: If there is any leakage between pins 1, 3 and 9 of the line output transformer and pin 5 (check with pin 5 unsoldered) replace the transformer.

Dead with the 330Ω, 30W dropper R105 burning up: Incorrect line output transformer has been fitted. Replace the dropper as well. One spares stockist has been known to supply the TFHR7026 for this chassis. The above is the result when it's fitted.

Dead, no voltage at pin 3 of the line output transformer: Replace R81 (4·7Ω, 9W). This resistor may have failed because the transformer has died, but can also fail on its own accord. Note that the circuitry here can vary.

Dead, tries to start for five-ten seconds then nothing: Replace the safety resistor R94 (3·9Ω, 0·5W) and the TDA1670A field timebase chip IC1. With this fault the voltage at the collector of the line output transistor will be low at 109-112V.

EHT but no picture: Cracked print to F connections on the CRT base panel.

Field roll after ten minutes, with limited control using the potentiometer: Replace C38 (1μF, 63V), D5 (1N4004) and D4 (1N4148).

Intermittent field roll: Replace C9 (100μF, 35V) which is connected to pin 15 of IC1.

No field sync: C18 (10μF, 25V) is low in value. It's connected to one side of SW4.

Shimmer at extremities of picture: Replace the 26V supply reservoir capacitor C57 (1,000μF, 35V). I prefer to see a 50V capacitor in this position.

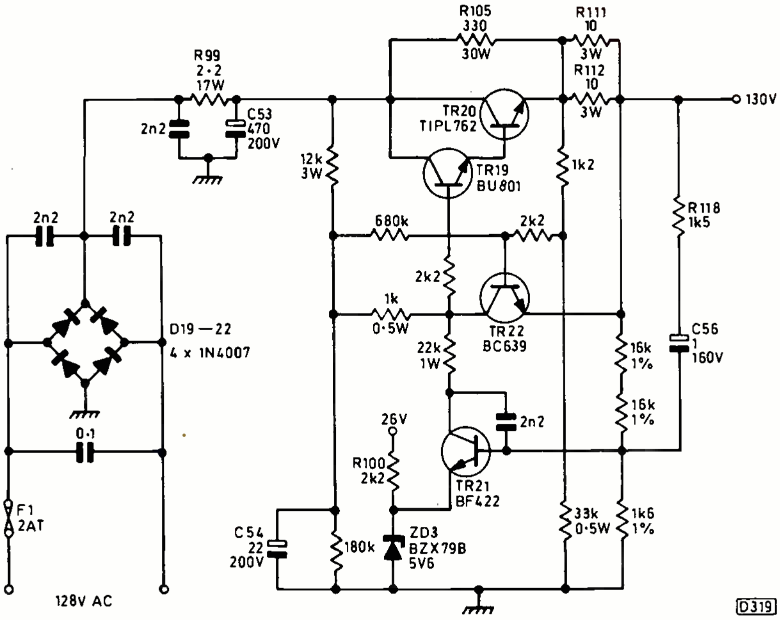


Fig. 1: Power supply circuit, with series regulator, used in Hantarex 9000 series games monitors. The 26V supply for R100/ZD3 is obtained from the line output stage. This supply is used by several stages and is the source of the 12V supply. R118/C56 provide ripple feedback to the base of TR21. TR22 provides excess current limiting by sensing the voltage developed across R111/112: should the voltage rise because of an overload TR22 will switch on.

The degaussing circuit (not shown) requires a 220V AC input and is separately fused (F2, 3·15AT). In some monitors the degaussing is push-button operated.

Shimmering picture with line whistle: Replace C34 (22µF, 160V). I use a capacitor rated at 200V in this position and have never had to replace one a second time.

Blank pink raster with black diagonal lines scrollling through the picture: The RGB input plug has been reversed.

In conclusion, it's safe to say that if these monitors are well serviced and properly set up they will provide excellent pictures despite the fact that they are now getting on in years.

General Points

When restarting these monitors after the winter break you would be well advised to dry them out thoroughly, using your trusty hairdryer, and to check the line driver and output transformers for dry-joints before you switch on. Most of the spares required for these monitors can be obtained from CPC at very reasonable prices.

I can supply photocopies of the circuit diagrams for the Hantarex 900, 900E, 9000 series and Polo monitors at £1.50 each including post and packing. Telephone 01639 630 539 after 6 p.m.

You will mostly come across 9000 series monitors. There are a few of the older 900 and 900E monitors around. These are very reliable and there is little service history. Likewise there is little service history for the newer Polo, which has been introduced during the last couple of years.

I hope that this article will be of help and that some of you will decide to take the plunge as I did. It can be quite interesting and enjoyable work, and requires no investment in additional specialised test gear.

Book Review

Electronics Made Simple, by Ian Sinclair. Published by Butterworth Heinemann Ltd. under the Made Simple Books imprint. 200 pages 186 x 245mm. £14.99.

The author of this book is well known for his ability to explain electronic systems and circuitry clearly, so that the reader gains a quick understanding of what is involved without having to go through the agony of calculations and excessive theory. He tells us that aim of this book is to present an outline of modern electronics with a strong emphasis on how systems work rather than circuit details and theory. I'd say that he manages rather more than this, and in the process makes the book an ideal starter for anyone who comes to the subject for the first time.

The book concentrates on those aspects of electronics most relevant to day-to-day matters – radio and TV, disc and tape recording, basic digital techniques, microprocessors and computers. For its intended readership the book is first rate. It's available from the Customer Services Department, Heinemann, PO Box 382, Oxford OX2 8RU. **J.A.R.**

Correction

Because of a computer program compatibility problem some errors occurred in the section on the Amstrad SRD950 in Satellite Workshop last month. The rather curious percentage symbols in the first line of the instructions (page 632) for use with a standard 10GHz LNB should have been arrows pointing right, i.e. press Setup > > >. In line seven of the next paragraph (centre column) the odd-looking s and t should have been arrows pointing up and down. We have been having some teething problems with a new Apple Mac computer and the software that has been installed.

There were also problems with the cartoons last month (pages 663 and 665), which were incorrectly scanned in at low resolution by our filmsetters.

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LA4520	£3.80	SAB3035	£9.80	STK5471	£4.50	TA7681P	£7.80	TDA1670A	£3.20	TDA2680	£3.80	TDA4505E	£5.00	TDA9503	£3.80	UPC1363C	£5.80
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LA7801	£3.50	SDA2546	£9.00	STK5490	£7.80	TA8216H	£3.90	TDA1904	£1.80	TDA3330	£12.50	TDA4600	£2.85	TEA1039	£1.90	UPC1420CA	£12.20
LA7820	£3.80	SDA3202	£4.00	STK6962	£3.80	TA8690	£22.50	TDA1908	£2.80	TDA3504	£6.80	TDA4601	£2.80	TEA2014	£3.80	UPC1488	£3.20
LA7830	£2.80	SL470/471	£4.00	STK7253	£5.80	TA8691N	£6.80	TDA1950	£3.50	TDA3505	£15.80	TDA4601D	£2.80	TEA2018A	£2.20	UPC1498	£3.20
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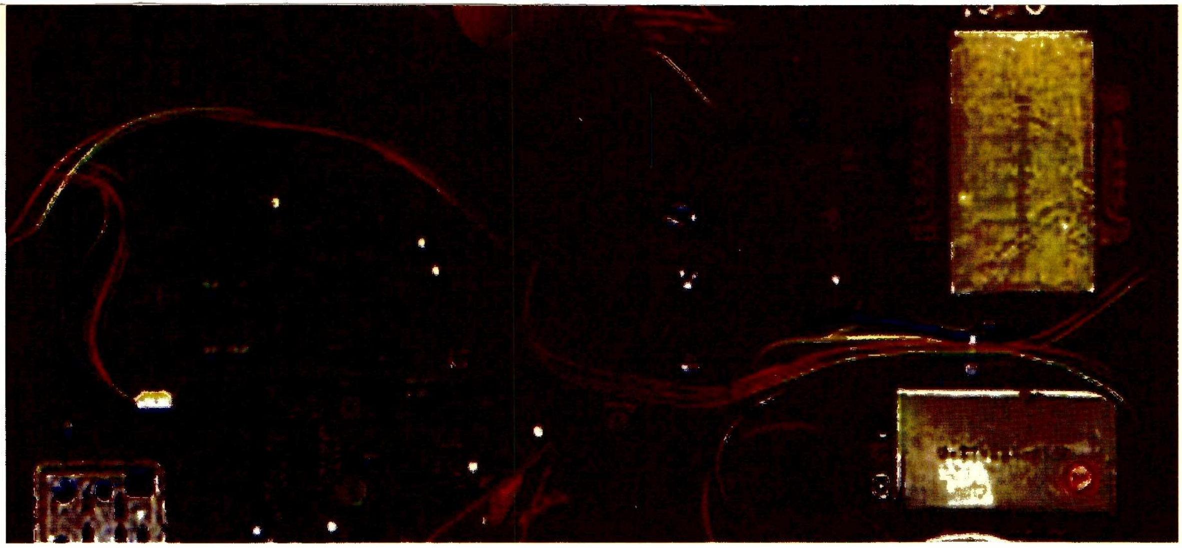


Satellite Notebook

Reports from Hugh Cocks John C. Priest and Pete Haylor

Cable Trouble

The owner of a Drake ESR100 receiver phoned to complain about "intermittent picture whiteout" – an intriguing fault description if ever there was one! When I called I found that it was a not unreasonable description. There were sparklies on all the Astra channels. Some were worse than others, the lowest frequency channels in general suffering most. Tuning through the band produced a variation in the sparklies, which was unusual.

BBC Prime via a MAC decoder was received from Intelsat 601 (27·5°W) via a separate dish – also Country Music TV (this is the feed for the Astra service). These signals came through all right, so the receiver was obviously OK. The results were the same when I bypassed the Astra/Intelsat changeover switch. As it was a terrible, wet day I fitted an IF line amplifier, which brought things almost back to normal, and promised to call back when the weather improved. The problem might require access to the dish, which was awkward. The Astra feed to the receiver came from a magic switch arrangement that also linked six other houses, where there were no complaints about the reception. The Intelsat feed went to the receiver direct.

I returned when the weather had improved. Fortunately the magic switch had two spare outlets (it was an eight-way type), but connecting the Drake receiver to either of them produced similar results. When I connected a temporary length of cable between the magic switch and the receiver normal reception was obtained.

As so often, the old cable looked to be all right, with no visible cuts or snicks anywhere. The connection to the magic switch was as dry as a bone – everything was housed in a waterproof box. The lower frequencies were being attenuated more than the higher ones: I have come across this before with duff cable, though it's much more common for the attenuation to be greatest at the higher frequencies. Strange also that the sparklies came and went at random.

Because of the number of connections to the Astra dish, we had to fit a DC injection system at the magic switch. The Drake receiver was often the only one in use, and if a horizontally-polarised channel (17/18V) was required the receiver couldn't cope with having to power both the switch and the LNB, stubbonly staying with the vertically-polarised channels (14V) until a neighbour's receiver was switched on to provide assistance. **H.C.**

Receiver Cleaning

We occasionally get for repair a receiver whose top has been selected as a sleeping space by the owner's cat. Nice and warm for the cat, but not so wonderful for the receiver. The blocked ventilation holes raise the temperature, while fur etc. gets in and can end up as a thick carpet on the main PCB. The accompanying photograph shows the result with a Pace SS9200 that came our way recently – it had eventually given up and stopped working.

If you are willing to undertake the repair of such a receiver, the first thing to do is to clean up the PCB. Gloves are certainly required for this. We're lucky in having an air compressor, so the first job is to use an air hose to blow out as much mess as possible. Do this outside the workshop!

The PCB may have some hard-to-shift deposits on it. Clean off as much as possible with surgical or methylated spirit or a suitable alternative. This may suffice. In stubborn cases we literally hose down the PCB and leave it to dry as quickly as possible in bright sunshine or in front of a heater. Remove the tuner and modulator metal lids when you do this, to prevent any water being trapped. Consult the owner first, as it could be a kill-or-cure solution.

The owner may be a little embarrassed by his/her cat causing the problem. One offered to clean up the board himself! We've never had a PCB that refused to work after being hosed down – the important thing is to dry it as quickly as possible after the cleaning operation. Don't power the board until it's bone dry.

In this particular case a new chopper transformer and replacement of C9 (1μF) did the trick. As the 2,200μF 5V and 12V supply reservoir capacitors C25 and C21 had some years on the clock we replaced them, also C29 (100μF, 35V) which is the usual cause of diagonal lines on VideoCrypt channels. The tuner was the later (Sharp) type, so there was no need to replace any capacitors inside it. **H.C.**

Pace PRD900+

This receiver was brought in because it was dead. It came to life after the usual power supply rebuild, but wouldn't decode encrypted channels and showed the "card invalid" message, especially when first connected to the mains supply. The voltages on the secondary side of the power supply were all low. While checking through the LT reservoir capacitors I turned the PCB over and felt something move under my finger. It turned out to be the top core, which had cracked, of the chopper transformer. A new transformer restored normal operation.

It transpired that when the set had failed its owner had opened the case to check the fuse. He had levered the fuse out with a screwdriver, using the top of the transformer as a fulcrum. That bit of DIY jacked up his repair bill by fifty per cent. **J.C.P.**

Pace MSS 1001-1

This receiver worked normally most of the time. It would occasionally produce a blue screen with the warning "LNB short" however. A loan receiver worked perfectly at the customer's house, while the MSS1001-1 was also OK on the bench, with no fault messages.

When the MSS1001-1 was returned to the customer's house the fault returned. It could be cleared by a power-off reset, and would then be OK for two-three days. After a chat with Pace technical I replaced the LM358 chip U3A in the LNB-short detector circuit. This didn't clear the fault, but replacing the associated resistors R22, 23, 24, 51, 52 and 419 en bloc did. It seems that the LNB-short detector circuit is sensitive to resistor tolerance spreads and/or different LNB loads. **J.C.P.**

Pace PRD800

Another dealer passed this receiver to me after rebuilding the power supply. When it was connected to the mains supply the standby dash came on but, after a couple of minutes, faded – or went off immediately if any button was pressed. Checks showed that the voltages were ticking up and down as if the power supply couldn't meet the current demand.

While I was checking the components on the primary side of the circuit I noticed that R129 was missing. This 220Ω, surface-mounted resistor is connected between the base and the emitter of the BUT11A chopper transistor. It had apparently been removed inadvertently when the previous engineer had used desoldering braid to remove the faulty chopper transistor. A new 220Ω resistor restored normal operation. **J.C.P.**

Quickies

BT SVS250: No decoder messages. C45 (1μF, 50V) was faulty.
Pace PRD800: There was no RF signal. The aerial socket pin was broken at the print.
Echostar SR5500: This one was dead because the fuse in the mains socket was open-circuit.
Pace MSS200: There were just crackling sounds. The pins on the mains connector had burnt off!
Churchill D2-MAC receiver: Replacing three electrolytics in the power supply brought this dead receiver to life.
Pace PRD800: The symptom was no decoder operation. The cure was to replace U22. **P.H.**

Two Paces

As usual on a Monday morning the phone was quite busy with calls from customers about their receivers that had stopped receiving. Two that were brought in for attention were a Pace MSS100 and a Pace MRD920 (a MAC model). Neither of them showed any signs of life.

I decided to tackle the MSS100 first. It was an early model, just out of guarantee, and the mains bridge rectifier's 47μF reservoir capacitor C4 had gone open-circuit. As a result, the TOP202 chopper device U1 had failed. No great problem here: a new capacitor and chip soon put matters right. But when I connected the receiver to the workshop signal feed there was no picture. At this point I got distracted by the MRD920 repair, which consisted of replacing the pink chopper transformer, the mains fuse and the 1μF chopper drive coupling capacitor C9.

Once again there was no picture when the receiver was supposedly provided with a signal. The culprit turned out to be a poor F socket contact inside the workshop IF splitter. A lot of time could have been wasted on the MSS100, blaming it for no reception. A typical Monday morning problem!

When any MRD series receiver comes in for repair nowadays I replace all the large DC electrolytic capacitors in the power supply. This may make little difference with PAL reception, but with MAC reception the decoder lock-in time can be dramatically reduced and the picture generally improved. It's worth doing the same thing with any SS9000/9200 series receivers that come in. By now they've clocked up quite a few years' use, and the before and after picture quality difference can be seen.

MRD920 receivers always seem to produce blacker-than-black pictures with MAC reception. This isn't helped by going into the MAC vision set-up menu. The later MSS260 produces much better looking MAC pictures – in fact the flesh tones look as good as PAL!

After repairing an MSS100 receiver, or before supplying a new one, I always use the 'power-on options' menu to set it so that the receiver switches to Sky News after a power cut. We have quite a lot of these receivers in holiday villas, and though we leave instructions some people who don't have satellite TV at home can't manage to switch the receiver on. Sky News is referred to as the "boot channel" in the global options menu in the Pace Link PC download system. **H.C.**

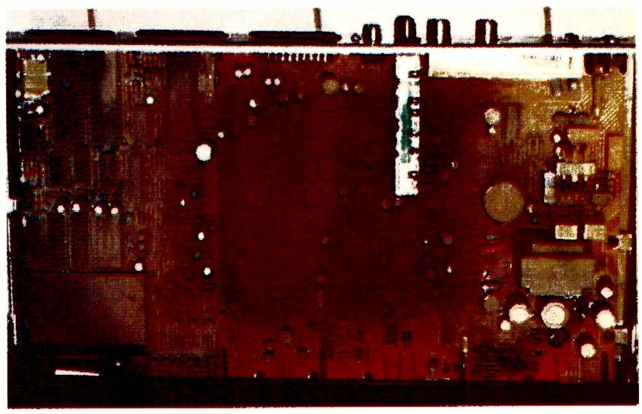
Radio Reception with PRD800s

A disadvantage when using a PRD series receiver to listen to a radio channel via a TV set is that the picture is normally present – there's no blank-screen radio facility as there is in the PRD900 and the later MSS series receivers. A useful dodge is to select "AV Source Ext V" in the channel set-up menu with each radio channel. The receiver then disconnects its internal video loop-through via the external decoder scart socket: as long as there's no decoder connected to the socket, a blue screen will accompany the radio channels.

The only problem with this otherwise excellent arrangement is that if someone presses button F followed by store in quick succession the blue screen will be removed and the internally-generated sync signals will lead to a "TV channels OK, dead on the radio channels" complaint. Repeating the F and store sequence with the remote control unit will bring them back. As long as the customer is aware of the problem and the remedy, there should be no difficulties.

The SS9200 can be set up similarly, but the quality of the internally-generated sync signal is such that only some sets will lock properly, others being unable to cope – sometimes locking all right after a minute or so. With most TV sets the audio is muted when sync is lost. **H.C.**

The consequences of the owner's cat finding the top of a Pace SS9200 receiver a convenient place to sleep. Photo courtesy José Ferreira.

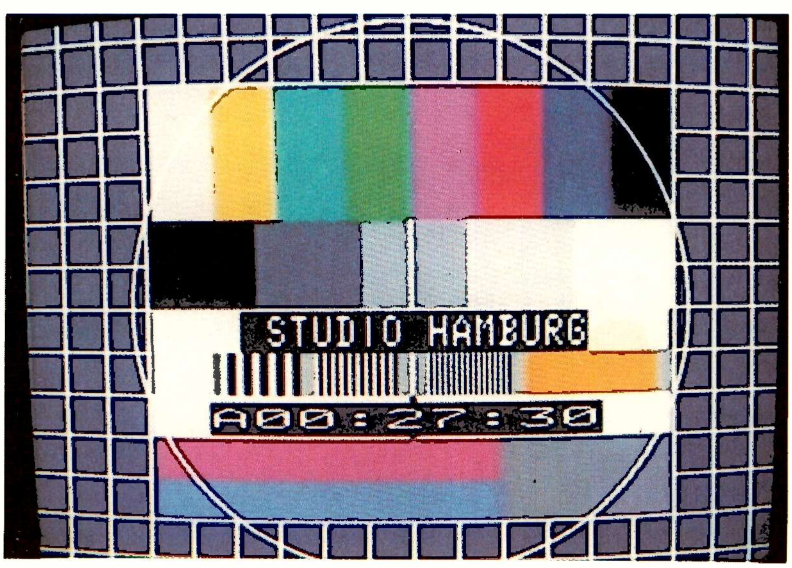


Long-distance Television

DX and satellite TV conditions and reception, news from abroad, digital receiver latest and interference problems.
Roger Bunney reports

Good news at last: in comparison with previous weeks, there was a real surge in Sporadic E activity at the end of May. Reception was mainly from the south, with signals from Italy, Spain and Portugal. There has been reception on most days up to the time of writing this (June 3rd). Here's the collated SpE log for the period:

10/5/97 Unidentified programmes (similar) on chs. E3 and 4.
15/5/97 Ch. E2 signal received from the Middle East.
16/5/97 ORT (Russia) chs. R1, 2; HRT (Croatia) ch. E3.
17/5/97 YT (Ukraine) ch. E2.
22/5/97 TVE (Spain) chs. E2-4; Video (Italy) ch. E2 (vision carrier actually at 47·875MHz).
23/5/97 HRT E3; RAI (Italy) IA, B; Video E2; also many unidentified signals.
24/5/97 RTP (Portugal) E2, 3.
27/5/97 TVE E2-4.
28/5/97 TVE E2, 3.
29/5/97 Unidentified signals on chs. E2, 3 and R1.
30/5/97 NRK (Norway) E2, 3; RAI IA, B; RTP E3; also unidentified signals. There was also a tropospheric lift in the east, with signals from DR (Denmark) on chs. E5, 7, 8, 10 and TV2 at UHF, and from NRK (Norway) on chs. E6, 8, 9 and 11.
31/5/97 Video E2; RAI IA; many unidentified signals on chs. R2 and E3.
1/6/97 TVE E2-4; RAI IA, B; Syria E2; RTS (Serbia) E3; TVE E2-4; RTP E3.
2/6/97 RAI IA.
3/6/97 TVE E2-4; RAI IB; CRO (Croatia) E4; SVT (Sweden) E2-4; Eesti (Estonia) R2; RUV (Iceland) E4.



A digital FUBK test pattern received by John Locker via the Kopernikus satellite at 28·5°E.

Cyril Willis (King's Lynn) mentions that Belgium ch. E3 had scrambled video during May, though the Band III outlets remained in the clear. The Tele-21 outlets opted for scrambling/pay TV recently: it looks as if Liege has already gone this way.

On May 15th, just before 0700 GMT, Garry Smith (Derby) received a weak ch. E2 signal, with a fluttering flag followed by inside views of a mosque. I presume that this was an opening sequence from the Middle East, probably with a national anthem and readings from the Koran. On June 1st he again received a weak ch. E2 signal at 0700. This time the signal rose to become strong. There were waterfall scenes and Arabic text – no field blanking text. At 0730 an L-shaped Syrian logo appeared at the lower left-hand corner.

The very warm weather at the end of May was accompanied by some odd propagation effects. Cyril mentions that the local signals from Sandy Heath, received via his 14-element aerial, kept fading and at times dropped below the noise level, with complete loss of programme on all channels. Most odd. I've known this to happen with a microwave link across a sea path, but not with close, terrestrial UHF line-of-sight signals. Any comments?

Satellite Sightings

With more news feeds opting for digital transmission, I'm getting fewer reports of satellite reception. Roy Carmen (Isle of Wight) is still sending in detailed listings that reveal a wide variety reception however. The general election on

May 1st produced loggings that, with further news on the 2nd, ran to two foolscap sheets. He noted reports from PAS-3R at 43°W across to Eutelsat I F4 at 25·5°E. Many countries, particularly Germany, took a keen interest in the results. Turkey took a live feed via Eutelsat II F2 at 10°E. On the afternoon of the 2nd, Ian Paisley was heard being told that he couldn't argue during a live transmission – this was via Eutelsat II F2 (11·656GHz vertical).

There was coverage of the Yugoslav war crimes trials via Eutelsat II F2 – the first sentencing was seen on the 7th, via the ICTY TV SNG unit. Intelsat K produced "Good Morning America" from Helsinki, Finland on the morning of the 15th. D2-MAC is still in use. For example the London Maxat Teleport carried the Irish Permanent annual report at 0900-1000 on the 21st – as the report came to an end before the transponder hire period was up, there was a lengthy test pattern showing.

John Locker (Wirral) has been sat-zapping with his new Nokia digital box. It's the modified Bentley-Walker (Hayling Island) version. He has used the red menu selection (over twenty memories) to enter the parameters for various news feeds, giving him rapid access to the signals. A comparison between analogue and digital colour-bar patterns shows that digital pictures are much sharper: the analogue bars were more smudgy. But while weak analogue signals will lock up, digital ones won't. You need a strong signal: below a certain level, nothing appears on the screen.

Terrestrial News

The Netherlands: New local TV services are being introduced. TV OOST will be basically a cable service operating on ch. E36 from Hengelo near the German border. Power is to be 50kW (ERP), mast height 125m, with a directional aerial aimed at approximately 190-260°. The service is to start on October 1st. ROF (Omrop Fryslasn) will serve the Friesland region, with a 150kW ERP transmitter at Irnsum.

Sweden: Plans for a digital terrestrial TV service, with five channels initially, have been announced. The service will probably start next year in Malmo, Gothenburg and the northern Swedish towns. The five channels will be Guldkanalen (The Gold Channel), a 24-hour news/sports channel, an arts/culture channel in conjunction with ARTE and the BBC, a repeats channel, and a channel for regional news and programming.

Spain: TVE-1's share of viewers' time has fallen to 24 per cent. Newcommers Antenna 3 and Tele5 are achieving shares just below this figure.

Greece: The government is to issue new licences in an attempt to regulate the TV airwave chaos. At present 430 transmissions are available across the country, with the state broadcaster ERT having 65. Eight broadcasters will receive national licences: ERT, TV Macedonia, New Kanali 5, 902 TV, Mega, Antenna, Star and Sky. There will be 24 regional allocations and a further 59 local channels around the country.

Hungary: Bids have been received to operate the Channel 2 national commercial service. The winner is expected to be announced shortly.

USA: The Federal Communications Commission has announced that analogue TV transmissions will end in the year

(Left) Analogue colour-bar identification received by John Locker from Intelsat K at 21·5°W.
(Right) Digital colour-bar identification received by John Locker from Intelsat K. Note the sharper bar transitions.

Iranian TV signal received by John Locker via the Orion satellite at 37·5°W. The world is depicted as the head of a cobra.

2006. By that time all digital TV technical and transmission problems are expected to have been resolved – and a common standard adopted. Viewers will have to buy new digital TV sets or use set-top converters. The main networks (CBS, NBC, ABC and Fox) are to introduce digital TV services covering 30 per cent of householders in May 1999.

Satellite News

The French government intends to impose a 5·5 per cent tax on foreign-owned satellite TV channels, such as TeleMonteCarlo and CLT's RTL9, aimed at France. It will be based on gross turnover and could affect almost forty channels. The money thus raised would be used to finance French-language TV programmes.

Television Par Satellite (TPS) hopes to set up pay-TV services for Spain and Italy in competition with Canal Plus's expansion plans. In Spain it would form part of the Distribuidora Television Digital package while in Italy it would operate with Telepiu. TPS is run by M6/CLT.

Those equipped to receive digital transmissions may be interested in a new channel, Fashion TV, that came into operation on May 1st via Hot Bird 1 at 13°E. It uses the 11·30775GHz horizontal transponder, with a 27·5Mbits/sec symbol rate and an FEC of 0·75.

Another satellite TV service for SE Asia, DBS Asia, has been announced. It will be based in Taiwan and plans to provide some 500 channels via Ku band capacity aboard the Laostar 1 and 2 satellites (due for launch next summer). Signal levels would be suitable for reception with 60cm dishes. News Corporation/Echostar and the Japanese Itochu Corporation have already joined the project.

A Maori-language channel is planned for New Zealand. Test transmissions were recently carried out via Intelsat 702 at 177°E.

Digital Equipment Update

A new, upgraded version of the Mascom 9200S receiver has been introduced. It's still based on the Nokia D-box hardware, but the software is substantially different from the Nokia's. The new version provides both C and Ku band reception, and will resolve conventional programme channels and news feeds. To quote a recent review: "The 9200S reacts astonishingly quickly when you are carrying out a manual search for SCPC channels. AP-TV, WTN, Reuters and feeds on DFS are read in within a matter of seconds." An Irdeto conditional access module (CAM) is not incorporated though one can be added. The receiver is intended as an independant free-to-air (FTA) unit.

The Hyundai Model HS100 is now on sale in SE Asean markets. This is again a non-CAM receiver intended for FTA use. The symbol rate can be as low as 4Mbits/sec, which is ideal for news feeds.

Nokia units are now available from a number of dealers, with various software modifications.

Interference Problems

Having moved to the new house, we are faced with different interference problems. Ignition interference has virtually disappeared now that we are no longer next to a main road. But, being on the edge of a large residential development and not too far from an established industrial estate, other forms of interference have appeared. There is extensive use of 49MHz baby alarms, as we expected, all but clobbering ch. R1. In addition a 49MHz industrial paging system contributes to the mêlée. We have already located the aerial for the paging system and plan to take action.

The first Band I aerial I tried, a conventional wideband two-element type WB2 with dual dipoles and a reflector, provides minimal rejection of interference from nearby sources. My next move will be to erect a wideband two-element aerial with the reflector spaced at 0·3 wavelength (55MHz) from the dual dipoles. This will be pointed upwards to the sky. The polar response of this arrangement provides a 30° uplift with respect to ground, and thus a valuable reduction in interference from ground-based sources.

I proved this years ago, when I had a serious problem with radiation across Band I from VDUs at a nearby industrial plant. I used crossed-dipoles with 0·3 wavelength-spaced reflectors, mounted at 30ft. This aerial could produce New Zealand ch. 1 during an F2 opening though the output from the main Band I aerial at over 50ft was jammed with interference. A 300Ω balanced to 75Ω unbalanced transformer will be used to match the output from the new aerial to the coaxial feeder. This should give clean signals with minimal pickup via the feeder. Fitting ferrite rings adjacent to the dipole take-off point can help reduce feeder pickup.

Having been troubled by many types of interference over the years, the first column I look at each month in the RSGB journal *RadCom* is Dave Lauder's EMC contribution. It covers all aspects of RF interference. I found the June 1997 column depressing: along with useful practical information on high-pass filters and Channel 5 problems, a new source of Band I interference is mentioned.

The interference consists of a long series of varying musical tones, extending from the HF band to the lower end of Band I at 50MHz. They are produced by water conditioners, which consist of coils of wire that are wound round input water pipes and have AF oscillations applied to them to reduce lime-scale deposits. Mineral salts are destabilised, while essential minerals are retained. Unfortunately the applied AF is rich in harmonics that produce the HF and VHF radiation. Ferrite rings fitted on a conditoner's cabling were found to reduce but not eliminate the problem.

These water-conditioner appliances are often fitted to reduce lime-scale build up in central heating boilers. Models identified as causing the problem include the Water King, Water Imp, Wrappa, Black Box, Hydropath and several models from Scale Watcher UK. If any readers have experience of this problem and have been able to devise any way of reducing it, please write in so that I can pass the information to Dave Lauder.

Answer to Test Case 416

– see page 709 –

Digital storage of analogue values has been a feature of much domestic electronic equipment for some years. But it can still cause confusion – when it seems that the tail is wagging the dog. On rare occasions the cause of symptoms like those with the Sony set lies in the control system, perhaps because a memory chip is faulty. Usually however the problem is caused by a faulty item in the relevant timebase or processing circuitry, just as in a set with discrete component presets. The Sony set's fault fell into this category.

The field timebase chip in the AE2B chassis (the AE2F, BE3B etc. chassis are similar in this respect) operates symmetrically about chassis potential, using separate +15V and –15V supplies (derived from the line output stage) and no scan coupling capacitor. All is well so long as the supplies are balanced. A shortfall in one of them will result in vertical picture shift and scan foreshortening however. If things go too far the trip circuit operates. But in this case the imbalance was relatively minor, within the range of the preset software control system – hence Colin's ability to produce a correctly scanned picture even with the fault present.

Ted found that when the fault was present the voltage on the +15V line was low and there was some ripple on it. The solution was to replace D814 and the two associated 470μF capacitors C835 and C1504.

NEXT MONTH IN TELEVISION

Servicing Computer Monitors

Though they both produce displays on a CRT, there are important differences between a TV set and a computer monitor. Some of these differences can cause problems for those who are not aware of them. Russ Phillips, who started out as a TV engineer, provides essential guidance for those new to the world of computer monitors.

Digital TV/video Servicing

RETRA's July Servicing Conference addressed the problems of TV/video servicing in the digital age. What will be repaired by whom, the investment and software that will be required, training and technical support from manufacturers were some of the subjects considered. Eugene Trundle was there to report for us.

Servicing the Tatung 190/195 Chassis

John Coombes on how to tackle these popular sets, which feature a FET chopper power supply.

Dolby Developments

Dolby Laboratories' Pro-Logic Surround sound system is found in millions of homes around the world. The company also developed the AC-3 digital audio system for the DVD, and Virtual Dolby Surround, its answer to JVC's 3D Phonic system. George Cole visited Dolby's San Francisco headquarters to hear about the company's latest plans for the home AV market.

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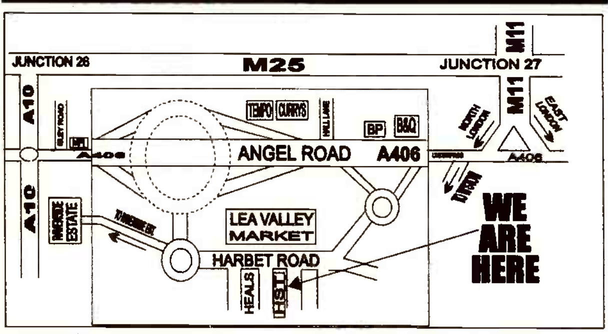

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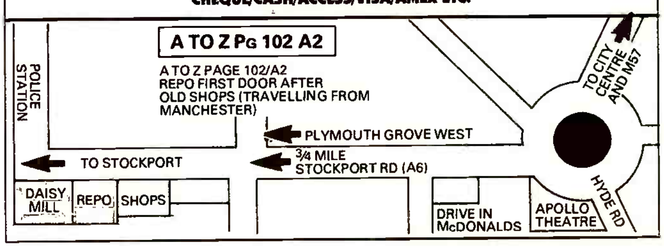

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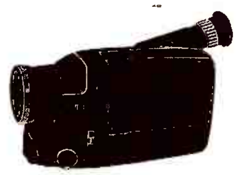

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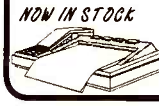

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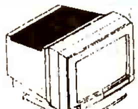

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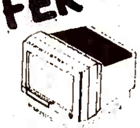

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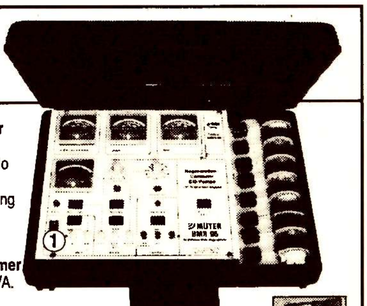

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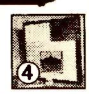

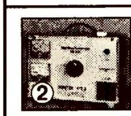

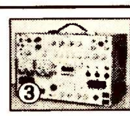

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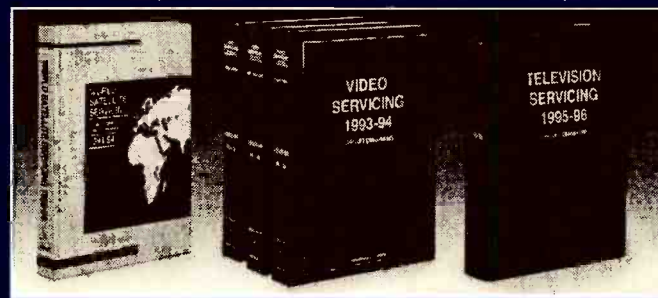

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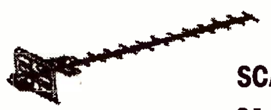

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TDA3561A	£3.00
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TDA3564	£3.00
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