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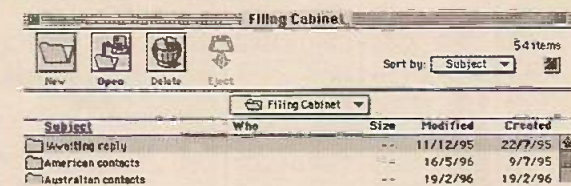
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# TV and Telephony

The cable TV industry in the UK has hardly been a success to date. Some £10bn has been invested by cable companies so far, and investment is continuing at the rate of £2bn a year. Yet the penetration rate – the percentage of homes that take cable services of those able to do so – remains stuck at 20-25 per cent, while the churn (disconnection) rate is as high as 40 per cent in some areas. There has been little by way of profit from the operations to date. Why, and what can be done?

Poor marketing has been put forward as a major reason for the lack of success of the cable TV companies. It is alleged that they are better at cable laying than selling services. The companies rely mainly on leafleting, with a poor follow up. Another reason for the lack of success is the competition from terrestrial and satellite services. Most people seem to be reasonably happy with the existing four terrestrial services, shortly to become five, while BSkyB has turned out to be highly successful. The cable companies are rightly concerned about the likely effects of adding large numbers of digital channels to the existing off-air and satellite TV services.

The cable industry has been more successful at selling telephone services. One in three of the homes passed by cable has taken up TV or telecoms or both. Offering a cheaper alternative to British Telecommunications seems to have worked, and any substantial increase in Internet use should help. TeleWest, until recently the largest UK cable company, has adopted this policy successfully with its Teleplus TV-telephone package. According to the company's acting chief executive, Stephen Davidson, the package

has produced "a significant improvement in churn rates, of the order of ten per cent, higher penetration levels and customer satisfaction and higher revenues per subscriber". Teleplus has now been introduced in all TeleWest franchise areas.

TeleWest has now been overtaken in size by the entry of Cable and Wireless into the field. C&W has approached the matter from the opposite standpoint. Seeking to strengthen its challenge to British Telecommunications in the telephony field, it has set up Cable and Wireless Communications, which brings together C&W's Mercury telephone operation and three of the leading UK cable groups – all with North American parent companies – Bell Cablemedia, Nynex CableComms and Videotron. The result is by far the largest cable company in the UK, with a capitalisation of some £5bn. The deal has given C&W management control of this major cable TV/telephony operation, with potential access to six million homes in several major franchise areas including London, Manchester and Liverpool. It will be interesting to see whether C&W can make significant progress in getting the public in the UK to take and keep up cable subscriptions. C&W executives point out that the new company is large enough to be able to provide marketing muscle, which was previously lacking.

The C&W move has been overshadowed by the proposed merger between British Telecommunications and MCI, the second largest US long-distance telephone carrier. BT expects to pay over £12bn for the 80 per cent of MCI it doesn't already own. The combined company, called

Concert, would be the world's fourth largest telecoms company by sales, after NTT (Japan), AT&T (USA) and Deutsche Telekom (Germany). It would have annual revenues of more than £25bn, with an annual cashflow of around £7.5bn.

BT first formed an alliance with MCI in 1994, when it bought a 20 per cent interest for \$4bn. This led to Concert Communications being set up, a joint venture to provide 'seamless' international telecoms services to multinational companies. The only problem is that BT will have to obtain clearance for the merger from the regulatory authorities on both sides of the Atlantic. This is expected to take up to a year.

In the fast-moving world of international communications, with all sorts of deals and interlinking interests, BT's move could have consequences in the TV field. The most obvious one initially is that MCI and News Corporation have a 50:50 interest in American Sky Broadcasting. MCI joined with News Corporation last January in making a successful \$682bn bid for the last national satellite TV spectrum on offer in the USA. The idea was to take it into one of the fastest growing sections of the US entertainments market. Rupert Murdoch has a seat on the board of MCI, which has a 13.5 per cent stake in News Corporation.

As we have pointed out before, a feature of today's world of international communications is increased links between ever larger global corporations. This is probably inevitable, in view of the vast cost of providing the communications services the modern world expects. It nevertheless needs watching.

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# TELETOPICS

## Daewoo to acquire Thomson Multimedia

The French government has provisionally decided to sell the Thomson electronics and defence group to the defence and media group Lagardère, which in turn plans to sell Thomson Multimedia (TMM), the consumer electronics arm of Thomson, to the South Korean industrial group Daewoo. There are still one or two loose ends to the arrangements. Following public concern over the Daewoo deal – despite Daewoo's promise to preserve TMM jobs in France and expand the European operation based there – the French government has promised a full parliamentary debate before making "a definitive decision". This appears to be a formality however.

On the employment front, most TMM jobs are in the USA and Asia, only ten per cent being in France. Further, Lagardère and Daewoo plan to share control of Thomson's digital television

division, and also turn Thomson Broadcast Systems into a 50:50 joint venture.

When, as expected, the takeover is finalised, Daewoo Electronics will become the world's largest TV receiver manufacturer, almost doubling its present production of 9 million sets a year to 17 million – 15 per cent of the total world market. Thomson's brands include RCA, General Electric, Telefunken, Saba, NordMende and Ferguson. It has 16.5 per cent of the US market and 12 per cent of the market in Europe. Daewoo has 20 per cent of the Korean market, behind Samsung and LG Electronics (until recently GoldStar). Daewoo will also acquire significant CRT production facilities.

Is Daewoo's strategy of making TV sets the centrepiece of its aim to become one of the world's top ten consumer electronics companies by the year 2000 wise?

TV sets and VCRs are low-profit businesses with mainly saturated markets. Global demand for TV sets is at present growing by only four per cent annually. But Mr Bae Soon-hoon, president of Daewoo Electronics, believes that there is considerable growth potential in countries such as China, India and Russia. He is also interested in developing and supplying dedicated terminals for Internet use.

Lagardère is to pay a symbolic FFr1 for Thomson, but will have to take on Thomson's massive debts. The French government is to write off some FFr11bn to reduce the debt burden of FFr25bn. Daewoo will in turn pay a token FFr1 for TMM and will take on \$960m of debt. Final financial details have still to be worked out, and will have to await the decision of the French government's privatisation committee. This is expected to take several weeks.



### Latest JVC DVC

JVC's latest digital video camcorder, Model GRDVM1, differs from its initial model in incorporating a high-resolution (180,000 pixels) flip-out LCD colour monitor. According to JVC the 2.5in. screen is the first to use polycrystalline-silicon TFT technology. Its horizontal resolution is 400 lines. The monitor can be tilted through 270° for high- or low-angle shooting. The DVC should be available in the UK next spring.

## Digital TV

The ITC has called for applications to run four of the six 'multiplexes' to be used for terrestrial digital TV broadcasting in the UK – each will carry three multiplexed digital TV channels plus stereo radio programmes. Applicants will be expected to offer a diversity of programming, though individual channels can be devoted to a specific purpose such as films. They will also be judged on their ability to promote the sale of DTT black boxes. The applications have to be in by the end of January: the ITC hopes to be able to award licences this coming spring so that services can be started in 1998. Existing broadcasters will have the use of the other two multiplexes to launch digital services. All have indicated their intention of doing so.

NTL has demonstrated a complete end-to-end DVB-compatible digital terrestrial TV system. The purpose-built transmitter used the Croydon site, and carried two half-multiplex services which were combined at the site. One half consisted of four

video channels from NTL's Crawley Court headquarters, the other half being provided by Channel 4. Six video channels plus data services were multiplexed into a data stream running at 19Mbits/sec. The transmissions included widescreen pictures, data services, a conditional access system for pay-TV and an on-screen Electronic Programme Guide (EPG). Teletext UK also demonstrated a data transmission service. Small integrated receiver-decoders were used for reception in conjunction with standard TV sets. NTL first transmitted experimental digital terrestrial TV pictures in 1993. This was followed by multichannel demonstrations in February 1995.

## Trade News

SEME has been appointed an official spares parts distributor by Daewoo Electronic Sales UK Ltd. A range of technical books has been added to the products available from SEME. The 26 titles are from

publisher McGraw-Hill and include books on PC, computer monitor and laser printer servicing, building and upgrading PCs, VCR servicing and software programming. The range is featured in SEME's new 1996/7 catalogue. For further details contact SEME Ltd., Unit 2, Saxby Road Industrial Estate, Melton Mowbray, Leicestershire LE13 1BS (telephone 0166 465 392, fax 0166 463 976).

CPC has added the GoldStar OS5020P 20MHz dual-trace oscilloscope to its range of test equipment. The economically-priced, entry-level scope is ideal for general-purpose, servicing and educational use. It has a 6in. CRT with internal 8 x 10 division graticule, high-sensitivity triggering and ten times sweep magnification.

CPC has also considerably extended its range of cables and connectors – more than 450 different cable types have been introduced and over 1,500 new connector lines added. For further details contact CPC PLC, Component House, Faraday Drive, Fulwood. Preston PR2 9PP (telephone 01772 654 455, fax 01772 654 466).

The 1997 Wizard Distributors catalogue is now available. New features include Tatung spares (Wizard is an appointed distributor), computer accessories and Wizard's range of HQ universal and replacement handsets. For a copy of the catalogue apply to Wizard Distributors, Sales Department, Empress Mill, Empress Street, Manchester M16 9EN (telephone 0161 872 5438, fax 0161 873 7365).

## Channel 5 News

The ITC has formally confirmed Ch. 5's plan to delay the start of its service. The new date is "by March 30th" – Ch. 5's chief executive David Elstein says that the official start-up date will not be announced "for some time". He wants to avoid "aggressive scheduling" by the existing terrestrial broadcasters. The main reason for the delay is the extra frequency (ch. 35) that has been released for Ch. 5 use. It means that Ch. 5's retuners will have to visit an additional three million homes.

The first Ch. 5 transmitters to use ch. 35 will be Bilsdale, Hannington, Ridge Hill, Sudbury and Waltham. A further technical point is that some relay transmitter channel allocations will have to be changed to avoid interference problems. Six stations are involved to date. Each will have one channel allocation changed. Details are as follows:

Black Mountain	C4 moves to ch. 41
Blackburn	C4 moves to ch. 31
Edmonton	BBC-2 moves to ch. 42
Galashiels	BBC-1 moves to ch. 68
Jedburgh	BBC-1 moves to ch. 68
Middleton	C4 moves to ch. 37

New wideband aerials will be required in the Blackburn, Edmonton, Galashiels and Jedburgh service areas. Retuning will be undertaken by companies under contract to Ch. 5. They will also supply and fit wideband aerials where necessary, free of charge to householders.

The first full-scale Ch. 5 test transmission was carried out on October 13th, using the Cambret Hill transmitter. The ITC gave approval for the test after the equipment in more than 50 per cent of the 37,000 or so homes in the area had been returned. Ch. 5 claims that interference was lower than expected. Initial results suggest that interference was experienced in less than twenty per cent of homes yet to be retuned. Ch. 5 deployed a team of researchers to call on homes and check on this. A publicity drive alerted the public to the test.

## DVD Launch

Representatives of the electronics, film, music and computer industries have reached provisional agreement on the encryption system to be used for prerecorded digital video discs (DVDs). The encryption system is based on Matsushita technology, adapted with contributions from IBM and Intel.

The agreement was followed by initial announcements about launch dates for DVD gear. Matsushita is to introduce its first DVD players in Japan by the end of the year. Its first European players should be available in Germany next February. They will sell for DM1,300-DM1,400 (about £570-£610). Warner Home Video has

announced that DVD versions of Warner Bros films will be released as part of an internationally co-ordinated introduction of DVD software and hardware. Feature film discs will sell for about \$20 each in the USA, a few dollars more than a prerecorded video cassette. Sony and other consumer electronics firms are aiming for a launch next spring.

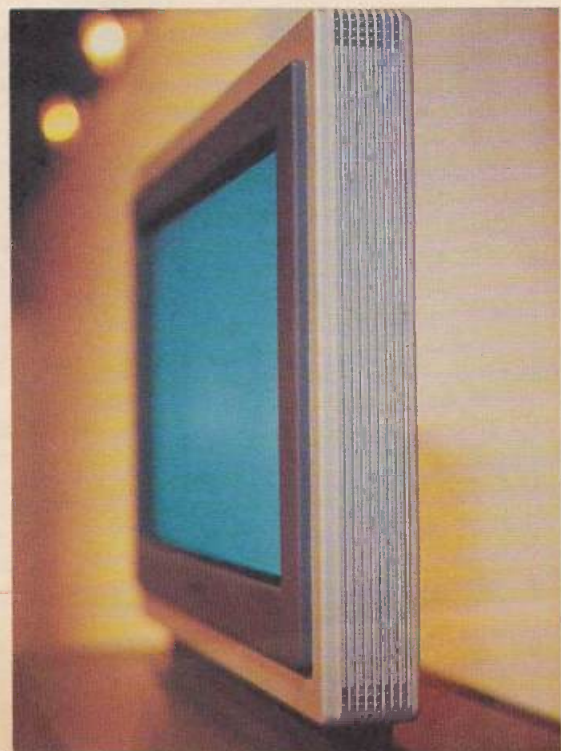
TDK has developed a re-recordable DVD that can be erased and reused at least 1,000 times. The disc, which can store 2.6Gbytes of data, uses an alloy of silver, vanadium, indium, antimony and tellurium. Further research is aimed at increasing reuse to 10,000 times.

## Flat Screen TV

Sony is to launch the first Plasmatron flat-screen TV set in Japan this month – see photograph above. The set, Model PZ2500, has a 25in. screen and a price tag of around Y900,000, which works out at about £6,500. It is 132mm thick (242mm with the base stand) and is designed for both TV and computer applications. The receiver and display system can be operated separately, enabling the screen to be wall mounted.

Features include a built-in satellite TV tuner, composite video and RGB sockets and phono audio sockets. The five-speaker system also uses flat technology. Power consumption is 225W. No UK launch details are available.

Japanese component manufacturer Hosiden and Philips Flat Panel Display, a Philips subsidiary, have agreed to set up a joint venture to manufacture liquid-crystal display panels. When established next April the venture will take over Hosiden's LCD operations in Japan.





**Reports from  
David C. Woodnott,  
David Corcoran  
and Simon Bodgett**

### **Panasonic NVS20**

The reported symptom was no zoom or autofocus operation. Our first step was to check the relevant ribbon cables carefully. Everything seemed to be OK. Checks around the autofocus processor IC702 were not helpful, but we decided to replace it as other tests were equally inconclusive. Thankfully this cured the fault. **D.C.W.**

### **Sony CCDTR45**

The complaint was of noise lines that rolled down the picture. Playback was OK with one of our own tapes, so we checked the customer's tape and found that it had diagonal crease lines across it. As the tape path alignment appeared to be all right, we checked the mechanism in the fast forward and rewind modes and found that in the latter the supply reel stopped rotating intermittently. A new back-tension string assembly and supply reel base cured the problem. **D.C.W.**

### **Canon E30E/E50E etc**

Colour balance problems with this range of camcorders can usually be cured by replacing the six surface-mounted electrolytic capacitors on the Process PCB. It's advisable to clean the PCB ultrasonically. **D.C.W.**

### **JVC GRS707**

This middle-aged S-VHS model's camera E-E pictures were OK but there were no mechanical functions. The cause was simply that CP203 (F20) on the main PCB was open-circuit. Inspection showed that it had been replaced on a previous

# Camcorner

occasion. As no cause of its failure could be found we replaced it, reassembled the unit then tested it. When we discussed the matter with the customer he said that it had been bought new and had never been repaired. Oh well! **D.C.W.**

### **Sanyo VMD6P**

The report which came with this camcorder said that playback was marred by a colour fault and flashing white lines, the E-E pictures being OK. X9101 on board CA-1 was the cause of the colour fault. Because of its failure the phase locked loop couldn't be set up correctly, the result being several no-colour bands on the picture. C1210 (10 $\mu$ F) on the main VTR PCB was the cause of the white flashing. It had gone low in value. **D.C.W.**

### **Canon E60E**

One of these camcorders came in with the usual faults you get with this range, i.e. intermittent power up, no playback colour etc. When we'd replaced the 31 capacitors previously mentioned in these pages, playback and all mechanical operations were OK. But there was a further fault we'd not had before – no E-E pictures. Yet another electrolytic capacitor was leaky, this time C1036 (33 $\mu$ F, 25V) on the camera process PCB. **D.C.W.**

### **Ferguson FC27**

This unit was permanently powered up and there were no functions. The cause was electrolyte leakage from C317 on the main PCB. When it's leaky this capacitor can be the cause of various diverse symptoms, such as erratic tape ejection during play or record – this is quite a frightening occurrence! Another symptom is failure of the mechacon chip to carry out deck functions in accordance with the position of the mode encoder. The mechanism can lock-up in the laced state and become jammed. A new capacitor and a PCB clean up in the ultrasonic tank usually provide a lasting cure. **D.C.W.**

### **Panasonic NVM10**

All functions apart from zoom worked correctly. The cause of the fault was traced to R763 (27 $\Omega$ ) on the autofocus board being open-circuit. When you get this fault, the first thing to do is to check connectors P705 (to the lens unit) and P706 (to the zoom switch). **D.C.**

### **JVC GR303**

Failure to record because of loss of one of the power supplies is a fairly common fault with this model. What happens is that connectors CN5 and CN14 break their bond to the print when the PCBs mounted on the deck assembly are subjected to stress as a result of an impact. It's good practice to remove these two connectors, resolder them, then bond them with a hot-glue gun. Also check CN9 and CN3's connections. I place small pieces of bonding around the connectors then melt them with a fine hot-air jet. **S.B.**

### **JVC GRAX5**

According to the fault report this camcorder produced negative pictures. They were not really negative however: loss of a substantial portion of the luminance signal, leaving mainly the chroma component, produced the effect. The cause of the fault was the MSM6819MS luminance delay line chip IC4. It's used in a wide range of models and the fault can occur with any of them.

In one case we thought we'd cured the fault by replacing the chip, but it returned when the camcorder had been left for a while. This time the cause was the decoupling capacitor C49, which is connected to pin 5 of the chip. To save time and prevent subsequent problems, it's as well to replace both components. **S.B.**

### **Grundig VSC70**

After eject the cassette housing would sometimes fail to close. The cause was the loading motor, which had a dead spot. **S.B.**

# VCR BELT KITS/VIDEO LAMPS & SWITCHES

Model	Price	Model	Price
<b>GRANADA</b>		323, 535, VR20DV1, 20DV2, 20RH7, 210V1,	
VHS0P1, VHSFV2	80p	210V2, 21D, V3, 25B01, 25B02, 11, 12, 302,	
VHSTJ1, VHSTJ2	150p	303, 305, 310V1, 310V2, 31D, V3, 35B11,	
VHSTJ3	85p	35B12, 35B13, 725B8, VR300V2, 35B02,	
VHSWJ1, VHSWJ2	120p	35B03, 635B7, 715B4, 715B5, 715B8,	
VHSXJ3	85p	VR665B2, 916B2, 825B3, VR6180, 8182, 8185,	
VHSYJ2	80p	6285, 6290VR6291, VR8293, 6362, 6367,	
VHSFJ2	140p	VR6390, 6391, 6393, 6467, 6468, 6470, 6581,	
VHSF51, VHSF52	130p	6570, 6581, 6570, VR8678, 6710, 6760, 6761,	
VHSF61, VHSF62, VHSF63,		6762, 6870, 8970, VR685B4, 865B1,	
VHSF64, VHSF65	100p	825B3	85p
<b>GRUNDIG</b>		VR445B920, VR445B922, VR843,	
MV5400, 440, VS400, 410, 415, 435, 440, 441,	65p	6843, 6843, VR6943	100p
450, 456, 460		VR3260, 6349, 6448, 6449, 6548, 6648,	
VS180, 200, 220, 226, 262, 265, 267,		495B620, 6C48695, 495B8	110p
2X40800, 0650, 0880		VX66550, VXR6655	70p
1600, 2000, 2080, 2200, 2280,		VR501	110p
MV5200RC	90p	VKR8900, VKR6810, VKR6820	70p
VS150	100p	SE4104, VR231, 2310, 2319, 231, 232, 232B,	
VS310, 311, 315, 320, 326, 340, 345, 380, 385,	445	237, 23, 241, 2410, 2419, 242, 243, 245, 246B,	
245	86p	247, 247B, 251, 252, 256, 257, 268, 33, 18,	
VS150	75p	332, 332B, 333, 337, 339, 3419, 342, 343,	
LC2900, LC2955N, SVS 180, VS 170	70p	3469, 347, 3479, 35, 1, 352, 357, 358, 422,	
VS 180, BARCELONA, FLORENZ, GV4000,		4229, 432, 437, 442, 422B, 432, 437, 442, 44,	
4000, 4001,		5, 446B, 447, 447B, 461, 452, 457, 458, 459,	
GV4002, 400, 401, 410, 402, 403, 404, 405,		512, 522, 522B, 6379, 642, 647, 722, 722B,	
406, 407, 4082, 410, GV411, 412, 414, 415,		723, 7379, 747, 8389, 938, 9489	70p
416, 417, 4192, 4200, 420, 430, 434, 435,		<b>SAISHO</b>	90p
437, 440, 450, 4552, 460, 464, 470, 500,		VR2000, VHL3	90p
501, 5050, 5095,		VR3800, 3200, 3300, 3500, 3600, 3650,	
GV5105, 511, 530, 5395, 540, 560, 5695,		VR5440, 5000	78p
MV4005, 4105, SE4100, 4104, 4120, 5102,		VR3400	100p
5104, 5106, TVR37001	70p	<b>SAMSUNG</b>	
<b>HINARI</b>		SV716, 717, V1618, V-621, V1626, VK616,	
VXL2	80p	VX617, VX619, X628, VX627, VX629,	
VXL7, VXL8, VXL9, VXL10, VXL11, VXL19,		VX714	85p
VXL90, VCR34, VTV 100,		VBS20, 510, 610, 616, 617, 619, 620, 626, 627,	
200	180p	629, V1510, 520, V1611, 616, 621, 626,	
VXL4, VXL35, VTV300	70p	VX610, 511, 520, VT320, 5600	100p
VXL5, VXL6	160p	V110P	110p
VXL3, VXL20	90p	V9900, V9910, V1900, V1910	80p
<b>HITACHI</b>		PX980, 981, 982, SE9001, SV9001, SVX307,	
VT11, 14, 16, 17, 19, 33, 330, 34, 35, 350, 38,		319, 322, VB750, 770, 8220, 8225, V1770, 790,	
39, 88, 165, 5000	85p	8220, 8225, VK8220, VPK31, VX750, VX770,	
VT5000, VT5500, VT18	120p	790, 8220, 8225, SE9000, 9001	90p
VT7000, VT8000, VT8030, VT8040, VT8300,		SVX301, 303, 305, SX7301, VB710, 971,	
VT8500, 8700	60p	V1710, 730, 750, 970, VX710, 712, 720, 730,	
VT880, VT8500, VT6800, VT8300, VT9500,		970, 971, 972	100p
VT9700, 9900	75p	VX9890	110p
VT52, VT57, VT61, VT62, VT63, 64, 65, 65,	60p	SX7121	95p
640	90p	<b>SANYO</b>	
VT3000	120p	VTC5000, 5150, 6000, 6500, VTCM10, 11, 20,	
VT100, 110, 111, 113, 115, 118, 120, 126, 128,		21, 30, 31, 50	75p
130, 135, 138,		VTC5300, VTC3350, VTC5400,	
VT145, 150, 168, 170, 175, 220, 225, 250, 255,		VPR5800	80p
256, 260, VTL30	90p	VTC5500	70p
VHS500, VHS600	90p	VTC5100, VTC9300	140p
<b>J.V.C.</b>		VTC1100, 1300, 1500, VHR1100, 1110, 1150,	
HR3300, HR3330, HR3360, HR3660,		1200, 1300,	
HR4100	130p	VHR1500, 2370, MVR220	90p
HR7200, HR7300	70p	VHR2100, VHR2300, VHR2500,	
HR7350, HR7600, HR7610, HR7850,		VHR3100, 3110, 3150, 3300, 3310, 3400,	
HR7855	75p	3500, 3700, 3800, VHR5000, 700, TLS1000,	
HR7700	75p	TL51001	80p
HRD110, 111, 120, 121, 220, 225,		VHR120, 130, 14, 141, 143, 14, 150, 151, 153,	
BP5000	90p	154, 15, 16, 171, VHR184, 220, 23, 235, 240,	
HRD140, 141, 143, 150, 152, 157, 158, 160,		244, 250, 251, 274, 297, 310, 330, VHR335,	
190, 250, 257, 310, HRD465, 565, 566, 75,		290, 4100, 4105, 4160, 4200, 430, 4300, 4350,	
785, HRP50	65p	474, VHR4770, 5080, 5100, 5200, 5300, 5350,	
HRD170, 171, 180, 210, 211, 217, 230, 300,		5700, 6850, 7100, VHR7200, 7250, 7260, 7300,	
320, 321, 330, 337, HRD350, 370, 400, 430,		7400, 7500, 7520, 7530, 7530, VHR7540,	
440, 441, 500, 630, 700, 750, 950,		7700, 774, 7800, 7810, 8000, 8100, 8200,	
HR55000, 5500, 8000, 9000, BR9060,		8250, 8500, VHR8800, 8801, VHRD4400, 4410,	
BR5600, 605, 920, 925	50p	5000, 4600, VHRD4610, 4710, 4890, 670076P	
HRD227, 520, 521, 522, 527, 600, 610, 620,		VMD66, VMD68P	80p
637, 641, 650, 630,		VTR1000	70p
HRB40, HRD200, 22, HRJ200, 205, 300, 305,		VTC8010	75p
SR330, HR510	80p	<b>SHARP</b>	
HRD840, 550, 560, 580, 590, 640, 660, 670,		VC200, 381, 384, 385, 386, 388, 390, 393, 838,	
720, 730, 740, 770, HRD620, 860, 870, 880,		9100, 9300, 9500, VCS700	100p
910, 960, 980, HRD20, 25, HRJ2 10,		VC7300, VC7700, VC7750, VC7800,	
HRJ215, 315, 316, 318, 400, 405, 407, 410,		VC9000	110p
411, 415, 418, 507, HRJ610, 615, 715, 97,		VC9300	115p
HRJ4700, 5800, SR3200, SR366E	60p	VC300, 387, 471, 473, 481, 482, 483, 486, 488,	
HRJ600	40p	496, 8481	80p
<b>LOGIK</b>		VC402, 500, 571, 573, 581, 582, 583, 584, 585,	
VR955	180p	VCSF3, VCS581	80p
<b>MATSUI</b>		VC108, 405, 408, 550, 600, 651, 674, 681, 682,	
VX600, 730, 735, 750, 755, 765, 850, 6000,		682, 684, 685, 693	
V5888	75p	VC700, 750, 783, VCB6F3, VCB8V3	70p
VX1800, VX2000, VX2500, VX3000,		VC208, 671, 772, 779, 780, 781, 782, 788, 789,	
VX6000	100p	787, 793, 800, VC7810, 7822, VCA100, 102,	
VX800	70p	103, 104, 131, 140, 170, 202, 03, VCA234,	
<b>MITSUBISHI</b>		501, 602, 602, 5011, VCB311, 361, VCD801,	
HS200	200p	802, VCH881, 852, 862, VCM773, VCT72 78p	
HS300, 301, 302, 307, 310, 337, 338, 347, 349,		VCA10, 103, 105, 106, 113, 11813, 211, 234,	
411, 412, 421, 480, HSB10, 20, 30, HSE10, 20,		244, 24, 30, 33, 35, VCA36, 37, 40, 43, 454,	
30, 70	110p	48, 50, 505, 51, 52, 53, 54, 55, 56, 57, 58,	
HS303, HS304, HS306, HS307, HS330,		VCA80, 605, 615, 67, 68, 1031, VCB320,	
HS400, HS700	110p	VCBS97, VCD805, VCD806, 810, 815, VCH80,	
HS318, HS318, HS410	110p	81, 85, 865, 910, VCS1000,	
HSM1000, 15, HSM23, 25, 33, 34, 35, 37, 54,		VCT212, 310, 410, 610, VCT1314, VCTS312,	
55, 57, 58, 59, 68	55p	313, VC790ET	80p
<b>N.E.C.</b>		VCC10	70p
N830, N831, N832, N833	100p	<b>SONY</b>	
N895	90p	SLC6, SLJ10, SLT6ME	140p
PVC2300, PVC2400	180p	SLC5, SLC7, SLJ7, SLJ9, SLT7ME	140p
DX1000, 1800, 1800, 2000, 3000, N9012,		SLC9, SL8000, SL8080, SLT50	165p
9013, 9014, 9016, N9033, 9034, 9053, 9054,		SL8000E, SL8080E, SL8200, SL8600	175p
9055, 9056, 9066, 9096, 9110, 9120,		SLV255, 126, 213, 225, 262, SLVX1,	
N9510, 9520, 9530, 9610	85p	20, 3	95p
<b>NATIONAL PANASONIC</b>		<b>TOSHIBA</b>	
NV300, NV330PX, NV332, NV333, NV340,		V55, V57	85p
NV366	100p	V33, V31, V32, V51, V52, V53, V9600,	
NV777, NV788	100p	V9680	85p
NV2000, NV2010, NV3000	100p	V81, V83, V85, V66, V67	150p
NV7000, NV7200, NV7800	95p	VDB9B, DV800, V71, 73, 74, 75, 77, 81, 83,	
NV8800, NV8610, NV862	145p	85, 86	80p
NV2380, 250, 280, 430, 431, 433, 450, 460, 465,		V108, 109, 110, 120, 130, 140, 199, 209, 210,	
470, 660, 730, NV770, 810, 670, 890, 970, AG		211, 220, 221, 411, V421, 609, 810, 811, 859,	
1000, 1050	110p	660, 711, 890	120p
NV370, NV380, NV480, NV630, NV780,		V91 G, V95G	115p
NV830, NV850	70p	V212, 213, 22-2, 312, 322, 403, 412, 413, 610,	
NV600, NV688, AG8010, AG8015	100p	703, 813	50p
NVG7, 9, 10, 11, 12, 14, 15, 16, 18, 30, 130,		VCP81E	110p
450, NVH70	50p	<b>PHILIPS</b>	
NV101, NVM10, 3000, 3300, 40, 7, 9000,		VR6460, VR6920	170p
9900, NVMS1, 4	70p	VR6540	100p
NVM1, NVM3, NVMS	70p	VR6442, VR6542	70p
<b>PHILIPS</b>		VR2025, VR2580	100p
VR6460, VR6920	170p	DV1865, 190, 288, 291, 282, 468, 471, 562, 571,	
VR6540	100p	711, VR201, 202, 203, 211, 2115, 212, 213,	
VR6442, VR6542	70p	223, 311, 312, 313, 3210, 3219, 322, 32, 29,	
VR2025, VR2580	100p		

Model	Price	Model	Price
<b>Model &amp; Description</b>	<b>Order Code</b>	<b>Price</b>	
UNIVERSAL VIDEO LAMP 9V	VL01	25p	
80mV (310mm WIRES)			
PANASONIC VIDEO LAMPS	VL02	30p	
SHARP VIDEO LAMPS	VL02	30p	
HITACHI 5381682 (VT63, VT64) VL04		135p	
VIDEO LAMPS			
AIWA, AKAI, ALBA, AMSTRAD, VL05		210p	
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			
AKAI, GRANADA (VHSTJ2), VL01		25p	
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)			
BLAUPUNKT, ORION (VH1, 2A), VL02		30p	
NATIONAL (NV200, 2010, 3000,			
7000, 8150, 8200, 8400, 8600,			
8610, 8620), SHARP (VC2300,			
6000, 6200, 6300, 7300, 7700,			
8300)			
AKAI (VS10), GRANADA VL06		40p	
(VHSXJ3), TT (VR3993, 3994),			
JVC (HR2650, 7600, 7610, 7650,			
7855), TELEFUNKEN (VR530,			
535, 539, 550, 630, 650),			
THOMSON (V309, 316, 357,			
VK309, 411, TX8000),			
FERGUSON (3V3			

## VIDEO SERVICE KITS

<b>AMSTRAD</b>	
VCR700	
<i>Contents</i>	
BELT SET, PINCH ROLLER, REEL IDLER, VIDEO LAMP	
Order Code: SK41	£5.00
<b>FERGUSON &amp; JVC</b>	
3V42/43	
HR0455/HRD725	
<i>Contents</i>	
BELT SET, PINCH ROLLER, CLUTCH MECHANISM, TENSION BAND	
Order Code: SK37	£16.00
<i>Economy Kit Contents</i>	
BELT SET, PINCH ROLLER, SUPPLY CLUTCH, TAKE UP CLUTCH	
Order Code: SK38	£9.00
3V58/59/64/65	
HRD170/180/210/230/300/320/370/400/430/530/700/750	
HRSS5000	
<i>Contents</i>	
BELT SET, PINCH ROLLER, IDLER ARM, TENSION BAND	
Order Code: SK44	£7.00
3V29/3V30	
HR7200/7300/7350	
<i>Contents</i>	
BELT SET, PINCH ROLLER, TENSION BAND, IDLER TYRES	
Order Code: SK05	£5.00
3V35/36, 38/39/49	
HRD110/111/120/225	
<i>Contents</i>	
BELT SET, PINCH ROLLER, TENSION BAND, IDLER TYRES	
Order Code: SK04	£5.00
3V31/3V42	
HR7600/7610/7650/7655	
<i>Contents</i>	
BELT SET, T/U REEL TABLE TYRE, PINCH ROLLER, REEL IDLER, T/U CLUTCH, T/U IDLER, TENSION BAND, VIDEO LAMP	
Order Code: SK33	£11.00
<i>Economy Kit Contents</i>	
BELT SET, T/U REEL TABLE TYRE, PINCH ROLLER, REEL IDLER TYRE, T/U IDLER TYRE, T/U CLUTCH	
Order Code: SK34	£5.00
3V35/36/38/39/49	
HRD110/111/120/121/225	
<i>Contents</i>	
BELT SET, T/U REEL TABLE TYRE, SUPPLY REEL TABLE TYRE, PINCH ROLLER, T/U CLUTCH, T/U IDLER, REEL IDLER, TENSION BAND	
Order Code: SK35	£10.00
<i>Economy Kit Contents</i>	
BELT SET, T/U REEL TABLE TYRE, SUPPLY REEL TABLE TYRE, PINCH ROLLER, T/U CLUTCH, T/U IDLER TYRE, REEL IDLER TYRE	
Order Code: SK36	£5.50
3V29/3V30	
HRD7200/7300/7350	
<i>Contents</i>	
BELT SET, T/U REEL TABLE TYRE, SUPPLY REEL TABLE TYRE, PINCH ROLLER, REEL IDLER, T/U CLUTCH, T/U IDLER, TENSION BAND, VIDEO LAMP	
Order Code: SK31	£10.00
<i>Economy Kit Contents</i>	
BELT SET, T/U REEL IDLER TYRE, SUPPLY REEL TABLE TYRE, PINCH ROLLER, REEL IDLER TYRE, T/U IDLER TYRE, T/U CLUTCH	
Order Code: SK32	£5.00
3V44/45/48/53/54/55/57	
HRP50/HRD140/150/158/160	
HRD250/257/565/566/755	
<i>Contents</i>	
BELT SET, PINCH ROLLER, CLUTCH MECHANISM, TENSION BAND	
Order Code: SK39	£15.00
<i>Economy Kit Contents</i>	
BELT SET, PINCH ROLLER	
Order Code: SK40	£9.50
<b>FISHER</b>	
FVHP905/906/907/908/910/911/916/918	
<i>Contents</i>	
BELT SET, PINCH ROLLER, IDLER, GEAR IDLER UNIT, TENSION BAND	
Order Code: SK57	£13.00
<i>Economy Kit Contents</i>	
BELT SET, PINCH ROLLER, IDLER TYRE	
Order Code: SK58	£5.00
FVHP615/618/620/622/710/711/715/716/720/721/722/725/730/830/840	
<i>Contents</i>	
BELT SET, PINCH ROLLER, IDLER, GEAR IDLER UNIT, TENSION BAND	
Order Code: SK68	£11.00
<i>Economy Kit Contents</i>	
BELT SET, PINCH ROLLER, IDLER TYRE	
Order Code: SK69	£9.00
<b>HITACHI</b>	
VT11/VT33	
<i>Contents</i>	
BELT SET, PINCH ROLLER, TENSION BAND, IDLER TYRES	
Order Code: SK08	£5.00

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## VIDEO SERVICE KITS (Cont.)

<b>VT11/VT33</b>	
<i>Contents</i>	
BELT SET, T/U REEL TABLE TYRE, SUPPLY REEL TABLE TYRE, PINCH ROLLER, FF/REW IDLER, CLUTCH PLATE, TENSION BAND	
Order Code: SK45	£13.00
<i>Economy Kit Contents</i>	
BELT SET, PINCH ROLLER, FF/REW IDLER TYRE, T/U REEL TABLE TYRE, SUPPLY REEL TABLE TYRE	
Order Code: SK46	£3.75
VT52/61/62/63/64/65/85/86/540	
<i>Contents</i>	
BELT SET, PINCH ROLLER, FF/REW ARM, CLUTCH PLATE, TENSION BAND	
Order Code: SK49	£14.00
<i>Economy Kit Contents</i>	
BELT SET, PINCH ROLLER, FF/REW IDLER	
Order Code: SK50	£3.00
VT400/405/410/13/14/15/18/420/25/26/28/430/31/35/48/450/498/510/520/25/26/530/35/36/540/545/46/48/570/75/576/580/85/88	
<i>Contents</i>	
TIMING BELT, PINCH ROLLER, FF/REW ARM, CLUTCH BASE, TENSION BAND	
Order Code: SK52	£9.75
VT100/110/111/113/115/118/120/125/128/130/135/138/145/150/175/220/225/250/255/258/260/VTL30	
<i>Contents</i>	
BELT SET, PINCH ROLLER, FF/REW ARM, CLUTCH PLATE, TENSION BAND	
Order Code: SK51	£14.00
<b>PANASONIC</b>	
NV2000/NV2010	
<i>Contents</i>	
BELT SET, PINCH ROLLER, TENSION BAND, IDLER TYRES	
Order Code: SK03	£5.00
<i>Economy Kit Contents</i>	
NV7000/NV7200/NV7800	
<i>Contents</i>	
BELT SET, PINCH ROLLER, TENSION BAND, IDLER TYRES	
Order Code: SK02	£5.00
NV300/NV330/NV333/NV340/NV366	
<i>Contents</i>	
BELT SET, PINCH ROLLER, TENSION BAND, IDLER TYRE	
Order Code: SK01	£5.00
<i>Economy Kit Contents</i>	
NV2000/NV2010	
<i>Contents</i>	
BELT SET, PINCH ROLLER, FF IDLER, PLAY IDLER, TENSION BAND, VIDEO LAMP	
Order Code: SK13	£6.00
<i>Economy Kit Contents</i>	
BELT SET, PINCH ROLLER, IDLER TYRE, PULLEY TYRE	
Order Code: SK14	£3.50
NV7000/NV7200/NV7800	
<i>Contents</i>	
BELT SET, PINCH ROLLER, IDLER UNIT, PLAY IDLER, TENSION BAND	
Order Code: SK11	£8.50
<i>Economy Kit Contents</i>	
BELT SET, PINCH ROLLER, IDLER TYRE, CLUTCH TYRE	
Order Code: SK12	£3.25
NV300/NV330/NV333/NV340/NV366	
<i>Contents</i>	
BELT SET, PINCH ROLLER, IDLER UNIT, PLAY IDLER, TENSION BAND	
Order Code: SK15	£7.00
<i>Economy Kit Contents</i>	
BELT SET, PINCH ROLLER, IDLER TYRE, PLAY IDLER	
Order Code: SK16	£3.25
NVG7/NVG9/NVG10/NVG11/NVG12/NVG14/NVG15/NVG16/NVG18/NVG30/NVG120/NVG130/NVG400/NVH65 (PX/AC)/AG1810 (P/K)	
<i>Contents</i>	
LOADING BELT, CAPSTAN BELT, PINCH ROLLER, IDLER, TENSION BAND	
Order Code: SK27	£6.00
<i>Economy Kit Contents</i>	
LOADING BELT, CAPSTAN BELT, PINCH ROLLER, IDLER TYRE	
Order Code: SK28	£3.00
NV332	
<i>Contents</i>	
BELT SET, PINCH ROLLER, PLAY IDLER, FF/REW IDLER, TENSION BAND, FF/REW TYRE	
Order Code: SK29	£12.00
<i>Economy Kit Contents</i>	
BELT SET, PINCH ROLLER, PLAY IDLER TYRE, FF/REW IDLER TYRE	
Order Code: SK30	£5.10
NV230/250/260/280/430/450/460/470/650/810/890/AG1200/PK/AG1500PK	
<i>Contents</i>	
BELT SET, PINCH ROLLER, IDLER, TENSION BAND	
Order Code: SK23	£6.00
<i>Economy Kit Contents</i>	
BELT SET, PINCH ROLLER, IDLER TYRE	
Order Code: SK24	£3.25
NV600/NV688	
<i>Contents</i>	
BELT SET, PINCH ROLLER, PLAY IDLER, FF/REW IDLER, TENSION BAND	
Order Code: SK25	£12.00
<i>Economy Kit Contents</i>	
BELT SET, PINCH ROLLER, PLAY IDLER TYRE, FF/REW IDLER TYRE	
Order Code: SK26	£6.00
NV730/NV770	
<i>Contents</i>	
SLOT IN BELT, LOADING BELT, PINCH ROLLER, IDLER UNIT, TENSION BAND	
Order Code: SK19	£5.00
<i>Economy Kit Contents</i>	
SLOT IN BELT, LOADING BELT, PINCH ROLLER, IDLER TYRE	
Order Code: SK20	£3.00
NV370/NV380/480/630/780/830/850/AG2100PK/AG2200PK	
<i>Contents</i>	
BELT SET, PINCH ROLLER, IDLER, TENSION BAND	
Order Code: SK21	£5.00
<i>Economy Kit Contents</i>	
BELT SET, PINCH ROLLER, IDLER TYRE	
Order Code: SK22	£2.75
NV771/NV788	
<i>Contents</i>	
BELT SET, PINCH ROLLER, IDLER UNIT, TENSION BAND	
Order Code: SK17	£6.00
<i>Economy Kit Contents</i>	
BELT SET, PINCH ROLLER, IDLER TYRE	
Order Code: SK18	£4.00

## VIDEO SERVICE KITS (Cont.)

<b>SHARP</b>	
VC381	
<i>Contents</i>	
BELT SET, PINCH ROLLER, REEL IDLER, TENSION BAND, VIDEO LAMP	
Order Code: SK47	£8.00
<i>Economy Kit Contents</i>	
BELT SET, PINCH ROLLER, REEL IDLER TYRE	
Order Code: SK48	£3.25
VC500/VC571/VC581/VC582/VC583/VC584/VC5F3	
<i>Contents</i>	
BELT SET, PINCH ROLLER, REEL IDLER, TENSION BAND	
Order Code: SK60	£9.50
<i>Economy Kit Contents</i>	
BELT SET, PINCH ROLLER, REEL IDLER	
Order Code: SK61	£5.00
VC781/VC781Q/VC782/VC785/VC786/VC789/VC800/VC100/VC102/VC104/VC104A	
<i>Contents</i>	
BELT SET, PINCH ROLLER, REEL DRIVE UNIT, TENSION BAND	
Order Code: SK64	£13.50
<i>Economy Kit Contents</i>	
BELT SET, PINCH ROLLER, REEL DRIVE UNIT TYRE	
Order Code: SK65	£3.75
VC881/VC882/VC884/VC885/VC889/VC899/VC8F3/VC700	
<i>Contents</i>	
BELT SET, PINCH ROLLER, REEL DRIVE UNIT, TENSION BAND	
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<i>Economy Kit Contents</i>	
BELT SET, PINCH ROLLER, REEL DRIVE UNIT TYRE	
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Fits Chassis TX99 41cm + 51cm		
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Used On: TX2231, TX2244		
PANASONIC TLF14584	2000p	LOT41
Used On: TC2210, TC2160, TX1752, TX2112		
PANASONIC TLF14586F	£18.00	LOT42
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V51-2, VS4-6, VS15	T-UP IDLER	BV327815	500p
V53, 6, 12, 59, 59	IDLER	BV321979	600p
V5125, 126, 155,	IDLER ASSY	MZ38860J2	900p
V5165, 240, 244, 245, 247, 248, 250, 512, 515, 518	T-UP IDLER	PL47752	£4.50
V522, 38, 105, 112, 116, 116, 206, 220	T-UP IDLER	PL47752	£4.50
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VS8500, VS9800	REW IDLER	PU46380	500p
VP7100, VS9300	REW IDLER	PU46380	500p
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V515, 58	CLUTCH	ML373043	1100p
VS23, 35, 37, 53, 55	FF IDLER	BV321761	£3.20
V566, 75, VS477	REW IDLER	W321762	£4.25
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TVR1, VCR4500	GEARHOLDER	151284	£3.50
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TVR1, VCR4600	REF CLUTCH		
VCR5200	CLUTCH	152302	£3.80
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VCR4500, VCR9000	CLUTCH		
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VCR4700			
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VCR4500, 4600, 4700			
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3V22, 3V29, 8900, 8904, 9806	T-UP IDLER	PU49280	£5.50
3V16, 3V22	T-UP IDLER	PU49280	£5.50
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3V23, 3V29, 3V30	REEL IDLER	PU48967	175p
3V31, 3V32, 3V35, 8923, 8924, 8929, 8930, 8931, 8940, 8941, 8942	ROLLER ASSY	PU49042A	350p
3V23, 3V31	ROLLER ASSY	PU49042A	350p
3V28, 3V30, 3V31	T-UP IDLER	51402	100p
3V32, 3V35, 3V36, 3V38, 3V39, 3V48, 8930, 8931, 8940, 8941, 8942	T-UP CLUTCH	PU51380	200p
3V29, 3V30, 3V31	REEL CLUTCH	PU51380	200p
3V38, 3V38, 3V38	REEL IDLER	PU55374	200p
3V38, 3V49, 8943, 8944	CLUTCH		
3V35, 3V38, 3V38	T-UP CLUTCH	PU55373	150p
3V39, 3V49, 8943, 8944	IDLER ARM	PU58645	£2.25
3V58, 3V58, 3V64	T-UP CLUTCH		
3V55, TV10, TV11, TV12, FV13, FV14, FV20, FV21, FV22, FV26	CLUTCH ASSY	PU58622	1200p
3V42, 3V43	CLUTCH ASSY	PU57658	1050p
3V43, 3V44, 3V45	CLUTCH ASSY	PU57658	1050p
3V48, 3V53, 3V54, 3V55, 3V57, 8947, 8948	T-UP CLUTCH	PU58043-1-4	240p
3V48, 3V48, 3V53, 3V54, 3V55, 3V56, 3V57, 8947, 8948	SUPPORT CLUTCH	PU58044-1-5	160p
3V42, 3V43, 3V44	SUPPORT CLUTCH	PU58044-1-5	160p
3V46, 3V48, 3V53, 3V54, 3V55, 3V56, 3V57, 8947, 8948	LOADING IDLER	PU43681	£4.00
3V00, 3V01, 3V16	LOADING IDLER	PU43681	£4.00
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8912, 8922	REW IDLER	PL48380	500p
3V00, 3V01, 3V16	REW IDLER	PL48380	500p
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3V18, 3V22, 8902	IDLER	PU49281	£1.70
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FVHP615, 618, 620	COMP. IDLER ASSY	R1430420400300	220p
FVHP622, 710, 711, FVHP720, 721, 722, FVHP725, 730, 830	GEAR IDLER ASSY	R1430490400900	380p
FVHP840, 905, FVHP906, 910, 911, FVHP915, 916, 918	GEAR IDLER ASSY	R1430490400900	380p
FVHP615, 618, 620	GEAR IDLER ASSY	R1430490400900	380p
FVHP622, 710, 711, FVHP720, 721, 722	REEL-UP ASSY	R1430410400900	£5.80
FVHP725, 730, 830, FVHP840	REEL-UP ASSY	R1430410400900	£5.80
FVHP615, 618, 620	REEL-UP ASSY	R1430410400900	£5.80
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FVHP725, 730, 830, FVHP840	GEAR IDLER ASSY	R1430490402400	275p
FVHP905, 906, 908	GEAR IDLER ASSY	R1430420400700	300p
FVHP910, 911, 915, FVHP916, 916	IDLER	R1430420400700	300p
FVHP975, 980, 990	IDLER	R1430420400700	300p
FVHP999, 5000, 5005	REEL DRIVE ROLLER		£6.00
FVHP5050, 5075, 5100	REEL DRIVE ROLLER		£6.00
FVHP40, 55, 140	REEL DRIVE ROLLER		£6.00
FVHP1, 10, 20	CLUTCH	F12430510404200	£9.50
FVHP975, 980, 990	IDLER		£2.80
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FVHP420, 520, 530	LOADING GEAR		90p
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VBS3500	REW IDLER		95p
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GHV1221, 1222, 1240	IDLER		110p
GHV1241, 1242, 1243, GHV1244, 1245, 1246, GHV1247, 1248, 8000,	IDLER		110p
GHV8200, 8210, 8215, GHVPS1, VCP4100, 4130	IDLER		110p
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VXL2	IDLER		110p
VXL4, VXL35	IDLER		£2.75
VXL4, VXL35	CLUTCH		£6.50
VXL4, VXL12, VXL25	LIMITER POST		£1.30
VXL30, VXL35, VTV300	LIMITER POST		£1.30
VXL5, VXL6	CLUTCH		£3.75
VXL5, VXL6	GEAR HOLDER		£3.80
VXL7, VXL8, VXL9	CLUTCH		£3.80
<b>HITACHI</b>			
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VT14, 17, 19, 38, 57, 86, 88, 34, 35, 39, 52, 61	CLUTCH ASSY	8888824	£7.50
62, 65, 85, 330, 840, VT165			
VT120-220, 100, 110	CLUTCH ASSY	8888824	£7.50
111, 113, 115, 118, 200			
126, 128, 130, 135, 138, 145, 150, 175, 225, 250,			
255, 258, 260, V130			
VT8000-8300, 7000	FF-REW IDLER	6413663	£2.80
VT8500-8700			
VT8000-8300, 7000	PLAY IDLER	6414221	280p
VT8500-8700			
VT8000-8300, 7000	FF-REW PULLEY	6383531	80p
VT8500-8700			
VT8300-9500, 6500	FF-REW IDLER	8691471	250p
VT880, 6800, 9700, 9900	PLAY IDLER	8881482	230p
VT8300-9500, 6500	PLAY IDLER	8881482	230p
VT880, 6800, 9700	PLAY IDLER	8881481	230p
VT9900	IDLER	881505	230p
VT8300-9500, 9700	IDLER	887043	£3.80
VT9900, 6500, 680, 8800	IDLER	887043	£3.80
VT11-33, VT63-64	FF-REW IDLER	6868971	125p
VT14, 165, 17, 19, 34, VT36, 38, 39, 52, 61, 62	FF-REW ARM	6868792	240p
VT56, 85, 86, 88, 330, 640			
VT1000, 110, 111, 113	FF-REW ARM	6868792	240p
VT115, 118, 119, 120, 125, 126, 130, 135, 138, 145, 150			
VT775, 220, 225, 250, 255, 260, VTL30			
VT400, 405, 410, 413	FF-REW	6897094	£1.30
VT414, 415, 418, 420, 425, 426, 428, 430, 431, 435			
VT438, 450, 488, 510, 518, 520, 525, 526, 530, 535			
VT536, 540, 545, 546, 548, 570, 575, 576, 580, 585			
VT588, VT625, 626, 630, 635, 636, 640, 645, 646, VTS80, 85			
VT3000	T-UP IDLER (LARGE)	£4.50	
VT3000	RE IDLER		£6.00
VT680, 6500, 6800	FS-BRAKE	8661505	230p
VT9700, 9900			
<b>HITACHI</b>			
HR3300, 3660, 4100	T-UP IDLER SML	PU48289	£5.50
HR7200, 7650, 7650	T-UP CLUTCH	PU53462A	230p
HR7655, 7300, 7350, 7610	REEL IDLER	PU48967	175p
HR7200, 7300, 7350	REEL IDLER	PU48967	175p
HR7600, 7610, 7650, 7655, 7700	ROLLER ASSY	PU49042A	350p
HR7600, 7610, 7650	ROLLER ASSY	PU49042A	350p
HR7655, 7700	T-UP IDLER LRG	PU47752	£4.50
HR5300, 3660, 4100	T-UP IDLER	PU51402A	100p
HR7200, 7600, 7650	T-UP IDLER	PU51402A	100p
HR7655, HRD110, HRD111, HR7300, 7350, 7610, HRD120-121, 225	T-UP CLUTCH		150p
HRD110, HRD120-121	T-UP CLUTCH		150p
HRD226, HRD111	IDLER ARM	PU55374-3-8	200p
HRD110, HRD120-121	IDLER ARM	PU55374-3-8	200p
HRD170, 180, 210, 230	IDLER ARM	PU58465	£2.25
HRD320, 370, 400, 430, 470, 530, 700, 750, 950, 3000			
HR5500, HR5500	CLUTCH MECH	PU558822	1200p
HRD465, HRD725	CLUTCH MECH	PU57658	1060p
HRD140, 150, 157, 158	CLUTCH MECH	PU57658	1060p
HR200, 250, 257, 565, 566, 783, HRP50	REW IDLER	PL46380	600p
HR3300, HR3330	REW IDLER	PL46380	600p
HR3660, HR4100	TAKE UP CLUTCH	PU56043-1-4	240p
HRD140, 150, 157, 158	TAKE UP CLUTCH	PU56043-1-4	240p
HRD160, 250, 257, 456, 565, 566, 725, 755, HRP50	TAKE UP CLUTCH	PU56044-1-5	180p
HRD140, 150, 157, 158	TAKE UP CLUTCH	PU56044-1-5	180p
HRD180, 250, 257, 455, 565, 566, 725, 755, HRP50			
<b>MATSUI</b>			
VX730, 735, 750, 755	CLUTCH	850A00005	420p
VX730, 735, 750, 755	LIMITED POST LEVER		£1.30
VX770, 800, 810, 880	ASSY		£1.50
VX990	IDLER REEL		280p
VX800A, VX900	IDLER REEL		£1.50
VX800A, VX820	REEL UNIT CLUTCH		280p
<b>DAEWOO</b>			
HS306, 307, 318, 319	GEAR ASSY	522800201	£6.25
HS400, 410, 710	IDLER	522902002	£3.00
HS337, 338, 347, 349	IDLER	522801701	325p
HS411, 412, 421, HSB10, HSB20, HSB30, HSE10, HSE20, HSE30,	IDLER	522801701	325p
HS70	IDLER	641C34301	£2.00
HS306, 307, 318, 319	IDLER	641C34301	£2.00
HS400, 410, 710	IDLER	522902002	£3.00
HS310, HSB20, HSB30	HSE10, HSE20, HSE30, HSE70	522801801	320p
HS337, 338, 411, 421	TAKE UP IDLER (LARGE)	522801801	£4.50
HS200	UNLOADING IDLER		£6.00
HS200	REWIND IDLER		£6.00
HS200	SUPPLY REEL	522A00101	£3.20
HS306, 307, 318, 319	DISK	522C06301	£3.00
HS320	REEL DISK	522C06301	£3.00
HS337, 338, 41, 421	REEL DISK	522C06301	£3.00
HS300, 301, 302, 310	PULLEY	522C05201	£2.25
HS306, 307, 318, 319	GEAR WHEEL	641D71101	£1.50
HS400, 410, 710	GEAR WHEEL	641D71101	£1.50
HS306, 307, 318, 319	GEAR WHEEL	641D71101	£1.50
HS400, 410, 710	GEAR WHEEL	641D71101	£1.50
<b>NCC</b>			
N830, N831, N832, N833	TAKE UP CLUTCH		150p
N830, N831, N832, N833	TAKE UP IDLER		100p
N830, N831, N832, N833	REEL IDLER		200p
N895	TAKE UP IDLER SMALL		550p
N911, N915, N916, N917	REEL DRIVE PULLEY		360p
N9012, 9013, 9014, 9015, 9033, 9034, 9054, 9055, 9066, 9110			
N9510, 9520, 9530, 9510			
<b>NATIONAL</b>			
NV322, NV600, NV888</			

### Satellite PSU Repair Kits

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

MAKE & MODEL	ORDER CODE	PRICE
PACE PRD800, PRD900	SATPSU1	850p
PACE SS9000, 9200, 9010, 9210, 9220	SATPSU2	850p
AMSTRAD SRD510, SRD520	SATPSU3	650p
AMSTRAD SRD500	SATPSU4	650p
AMSTRAD SRX340, SRX345, SRX350	SATPSU5	850p
PACE D100/150	SATPSU6	650p
CHURCHILL D2MAC	SATPSU7	650p
PACE MSS100	SATPSU8	730p
PACE MSS200/300 APPDOLL	SATPSU9	650p
PACE MSS500/1000	SATPSU10	1230p
FERGUSON SRD4	SATPSU11	835p
ECHOSTAR SR5500	SATPSU12	1735p
ECHOSTAR 8500/7700/6700	SATPSU13	3125p
AMSTRAD SRD600	SATPSU14	3125p
MIMTEC (Sutensen)	SATPSU15	775p
AMSTRAD SRD700/SR950/SRX100/301 SRX501/1002/2001/SRD2000 SAT250	SATPSU16	730p

**PACE 9000 SWITCH MODE TRANSFORMER**  
ORDER CODE: PACE9000 PRICE 800p

### 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, 8802, 8803, VCR4600, 4800, 5200, 5800, 8800, VIP3000, 5000  
Also fits: FIDELITY, FUNAI, HINARI, PROLINE, SCHNEIDER, TOWADA, UNIVERSUM ORDER CODE: AH01 PRICE: 1350p

AMSTRAD ORIGINAL NO: 153134  
Used on: AMSTRAD DB8900, 8904, VCR2000, 6000, 6100, 8600, 8802, 8803, VCR8804, 8700, 8704, 8714, 8800, 9005, 8244  
Also fits: ANTECH, BONDSTEC, CASIO, CROWN, FIDELITY, GOLDHAND, GRANADA, HINARI, MARQUANT, OMEGA, PROFEX, SCHNEIDER, SEG, SENTRA, SHINTOM, TASHIKO, TATUNG, TOWADA, UNIVERSUM ORDER CODE: AH02 PRICE: 1450p

### Replacement Audio Control Video Sound Head for National Panasonic

PART NUMBER	MODELS	PRICE
VBR 0091	NV67 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: 1250p + VAT

### Cassette DC Motors

MOTOR TYPE	PRICE
6V MOTOR	170p
3V MOTOR	170p
12V CW MOTOR	170p
12V CCW MOTOR	170p
13.2 CCW MOTOR	280p

### Replacement Video Cassette Housings

NAME	MODELS	CODE	PRICE
AKAI	V535, V553, V555, V556, V575	CH18	3200p
GRANADA	VHSDP1	CH05	1100p
	VHSYJ2	CH01	2800p
GOLDSTAR	GHV1290P, 1291P, 1295P, 9400, 73401, GSE1295P, GSE1891P, 20001Q, 20051Q, VCP-2000, 4300, 4301, 4305, VCP4306, 4311, 4315, 4316, 4320, 4321, 4325	CH25	2000p
	GHV51, 1221, 1232, 1240, 1241, 1242, 1244, 1246, 1248, GHV8000, 8200	CH26	2800p
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, 208, 21R, 22L, 26, 395, HRD230, 430, 530	CH03	2800p
	3V58, 3V59, 3V64, 3V65, FV11R, 8950, 8951, HRD170, HRD180, HRD370	CH04	2800p
	FV31R	CH19	4300p
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, N835G	CH01	2800p
	N895	CH02	2800p
PHILIPS	CASSETTE LIFT ASSEMBLY (69120366) DV186, 190, 286, 471, 562, 761, VR6180, 6182, 6185, 6285, VR6290, 6291, 6293, 6382, 6387, 6393, 6467, 6468, 6470, VR6561, 6670, 6760, 8761, 6870, 8970	CH05	1100p
	VR6443	CH22	2900p
	VR6448	CH23	2500p
	49S86	CH24	2500p
SHARP	VCA100, VCH851, VCH852	CH22	2900p
	VCA103, 103GV, 106, 106GVM, 254GVM	CH23	2500p
	VCS211, 244, 5055, 605, VCB230, VCB086G, 810G, VCT212, 310, 410G, 810	CH24	2500p
TELEFUNKEN	VR2970	CH02	2800p
THOMSON	V320, 321, 323, 326, 4200, 4300	CH01	2800p
	V942, 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	160p
SWITCH CLEANER	178ML	SP02	170p
SILICONE GREASE	200ML	SP03	210p
FREEZE IT	170ML	SP04	310p
FREEZE IT	400ML	SP16	600p
FOAM CLEANER	400ML	SP05	180p
ANTI-STATIC	150ML	SP06	190p
AEROKLEANE	135ML	SP07	220p
AERO DUSTER	150ML	SP08	310p
AERO DUSTER	400ML	SP17	550p
PLASTIC SEAL	200ML	SP09	250p
GLASS CLEANER	250ML	SP10	150p
COLDKLEANE	250ML	SP13	230p
EXCEL POLISH 80	250ML	SP18	150p
ADHESIVE 120	400ML	SP19	190p
LABEL REMOVER 130	200ML	SP20	240p
REFURB 140	400ML	SP21	240p
TUBE SILICON GREASE	50 GRAMMES	SP11	210p
TUBE SILICON SEALANT WHITE	75ML	SP22	280p
TUBE SILICON SEALANT CLEAR	75ML	SP23	280p
TUBE HEAT SINK COMPOUND	25 GRAMMES	SP12	150p
DRIVE CLEANER	200ML	SP24	150p
SCREEN CLEANER	200ML	SP25	150p
COMPUTER CARE KIT	-	SP26	2100p

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

### CD Pick Ups

SONY OPTICAL PICK UP		
PART NO: KSS210A	SONY CDPC 301M, CDPC 305M	2200p
Fits most Sony, Akai & J.V.C. Portable Hi-Fi and Midi Systems		
PART NO: KSS210B	USED ON MODELS:	
CFD100, 105L, 120, 300, 440, 454, 455, 50, 500, 55, 58, 60		
CFD68, 750, 755, 760, 765, 770, 775, 440S, W100, 100S		2200p

### Cassette Tape Heads

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

### Soldering Accessories

DESCRIPTION	ODE	PRICE
ANTEX SOLDERING IRONS		
25 WATT 240 VAC (DS25W 240V)	S101	900p
15 WATT 240 VAC (DS15W 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 SVWG 500 GRAMMES	S110	500p
20 SVWG 500 GRAMMES	S111	650p
22 SVWG 500 GRAMMES	S112	700p
DESOLDERING AIDS		
SOLDER MOP STANDARD GAUGE 1.2MM X 1.5M	S187	80p
SOLDER MOP 1.2MM X 10M	S185	400p
DESOLDERING PUMP	S105	320p
SPARE NOZZLE	S106	80p

### 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 £21.75 - No VAT. Order Code: BOOK01

### TELEVISION Edition 5

Lists more than 6,000 faults with 306 pages covering 58 different brands  
Price: 1450p only - no VAT. Order Code: BOOK02

### Satellite Repair Manual Edition 3

A comprehensive guide to receiver reviewing, featuring stock faults and installation tips.  
Price 1400p Only No VAT Postage 100p  
Order Code: BOOK03

### SEMICONDUCTOR COMPARISONS 1996

Listing more than 29,000 Semiconductors with suitable alternative complete with descriptions and base information.  
Price: £14.50 - No VAT. Order Code: BOOK04

### 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 - 800p



### GRANDATA LTD

Tel: 0181-900 2329

Fax: 0181-903 6126



# REMOTE CONTROLS

Description	Order Code	Price	Description	Order Code	Price
GRUNDIG			PHILIPS (continued)		
TP160E	RC 107	900p	RC38	RC 301	750p
TP200, TP300	RC 380	750p	KT3 TEXT	RC 5301	750p
TP400	RC 401	675p	RC5352	RC 5352	750p
TP590-600	RC 600	750p	RC5375	RC 5375	750p
TP390, TP610	RC 610	750p	RC5 STANDARD	RC 5534	850p
TP621	RC 621	800p	RC5901	RC 5901	850p
TP630, TP650	RC 650	750p	RC5903	RC 5903	700p
TP660	RC 660	750p			
TP661	RC 661	750p	SABA		
HITACHI			T6772	RC149	900p
CLE800-CLE830	RC 140M	700p	TC319-320	RC 328	800p
A617402/655602	RC 192	800p	TC356	RC 356	800p
A512120/230	RC 900	750p	TC358	RC358	800p
A514790	RC 901	750p	TC360	RC 360	750p
A5088470	RC 902	800p	TC365	RC 365	750p
A518612	RC 903	750p	SALORA		
SCLO02	RC 904	750p	SERIES L	RC 190	750p
C2096	RC 905	800p	86173	RC 882	750p
A511940	RC 906	750p	SANYO		
655602H	RC 907	800p	RC218, RC222, RC228, RC238	RC 140M	700p
ITT			JXGE	RC 878	800p
IFB13, 14, 15	RC 143	800p	JXDE	RC 884	750p
FS4	RC 148	750p	VHR2300	RC 890	750p
RG305	RC 305	675p	RC628	RC 865	900p
RG306	RC 306	750p	SHARP		
FS9/1-10/1	RC 307	750p	G0121CESA, 123CESA, 204, 251	RC 140M	850p
VSS RUK	RC 308	750p	SIEMENS		
VS4-1	RC 310	750p	FC616	RC 130	850p
MULTICONTROL (17C20)	RC 311	750p	FC631	RC 132	750p
KORTING			FC742	RC 164	750p
18279, 18396, 18460, 18521 SE	RC 108	750p	SONY		
40540 VTS	RC 108	750p	RM604, RM605, RM606	RC 140	700p
LOEWE			32 CHANNEL	RC 140M	700p
DC11	RC 146	800p	RM613	RC 141	750p
MATSUI			RM632, RM636	RC 160	675p
010270601	RC 889	750p	TATUNG		
VX770	RC 892	750p	FXA	RC 877	750p
METZ			RC70	RC 883	750p
JAVA COLOR (6890)	RC 166	800p	FX70 FASTTEXT	RC 894	750p
COLOR (7156)	RC 183	800p	TELEFUNKEN		
JAVA (7180)	RC 184	800p	FB632	RC 632 ST	750p
MITSUBISHI			FB 639	RC 639 ST	750p
939P/03607, 939P/03609	RC 140M	850p	THORN/FERGUSON		
NOKIA			3V35-42	RC 342	650p
SATELLITE	RC 550	750p	3V31-32	RC 344	750p
NORDMENDE			3V57-58	RC 628	750p
TC2336	RC 351N	750p	TX10 TEXT	RC 732	575p
CMC1, TC3519	RC 356	800p	TX10 STEREO TEXT	RC 738	575p
OCEANIC			TX9-90-100	RC 740	675p
390C9500	RC 339	750p	3V55, FV11	RC 783	750p
ORION			TX100 FASTTEXT	RC 785	650p
RC53	RC 892	750p	TX100 STEREO FASTTEXT	RC 789	650p
PANASONIC			PROFESSIONAL	RC 790	650p
EUR51200	RC 200	800p	TOSHIBA		
TC2200	RC 201	850p	CT937	RC 950	750p
VSQ0357/NV730	RC 202	750p	CT9117	RC 951	750p
TNQ1621	RC 203	750p	201R4B	RC 952	750p
PHILCO					
CARVEL, CONCORDE,	RC 108	750p			
TELESTAR					
TC10	RC 152	900p			
PHILIPS					
RC5002.5154	RC 134	750p			
KT3 NON TEXT	RC 135	750p			
69117032	RC 178	800p			
69117194	RC 180	750p			
RC5991-UNIV	RC 300	580p			

## VCR ALIGNMENT KIT

CONTAINS:  
 SET OF 7 HEAD & TAPE PATH ALIGNERS  
 SET OF 9 ALLEN KEYS  
 - RCA TYPE AUDIO & CONTROL HEAD POSITIONING  
 - 0.77mm  
 - 0.90mm  
 - 1.27mm  
 - 1.50mm  
 - 1.60mm  
 - 2.00mm  
 - 2.40mm  
 - 3.00mm  
 TOOL  
 - RCA ADJUSTMENT TOOL FOR TAPE GUIDE POSTS  
 - RCA TYPE BACK TENSION TOOL  
 - TENSION ADJUSTMENT TOOL FOR VARIOUS USES  
 - VCR ADJUSTMENT TOOL  
 3 Reversible Screwdrivers  
 Spring Hook  
 VCR Head Extractor  
 Circip Pliers  
 Micro Screwdriver

Order Code: TOOL10 Price: 2900p

## FUSES

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

## FUSES

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

ALL THE ABOVE PRICES ARE FOR PACKS OF 10 FUSES

## I.C. PROTECTOR

- ICPF10 ICPF38 ICPN10 ICPN38
- ICPF15 ICPF50 ICPN15 ICPN50
- ICPF20 ICPF75 ICPN20 ICPN75
- ICPF25 ICPN5 ICPN25

Price: Only 30p each

We stock Remote Controls for over 5000 different models.

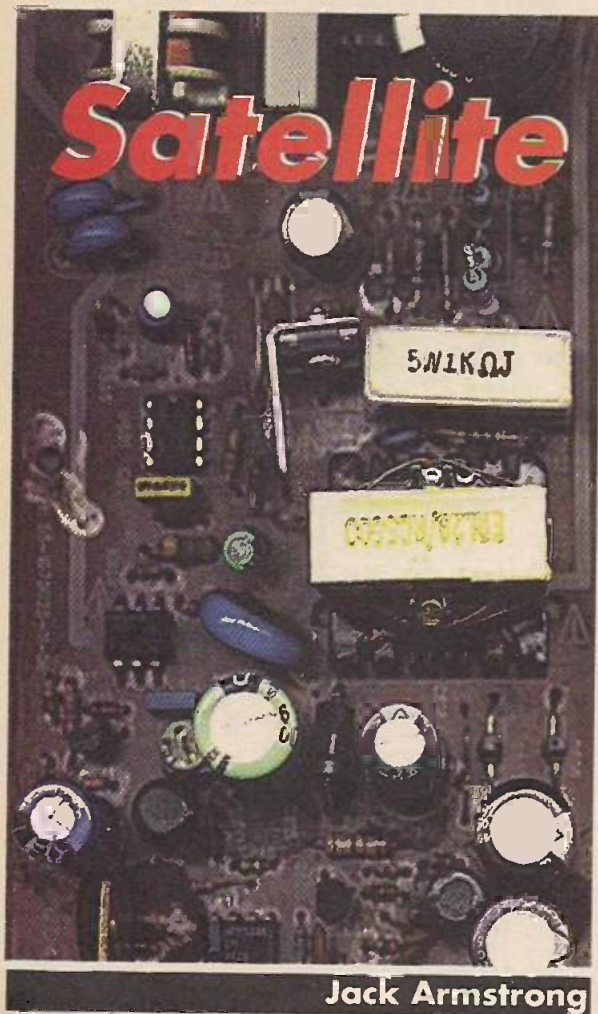
Ring for further details on 0181-900 2329.

# GRANDATA LTD

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Our picture shows part of the BT SVS300 satellite receiver

**M**y local chip shop owner is Italian. The other day he called me to complain that the receiver I sold him four years ago had failed "under guarantee". Now I don't know the legal situation in Rome, but in the UK the usual guarantee period is twelve months! Anyway, I agreed to go along to investigate, and promised not to charge for the call out.

"It's verra pecoolyar" he told me. "When I walk-a across-a da floor-a, da satellite she changes a channel by herself!"

Now Mario lives in an old thatched cottage, and the floorboards creak as you walk. Sure enough as I approached the JSR3300 receiver it changed channel before my eyes. I checked the external connections and removed the batteries from the remote control unit, but tapping the receiver still produced erratic behaviour. So it had to be a workshop job.

Back at the bench I soon discovered that the connector plugs from the front panel to the main board no longer made good contact. A squirt of switch cleaner on each

# WORKSHOP

plug cured the problem.

I earned myself a nice sack of potatoes!

## Echostar SR7700

I've had several of these receivers in for repair recently. The latest belonged to a couch potato who asked me to collect the unit because he wanted to remain at home to watch the football on terrestrial TV.

As is often the case, there were hum bars on the screen. All was well when I'd replaced the 150µF 'Gloria' capacitor in the power supply. If you catch this problem too late, Gloria tends to expire and can often melt the copper tracks beneath her. In this case track repair and replacement of the UC3844 chip will be required. The capacitor and, occasionally, the BUZ80A transistor will have to be renewed. Sometimes repair is not economic because the damage is so extensive.

Earlier problems with spares and service information have now been resolved, and these are now generally available. Agents include Satellite Solutions (01604 787 888), JD Electronics (01787 880 328) in Sudbury, Express TV (0181 881 0764) and Protel (0181 445 4441) in London, and GT Satellites (01792 897 600) in Swansea.

## Ferguson SRD4

These receivers produce a good picture when working. Although they are not Astra 1D compatible, many owners are still happy to have them repaired. So when a lady phoned and asked me to collect and repair her SRD4 I didn't argue – I simply mentioned my standard charge. She thought that this was reasonable, as it included collection and delivery, so the job went ahead.

The receiver had apparently produced very poor pictures for some weeks before it finally gave up during a thunderstorm (I love lightning, don't you? I stand at the window and clock up the rise in my bank balance with each flash. . .).

A repair kit from Economic Devices soon had the power supply working, but the pictures were very

sparkly. It was not difficult to pinpoint the culprit – the tuner unit. Sometimes the cause is dry-joints inside, but not this time. A tuner module lifted from an SRB1 did the trick. Since I'd had this BSB receiver given to me for nothing, I could justify charging only my standard rate. Without the SRB1 module, the repair would have been uneconomical.

## The Amstrad SRD700

I mentioned my first impression of this model in a previous article. Now that I'm seeing more faulty ones I feel that my comments were wholly justified. During the course of last month I received a couple from a dealer for repair.

Unfortunately the installer had removed them from his customers' houses without attaching a fault report label to each one. The first worked for twelve hours on test without displaying any sign of a fault. If there was anything wrong, it certainly wasn't obvious. The dealer will incur a nominal charge for my time.

The second one failed after half an hour. The symptom was a crackling noise that became steadily worse until it drowned the audio. Use of freezer quickly traced the cause to one of the three TDA6130-5X4 surface-mounted chips on the combined tuner/video/audio module.

Unfortunately the chip is not available from Amstrad as a separate spare part. Other distributors produced various reactions that ranged from "it's been withdrawn, I think it's obsolete" to "we can get it from Germany but you have to order 300". Since Amstrad stopped supplying direct to dealers, there's no such thing as a cheap Amstrad part. The tuner module for the SRD700 has been superseded by part no. 242842, which costs around £40 from approved distributors. Note that this is not the same as the SRD950's tuner assembly.

I took the plunge and ordered the complete tuner module. When It

arrived I was horrified by the length of time that was required to fit it. In addition, the service manual gives alignment instructions that include the use of a frequency counter.

When I eventually got the receiver back together the audio was even worse: the new tuner had the same fault! To cut my losses and avoid wasting more time, I removed a good IC from the new tuner and fitted it in the original one (so that I didn't have to carry out the realignment procedure). Once this had been done the receiver worked properly.

Naturally the dealer refused to pay me the cost of the tuner plus four hours' labour. I didn't even charge for the ten telephone calls, three faxes and four e-mail messages it took to establish that the chip was effectively unobtainable!

### The BT SVS300

I suspect that this BT receiver is manufactured in China and is based on a design which has been sold in Europe as the Houston 1002. It's remarkably similar to some Amstrad models. A power supply from one of them arrived in the mail recently. Apparently another dealer

had attempted to fix it without success. Several repair kits had been tried, but all had resulted in loud bangs.

The cause of the trouble was not hard to find. Someone had removed the chopper transistor complete with its heatsink and the copper land. On replacing it they had failed to notice that the heatsink land is required for continuity between two halves of the circuit.

I repaired the broken track and fitted another complete kit, in case the bangs had degraded any of the components. The supply then tried to work, but 'ticked'. It took me ages to trace the cause of the fault to a combination of a faulty transformer and a shorted 2SB1143 transistor inside the little metal can.

### Pace Problems

A customer posted me a Pace MSS300 receiver that displayed some intermittent fault symptoms after a warm-up time of about fifteen minutes. A row of zeros would appear at the top left corner of the screen, though the front panel display was not affected; sometimes a whistle could be heard from the TV set's speaker; and sometimes

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

**jackarm@netcentral.co.uk**

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.

the audio would disappear entirely.

I've had similar problems with the MSS500. They have usually been caused by a bad connection in the microcontroller socket. But this MSS300 had a masked micro that was soldered to the board.

A call to Pace produced the suggestion that the audio processor chip was faulty (hence the sound problems) and was affecting the I2C bus (hence the incorrect graphics display). This diagnosis was correct, as a new MSP3400 sound processor chip confirmed. I knew the answer all the time of course, and was just testing them. ■

## Test Case 408

Sage was sunning himself on a Greek island last month. He's now back: the tan has worn off, the chilly winds rattle the workshop windows, and our leading light has wasted half an afternoon on an Hitachi Model VT250 VCR. It's an interesting story however.

The symptom was simple enough: no go. When the machine was powered there was a brief flash from the on LED but no clock display. Sage investigated the power supply section of the machine, expecting to find something wrong with the voltage regulator chip. The situation he discovered was as follows. Although the power supply was working properly, its switched outputs were not being produced because the necessary command from the main microcontroller chip IC901 was missing. IC901's power control pin 6 remained obstinately stuck, whatever was done with the control keys. Its supply voltage, clock oscillator and reset were all OK, but there seemed to be a lack of communication between IC901 and the display/timer microcontroller chip IC751 on the front (timer) panel.

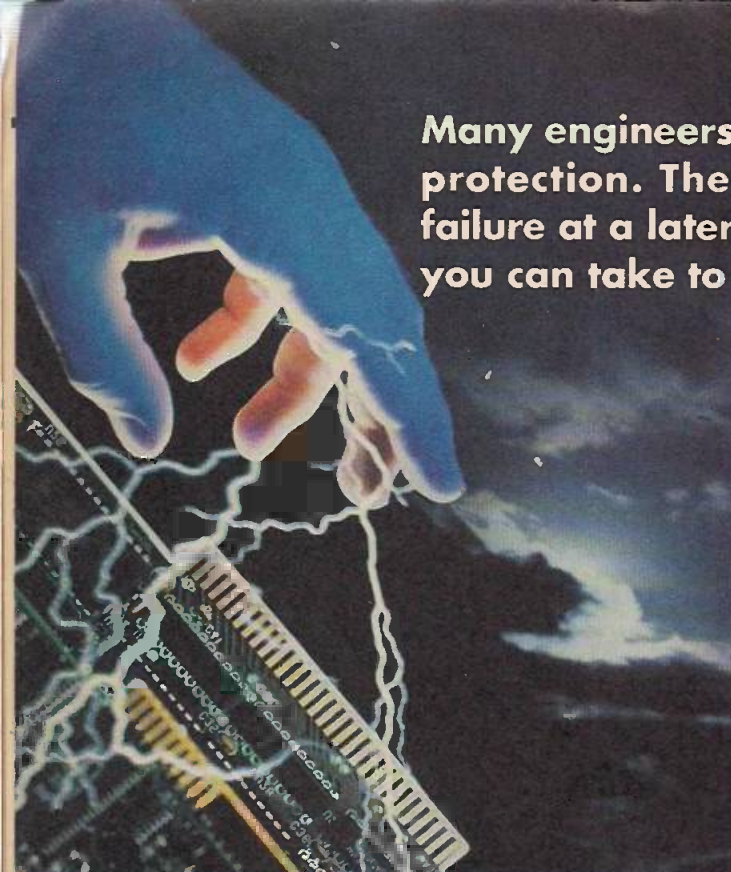
Time to take off the front cover then and go in with the scope. As with its companion IC901, the 5V supply voltage was present and correct, there was a reset pulse and the oscillator was throbbing away. But there were no drive pulses to the fluorescent display panel, no strobe pulses to the twenty five control keys, and no buzzes from the little buzzer. The machine was not dead then, but sleeping. Why?

The voltage-synthesis tuning system, which lives on a subpanel, is tightly bound up with IC751's operation and communications. Sage vaguely remembered having had trouble there before, so he moved into this third section of the machine. The main items are a small microcontroller chip, an EEPROM and a dogsbody chip,

plus some voltage stabilisers. The circuit protector IC804 was OK, and everything else that Sage checked with his scope maintained its electrical innocence. The micro's 5V supply was correct, its reset pulse at pin 26 was also OK and the 4MHz oscillator was running. This microcontroller chip did seem to be able to do something however: for about half a second after powering up – about the same period as the on LED's illumination time – it had a quick chat with its associated M58657P memory chip, via its clock and data lines (pins 4 and 13). It also hailed the timer chip IC751, but received no reply at all.

Sage returned to the front panel, convinced that the trouble was something to do with IC751. On closer examination he saw that there was a little corrosion around some of the key switches – the legacy of some earlier liquid spillage. To save a lot of weary testing for leakage in the individual switches, Sage isolated pins 38-44 of IC751 inclusive. This took out all the switches in the affected area. The VCR still refused to come on or produce a display, though the operate key pulled down pin 34 surely enough. Sage rechecked all the important pins of this 64-pin chip, which normally doesn't give any trouble. All the basic services appeared to be present. Sage wished he was dealing with a Sidari steak instead of this recalcitrant VCR.

So many microcontroller chips are replaced unnecessarily. Our wise one was not yet prepared to take the soldering iron and braid to the big IC, even though question marks rather than pulses were coming out of it. There wasn't an HD614045SE34 in the stores anyway – we must have just run out of them. In the event a new chip wasn't required, and the actual fault was amazingly simple. Which vital input was missing, and why? Think before you go to page 139



Many engineers still take chances with ESD protection. The result can be an embarrassing failure at a later date. Frank Harding on the steps you can take to eliminate the problem

# Controlling Electrostatic Discharges

**M**odern electronic equipment is very much more reliable than that of twenty years ago. When I started in the trade, twenty six years ago now, the average TV receiver had a call-out rate of 1.5 times a year. It now seems that after delivering a TV set you will in most cases not see it in the workshop for quite some years.

An ex-engineer I was talking to recently had left the trade because of what he called the "junk and plastic rubbish", particularly of Far Eastern origin, with which he had had to deal. His main gripe was about unreliable microcontroller chips and chips used in tuning circuits. He was a few years older than me, and had been brought up on valves. Whilst I can sympathise with him on some counts, I cannot agree that modern microcontroller chips are unreliable.

When I discussed the matter with him further it transpired that he had never bothered to use an antistatic mat or wrist strap when replacing these chips. He thought that their use was "questionable", and that "chaining yourself to the bench with a wrist strap" was absurd.

The fact is that you have to keep up with change in this trade. The techniques used twenty years ago will not always be appropriate today. This applies particularly with microcontroller and similar chips that use MOS technology. Manufacturers have invested millions of pounds on installing antistatic equipment in their factories. It follows that the same care should be taken in the workshop if reliable repairs are to be carried out.

## Basics

Static electricity (an electrostatic charge) is generated when two materials are rubbed together. With plastics and other nonconductive materials the charge remains, hence the name 'static'. We humans are the main source of static. The clothing we wear, the common plastics we use, the carpets we walk across – these all contribute to an electrostatic build up. You can sometimes feel this when you touch a car door or a filing cabinet.

The car is standing on rubber tyres, which form a wonderful insulator. Its bodywork is safely insulated from earth until we touch the door and the static is discharged

through our fingers. This might make you jump, or you might just hear a faint click. That faint click probably represents a discharge of about 3,000V however, at an extremely low current. Imagine what 3kV can do to a delicate, and possibly expensive, microcontroller chip! Only 60V or less is required to damage many semiconductor devices.

## Effect on Components

Electrostatic discharges (ESDs) can damage delicate semiconductor devices in all electronic equipment. Sometimes the damage is minimal – perhaps nothing more than a disturbed clock pulse train that results in the microcontroller 'hanging up'. In this case all that is required is to press a reset button or switch off, wait a few seconds, then switch on again, thus activating a software-controlled reset to restore normal operation. At its worst however an ESD can cause catastrophic failure, by creating semiconductor material 'punch through'. This obviously means total failure of the device.

The strange fact however is that in most cases the component appears to be undamaged but then degenerates in such a way that failure occurs at a later date. There is a term for this, 'latent failure'. It may happen quite quickly, or after say several weeks. The important thing is to avoid the initial discharge.

## Controlling ESD

Static electricity cannot be eliminated but can be controlled. This is done by providing adequate earth paths between any components likely to be affected and the person or objects that may come into contact with them. If the items involved are all at the same potential, no damage will be done. Hence the earthing wrist straps etc.

Anyone working on products that could be affected should be aware of the possible dangers. If static-sensitive components are purchased, they should be kept in their protective packaging until they are required.

I run only a small part-time business, so I cannot justify the expense of a static-free area. I can and do however take adequate precautions when handling static-sensitive components.

I was able to obtain a conductive floor mat from a bankrupt stock sell off. As it was much larger than I required, a section was cut from it to act as a bench mat. I can remove this if I want when working on 'standard' equipment/devices. When the bench mat is in use I clip an earth lead to it, with the other end connected to the floor mat. Large bulldog clips are used for this purpose.

I obtained some conductive gloves from the same bankrupt stock. They are very thin but remarkably strong. So I wear one of these with a similar clip to the floor mat when working with static-sensitive devices.

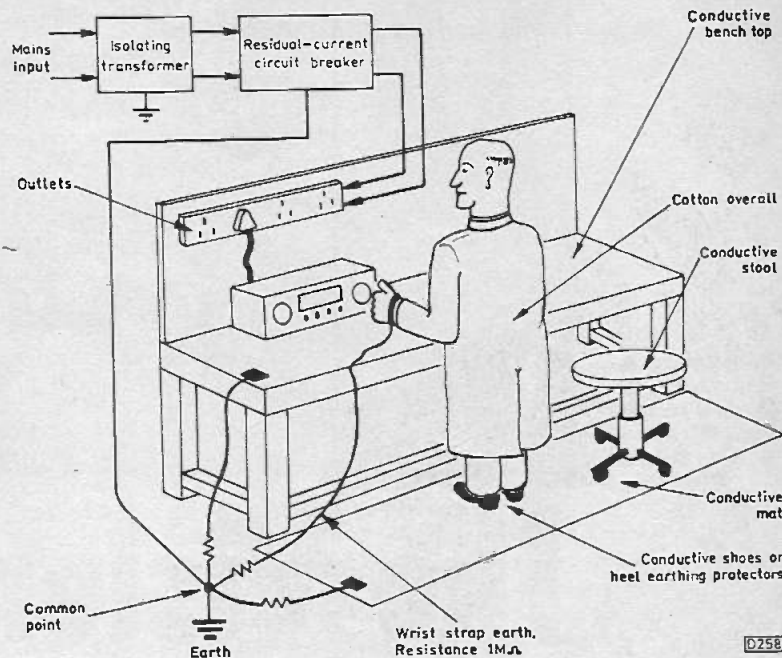
In all, the total cost of these items was around £15. But I was very lucky! I've used this arrangement for some time now and have had no problems. I keep all the conductive foam inserts and conductive boxes used in semiconductor packaging: any sensitive chips are stored on these foam inserts.

For a more professional and permanent set-up, use something like the arrangement shown in Fig. 1.

**In Conclusion**

These brief notes give just an idea of what can happen if static is allowed to build up, and the ways in which it can be controlled. Our friend mentioned in the opening paragraphs seemed to have difficulty in accepting that new technology brings with it new problems. He didn't seem to appreciate that if an original chip worked for five years and its replacement broke down after a few months, there was probably something wrong about the way in which the new chip was fitted.

Many suppliers now provide antistatic service aids. They are worth the investment required. ■



**Fig. 1: For full ESD protection in a permanent workstation, something like the above set-up is required. It is best to wear a cotton overall. Use conductive compartment trays for all ESD-sensitive components. An electrostatic voltage sensor such as the Mini-meg touch tester from CPC is helpful for checking that in use a wrist strap operates as intended.**

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Future products on display at Hitachi's recent Vision 97 show in Tokyo



# The Vision 97 Show

**H**itachi recently held its Vision 97 show in Tokyo. The company unveiled a variety of new digital technology, including Data VHS, DVD, digital satellite TV and digital cameras. Little doubt was left about the company's view that much of today's analogue technology will soon be superseded by digital technology. In particular Norio Ogimoto, senior engineer in Hitachi's consumer AV products division, described the MPEG digital video standard as the "English language of the digital world". His view is that it will form a common link between various digital technologies.

## MPEG Camera

One of the highlights of the show was a digital camera that records both moving MPEG-1 video images and JPEG still images on a PC card – formerly known as a PCMCIA card. The camera, tentatively called the MPEG1A, fits snugly into the palm of a hand and weighs around 540g. It uses a type III PC card, which is about the size of a thick credit card. This contains a 260Mbyte hard disc that can store 2,800 JPEG images, three hours of sound or eighteen minutes of MPEG-1 video. In practice a mix of still and moving

images, some accompanied with sound, will be stored. The camera has been made possible by a newly developed Hitachi LSI chip that contains both MPEG and JPEG codecs (coder-decoders). Other features of the camera include a 380,000-pixel CCD image sensor, a 1.8in. LC display and a swivel lens with x6 digital zoom. A lithium-ion battery provides an operating time of around forty minutes. For playback the hard disc card is inserted in a computer with a PC card drive, or alternatively an ISA serial interface board is used to connect the camera to a PC. There will also be a composite video connection for playback via a TV set.

Hitachi plans to launch the camera next year, at a price of around £1,300. It will be aimed at PC users initially, in particular people who need to take pictures when out of the office, such as surveyors and estate agents. In the longer

term the camera will also be developed for the consumer market. One suggestion is that the camera could be used to make up Internet pages. In time Hitachi considers that the price of video printers will fall to a level that will make them affordable in a mass market. When this happens the user will be able to hook a digital camera to a PC, select the best shots and print them out.

Various accessories are planned by Hitachi. They include an AV cable, an AC adaptor and a CD-ROM that will store relevant software such as programs for editing and retouching photos on a PC screen and an MPEG decoder in software form. This would enable an MPEG picture to be displayed by a computer without the need for an add-on board.

Demonstrations of the MPEG camera were impressive. The first thing you see on a PC screen is a menu that shows file numbers (each of these represents a shot), along with icons that tell you whether these are still or moving images and whether there is any audio. Click on a file and you see the recording date. Another click and you see the image or video clip.

Hitachi plans to talk to PC and consumer electronics companies in an effort to get the system accepted as a new standard for digital imaging. But there are already digital still cameras that record images on a PC card, though most of them record only dozens of images. Hitachi's system also faces competition from the digital video cassette (DVC) system, which records still and moving images on 6mm tape. DVC cameras are also designed to be connected to PCs and TV sets. Mr Ogimoto contends that DVC is simply an improvement on analogue tape systems. He points out that PC cards don't wear out and offer faster access, though Hitachi acknowledges that DVC offers a longer running time and better picture quality. An MPEG-2 version of the camera is being developed however.

## D-VHS

Data VHS is the digital version of the VHS format. It has the same basic specification as standard VHS (drum size, tape width etc) but there is one important difference – a D-VHS machine can play and record in both analogue and digital modes. The D-VHS system uses Super VHS type tape on which MPEG-2 video can be recorded.

Hitachi demonstrated a D-VHS machine that displayed

The video world is heading towards a digital future. George Cole visits Hitachi's Vision 97 show to see some of the latest technology

images from an American football game. They looked very impressive. There was also a demonstration of the differences between analogue and digital noise. Whereas the former looks like snow on the screen, digital noise produces a mosaic effect – the image breaks up into small blocks.

With the move towards disc technology, why bother with D-VHS? Hitachi points out that there are vast numbers of VHS decks in use (around 360 million world wide at present), and that tape is very cost-effective as a storage medium – the cost is about £10 for 40Gbytes of storage space.

Hitachi has a three-stage plan for D-VHS. The system will go on sale next year in North America and Brazil, where digital satellite services are in operation. Users will be able to record the digital transmissions on tape. Bit-stream recording will be used initially: the digital programme from the satellite is fed to an integrated receiver-decoder (IRD), then stored on D-VHS tape. The VCR doesn't process the data, i.e. no decoding or decompression takes place within the D-VHS recorder. In order to play the stored digital programmes, the data has to be returned to the IRD for processing, after which it is fed to the TV set. There will also be a direct link between the D-VHS recorder and the TV set for playback of VHS tapes and, should they be introduced, prerecorded D-VHS cassettes.

Stage two is planned for 1997/8, when D-VHS decks with built-in IRDs will be launched in Japan, Europe and other countries. Another D-VHS use would be as a visual streamer or giant data store. Data from satellites, the Internet, optical discs or digital cameras could be stored.

Finally, around 1999, D-VHS decks with built-in MPEG-2 decoders are planned, enabling users to record from analogue and digital sources. Hitachi is currently developing an MPEG LSI chip for this purpose.

## DVD

Hitachi is one of the leading members of the DVD group. So it was no surprise to find the company promoting the system at Vision 97. DVD Video players (for ordinary home use) and DVD-ROM drives for PC applications were demonstrated. The take up of DVD Video is uncertain (see DVD Forum report last month) but many believe that DVD-ROM will be a great success in the computer market. Hitachi believes that we will see a decline in CD-ROM drive sales as the price of DVD-ROM drives, which can also read CD-ROM discs, approaches the mass market level.

## Digital Satellite TV

By the time that this is read the Japanese digital satellite TV service PerfectTV should have been launched – current Japanese satellite TV systems transmit NTSC or MUSE analogue HDTV programmes. PerfectTV is to use a communications satellite (CS) positioned at 128°E, with an output power suitable for reception with 45cm dishes. There will be around fifty channels initially, but by the end of next year this should increase to over seventy TV and a hundred audio channels. Subscriptions are to range from £24 to some £227 a month.

Hitachi showed a PerfectTV receiver, Model CS-DP60S, that includes a 2,400 modem for two-way data transmission via a telephone line (for future interactive services). It weighs 3.5kg, measures 43.5 x 7.4 x 30cm and has a price in the region of £590, including a dish and smart card. Hitachi also showed a PerfectTV multiscreen set, able to display one live TV picture plus eleven others held in a buffer memory – ideal for seeing what's on the other channels.

## Display Technology

Hitachi is developing a number of flat-screen TV sets. One has a 25in. plasma display that's designed for both PC and

TV use. In the TV mode it produces a 16:9 widescreen image for NTSC and PAL systems. In the PC mode it produces a 4:3 XGA graphics display. The set is just 10cm deep. It's to go on sale next year. There were no price details – but don't expect it to be cheap.

There was also a 13.3in. TFT LCD set, Model MMX-133X, that's due for launch in Japan. The pictures were sharp and clear, with a wider viewing area than with standard LCD screens (140° compared to 60°). It can also handle compute VGA, SVGA and XGA graphics. The drawback is its price – the equivalent of about £4,000. You can buy an awful lot of 14in. CRT sets for that amount!

## Internet Products

Another new system, the Interdisc, is designed for TV and PC users wanting to explore the Internet. The snag with the Internet is that access is time consuming and the phone bill can mount up, even when using a 28,800 modem and local call rates. The idea of Interdisc is to put large data files such as photographic images and MPEG-1 video on to a CD-ROM, along with Web pages and Web browser software for logging on to the Internet. In this way the user can browse off-line, and go on-line for the latest news or to place an order. The system is similar to Philips' CD Online service,



Hitachi's DVD-ROM drive unit.

which was launched last year but has not been a commercial success. CD Online used CDi discs, with Philips hardware and software. Interdisc uses CD-ROMs and information from various companies. The Interdisc also contains MPEG-1 playback software, so that PC users don't need a computer equipped with an MPEG video card.

Examples of its use shown by Hitachi included a system for reserving a hotel room. First you browse through pictures of various hotel rooms and facilities. When you've picked the hotel you want, you log on to its Web site and make a booking. Another example enables users to select a car from four car manufacturer Web sites. Once online, you can find the nearest dealer and book a test drive.

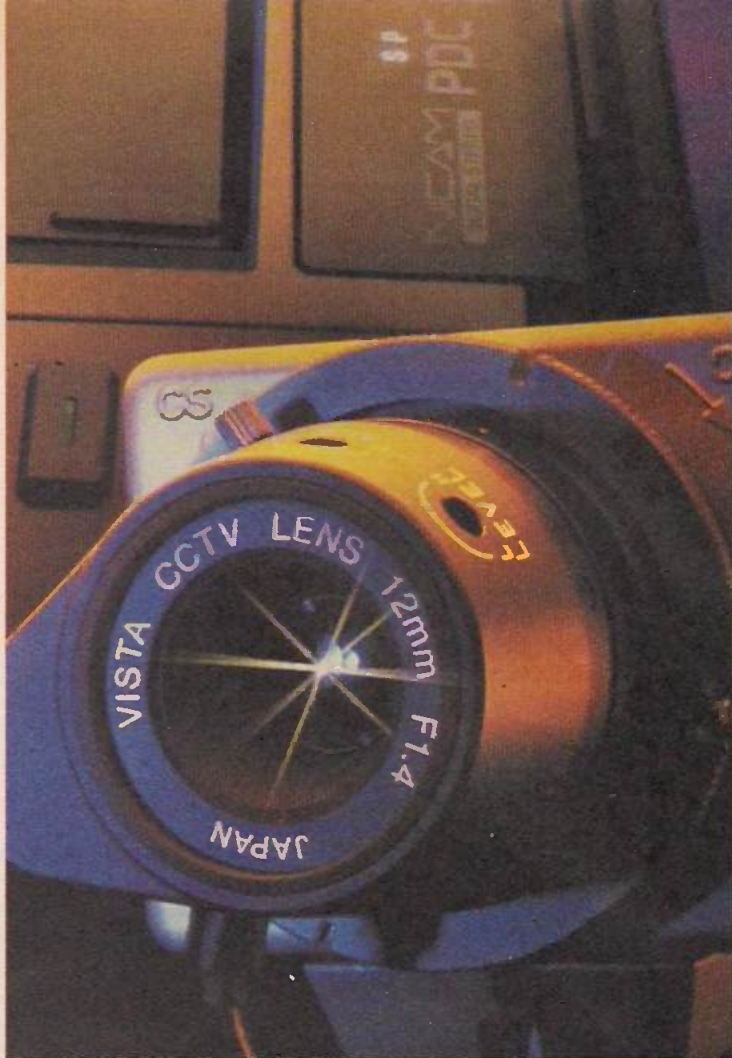
Hitachi also showed Internet players that hook up to a TV set, and Sega's Saturn 32-bit games console under the Hitachi brand name – Hitachi makes many of Saturn's custom chip sets.

## Role of the PC

Hitachi sees the PC becoming a dominant home entertainment product by the end of the century. This doesn't mean that we will all have a PC and keyboard sitting in our living rooms. Rather, smart sets that can receive data from satellite and terrestrial sources, connect to the Internet and play back data from optical discs and digital tape devices are likely to become a part of the household furniture. ■

# Buffer Amp for CCTV Video

**Keith Cummins** presents a video buffer amplifier design for driving up to four monitors



I recently purchased a small security camera of a type that has been advertised in several electronics magazines. It's a monochrome camera, with all the required sync generation circuits included. There are three connections, +12V, video output and 0V (earth). The output impedance is the usual  $75\Omega$ , so the camera's output will drive a coaxial cable and monitor directly.

## The Requirement

Being an awkward so and so, I naturally wanted to do something different, i.e. use the camera to drive two monitors. This meant that I had to design a buffer amplifier. The general arrangement is illustrated in Fig. 1. It's straightforward, consisting of a unity-gain amplifier with a high input and a very low output impedance. Note that when the camera's output is terminated in a high impedance instead of  $75\Omega$ , its output rises to 2V peak-to-peak. The amplifier's video output is 2V peak-to-peak at an impedance of less than  $5\Omega$ . It's a simple matter to match up to four  $75\Omega$  coaxial cables to the amplifier's output by the addition of series terminating resistors, one for each cable. These terminating resistors raise the output impedance to match each line, at the same time attenuating the signal level so that it's at the normal 1V peak-to-peak level.

This article describes the design of a simple yet effective buffer amplifier which can be connected directly

between the camera's output and the coaxial cables that feed the monitors.

## Design Details

The main objective is to obtain as low an output impedance as can sensibly be achieved to enable several line terminating resistors with values as near  $75\Omega$  as possible to be connected. At first a basic emitter-follower would seem to be a good idea, but a low-value emitter resistor would be required to obtain a really low output impedance. This implies heavy current flow and the use of a hefty transistor.

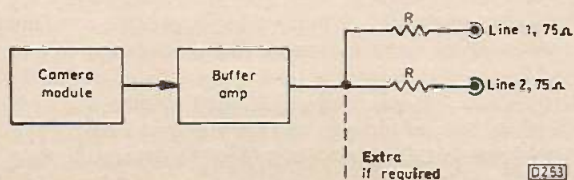
A more attractive approach is to use complementary emitter-followers. This provides plenty of pull-up and pull-down current capability with negligible quiescent current flow. A complementary compound emitter-follower is an attractive proposition, because the Vbe voltages of the npn and pnp transistors are of opposite polarity and therefore 'cancel out', the output voltage being the same as the input. If you use two complementary compound emitter-followers you get the circuit shown in Fig. 2.

This configuration is particularly attractive for several reasons. First, it's simple and predictable. Secondly any drift in the Vbe of the complementary transistors in theory cancels out, and the DC output is virtually the same as the input. Thirdly, under static conditions the standing (quiescent) current is zero, provided the transistors are members of the same complementary family. Lastly the output impedance is very low.

## Circuit Description

The buffer amplifier is run from the same regulated 12V supply that feeds the camera, so the transistors have to be biased for 'half-rail' working, i.e. to a nominal 6V. R1 and R2 set the bias. As it is unterminated, the camera's

**Fig. 1: Basic buffer amplifier arrangement. Up to four video outputs can be provided.**





video output is 2V peak-to-peak. This signal is coupled to Tr1 and Tr2 by the DC blocking capacitor C1. R3 and R4 form emitter loads for Tr2 and Tr1 respectively.

I found that the emitters of Tr3 and Tr4 could be connected together. But, bearing in mind the possibility of differential thermal drift, it would take a brave man to do this permanently! So it seems prudent to include R5 and R6 to provide local feedback at the output. Even with these components added, the output impedance is a little less than 5Ω. I measured this by loading the negative side of C2 with lower and lower value resistors until the output was reduced to half the unloaded amplitude.

R8 and R9 are the line source impedances, fed from the low output impedance of the buffer amplifier. R7 enables C2 to charge if power is applied with no lines connected to the outputs.

### Line Amplifier

While I was designing this amplifier I realised that there could be cases where a buffer amplifier would be useful farther down the line. When the line is correctly terminated the input will be the standard 1V instead of 2V peak-to-peak. We thus need a non-inverting amplifier with a gain of two ahead of the buffer emitter-followers.

Fig. 3 shows a suitable circuit. The earthed-base amplifier stage based on Tr5 provides a gain of two and is biased so that the standing voltage at Tr5's collector is nominally 6V, which is what is needed to bias the emitter-followers.

Note that the input impedance, at the emitter of Tr5, is low. R15 sets the standing current, but compared with the emitter its impedance is high. R10 and R11 in parallel terminate the signal from the line. The ratio of R14 to R11 determines the gain provided by Tr5 – because of the low emitter impedance, R15 hardly enters into this equation. So, to be on the safe side, the gain is a little over two.

If necessary you can lift the HF response and sharpen the edges in the pictures by adding capacitance across R11. I have used 33pF in one case to provide a useful improvement.

### In Conclusion

The advantage of these circuits is that they are uncomplicated, non-critical, do the job well and use components that cost pennies, not pounds. You need to include time in your personal reckoning, but it's easy enough to knock up a circuit on stripboard and box it in half a day. Keep capacitance low, as a matter of course, by cutting and isolating unused lengths of strip. Layout is otherwise non-critical.

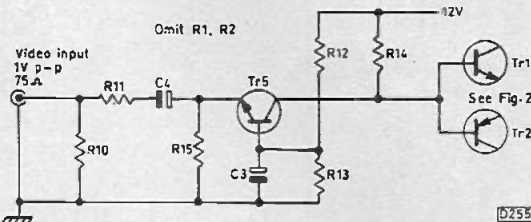
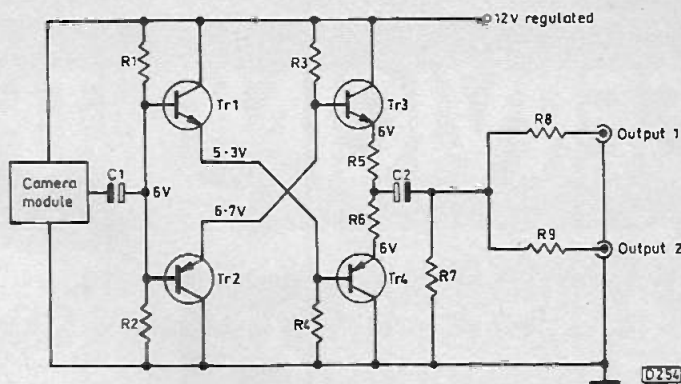


Fig. 2 (above): Complementary emitter-follower video buffer amplifier with two outputs. The number of outputs can be increased to four.

Fig. 3: Non-inverting amplifier for use with the circuit shown in Fig. 2 to enable it to act as a down-line amplifier. This circuitry takes the place of the camera module shown in Fig. 2 when fan-out from an existing 75Ω cable is required.

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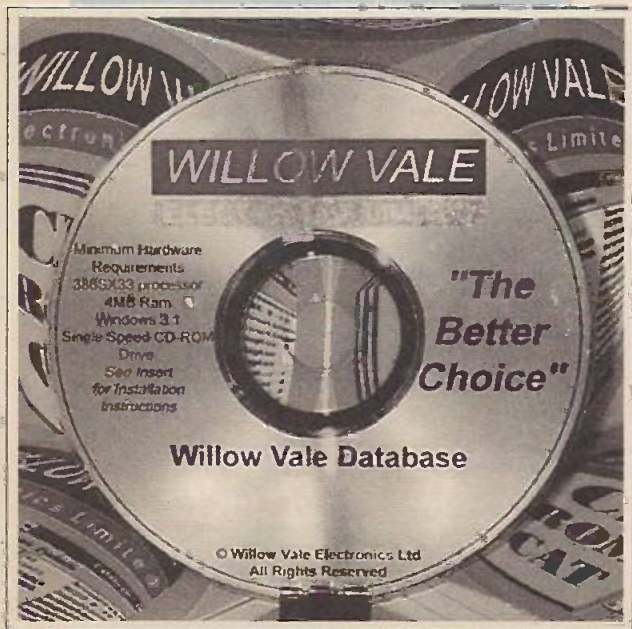
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# HELP WANTED

*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*

**Wanted:** Operating instructions for the Grundig Model A7400 (CUC200 chassis with teletext). F. Nedza, 40 Brynhryfyd, Glynneath, Neath SA11 5BA. 01639 720 429.

**Wanted:** Service information for the Mitsubishi VS360B projection TV receiver. W.J. Whatley, 5 Woodcroft Lane, Lovedean, Waterloo, Hants. 01705 592 862.

**Wanted:** Any user/technical information, service sheets or a circuit diagram for the Falco 5600 terminal monitor. Photocopies OK. M. Robertson, Karibisha, Horsell Rise, Woking GU21 4BG. 01483 765 959.

**Wanted:** VM6101/1 teletext decoder board for the GEC Model C2269H, working if possible. H.J. Wade, 8 Greyfriars, Deben Risc, Woodbridge, Suffolk IP12 4EY.

**Wanted:** Remote control unit for the Mitsubishi HSB21 VCR. R. Sedge, 25 Furfield Close, Maidstone, Kent ME15 9JR.

**Wanted:** One memory and tuning IC (MN15245FEK) for the Nikkai Baby 10. D.G. Jennings, 4 York Drove, Bitterne, Southampton SO18 5SA. 01703 490 174.

**Wanted:** Sony SL3000E or SL3000UB portable VCR, with or without power pack, for use with the Sony HVC3000P camera. D.H. Brown, Chapel House, Broadwood, Lifton, Devon PL16 0ES.

**Wanted:** Service manual (photocopy OK) for the Mitsubishi VS415B 46in. rear projection TV receiver. Also source of any spares or repair information. Richard Gifford, 15 Fairfax Gardens, Needham Market, Suffolk IP6 8AZ. 01449 720 304.

**Wanted:** Circuit diagram (photocopy OK) for the Telequipment DM6 dual-beam storage scope. A. Robinson, 68 Greenridge Road, Handsworth Wood, Birmingham B20 1JP. 01216 865 361.

**Wanted:** Circuit diagram for the Action ACN7200 5in. monochrome TV set or information on the AN5151N chip it uses. John Imperato, 118 Heol Uchaf, Rhiwbina, Cardiff CF4 6SS. 01222 623 734.

**Wanted:** Does anyone have any information and/or spares to assist the repair of a Ricoh FAX 240 fax machine? Andrew Tebbutt, 34 Coronation Road, Loftus, Saltburn by sea, Cleveland TS13 4SL. 01287 642 820.

**Wanted:** Spares source/manufacturer's name for the Otake Model 14VP CTV. It has manual tuning with push buttons, two fuses FS501/2, four ICs IC201/401/601/602

and a plastic power transistor marked D402. The tuner is marked TU010, the LOPT FB401. G.B. Lowther, 3 Southfield Lane, Thurnscoe, S. Yorkshire S63 0RW. 01709 895 402.

**Wanted:** ITT teletext conversion kit RFK200 for the Cinevision 200. R. Cavalla, 74 Wendling, Southampton Road, London NW5 4QU. 0171 813 0060.

**Wanted:** Set of tuning pots, tuner and circuit for the Crown TV36. The set is of Japanese manufacture and I believe bought in Germany. Anyone know of a source of spares? A. Tomkinson, 10 Lodge Court, Station Grove, Wembley, Middx HA0 4AP. 0181 903 5574.

**Wanted:** Service manual for the Philips N4520 reel-to-reel tape recorder, also help with a speed control problem - machine is stable at 3.75 but not at 7.5 or 15in/sec. Roy Caley, Moongold, Springfield Road, Woolacombe. N. Devon EX34 7BX. 01271 870 549.

**Wanted:** Complete drum assembly for the Toshiba Model V110B. Mick Henry, 197 Carr Lane, Acomb, York, Yorkshire YO2 5HQ. 01904 797 810.

**Wanted:** *Television* magazine issues from 1985-1992 inclusive to complete service library. Also, cash paid for best suggested new use for Luxcrypt decoders. John Stacey, 3 West Park, South Molton, N. Devon EX36 4HJ. 01769 573 382.

**Wanted:** Good tuner/IF panel for the B&O TV Model 3384. Bob Knight, 3 Hastings Road, Kempston, Bedford MK42 7EZ. 01234 851 277.

**Wanted:** Operating instructions for the Hameg HZ65-2 component tester, also a chopper transformer for the Wang Mon 1428 colour monitor. R. Morris, 24 Wootton Green Lane, Balsall Common, Coventry CV7 7EZ. 01676 533 060.

**Wanted:** User's handbook for the Siemens FM720 VCR. R.J. Phair, 10 Queen's Road, Everton, Liverpool L6 2BZ. 01512 649 100.

**Wanted:** Chopper transformer

for the Fidelity ZX3000 chassis (22in.), also pinouts and voltages for the STK4913 chip - photocopy circuit will do. R.E. Norgan, 24 Hankinson Road BH9 1HJ. 01202 778 069.

**Wanted:** Set of membrane button switches for the Bush Model 2714, also a remote control unit. N. Childs, 30 Chobham Road, Knaphill, Woking, Surrey GU21 2SX. 01483 472 011.

**For disposal:** Ferguson TX100 chassis, 20in. working Ferguson 405/625-line TV set, working Acc Telcom Viewdata decoder, colour TV project 1972/73 with cabinet, all parts and relevant issues of *Television*. Also various semiconductor devices, valves and miscellaneous items. Minimum cost to anyone who wishes to remove any or all of these items. M. Duffy, 7 Cranbourne Drive, Chorley, Lancs PR6 0LJ. 01257 273 081.

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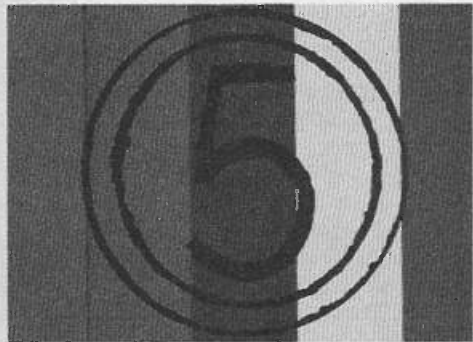
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# Channel 5 Reception

In this follow-up to last month's feature *Bill Wright* considers problems with communal aerial systems and adds a note on test equipment

**M**ost TV distribution systems are simple affairs that consist of an aerial, a broadband amplifier and a distribution system serving perhaps fewer than fifty dwellings. In places where Channel 5 will be received satisfactorily using an existing aerial, such systems will in most cases handle the new channel without the need for any alterations. The only major exception to this will consist of systems that incorporate a four channel-pass filter. This may have been included to equalise the signal levels, or to exclude interfering signals. It will be necessary to replace the four-channel unit with one that handles five channels. The input option will depend on whether the new channel is to be received using the same or a separate aerial.

## Wideband Aerials

Where the new transmission is outside the existing aerial's channel group but all five signals come from the same direction and are at more or less the same strength, use of a wideband aerial would be an option. As I mentioned last month however simple replacement of a grouped aerial with a wideband one might cause problems. This is especially so when the aerial is at the front end of a communal system. It will often be better to install an additional aerial. Ensure that work done to provide Channel 5 reception does not affect reception of the existing channels adversely – this is essential.

When an additional aerial is installed for Channel 5, its output will have to be combined with the existing signals in some way – unless channelised amplifiers are used. This was covered last month. Everything previously said applies to broadband communal systems, except that quality counts for more and cost counts for less (usually). Take particular care to obtain the correct signal levels, and ensure that masthead amplifier noise does not defeat the main function of the combiner by affecting the channels from the other port.

## Equalisation

Signal losses within a distribution network worsen as the

frequency increases. For example the loss per 100m of Raydex CT100 cable is 1.4dB in ch. 21, rising to 1.85dB in ch. 68. This doesn't sound too bad, but in a large system the cumulative differential loss in hundreds of metres of cable and a succession of splitters and tap-off units can be serious.

The answer is to use equalising filters. These attenuate the lower frequencies more than the higher ones. The slope is chosen to compensate for the unequal system losses. Normally the equalisers are fitted at the inputs to the repeater amplifiers.

When a system carries a standard four-channel group, in which the highest and lowest signals are only ten channels apart, equalisation is not really an issue. It's usually enough to slope the head-end outputs slightly. But the Channel 5 signal could be 35 channels farther up the band.

Consider a system that previously carried channels 21, 24, 27 and 31. It's a large installation serving 400 bungalows and low-rise flats. Overall signal loss in ch. 31, from the aerial to the last subscriber connected to each line, is about 80dB. This is made good by using 40dB of amplification at the head end and two repeaters each providing 20dB. There are actually ten repeaters, in five lines.

The system was carefully planned, and it was known at the time of the installation that the signals would be in group A. So losses were calculated on this basis. Along comes Channel 5 on ch. 67. Without equalisation, end-to-end ch. 67 losses will be 110dB. This sounds bad. It means that a subscriber who has been receiving a comfortable 5dB/mV (good picture) at the bottom end of the estate will get only -25dB/mV (virtually no picture) with the new channel. In fact the situation is even worse, because both repeaters will have a Channel 5 input which is well below optimum – the input at the second repeater will be 20dB down. Noise from the repeaters will mean that a subscriber signal at even -15dB/mV will be quite unwatchable.

So you can't just go along to a large system, fix a

wideband amplifier on the roof and saunter off to the next call. The idea of locating and gaining access to every repeater is not attractive, never mind fitting equalisers and extra amplification when you get there. Extra amplification? Remember that the equaliser merely attenuates the lower channels until they match the higher ones, so that every every equaliser requires compensating amplification. There must be an alternative. Thank heavens there is. Given the situation outlined above, I would consider the use of a channel changer very seriously indeed.

With a small system it will often be possible to get away without channel changing. If the head-end amplifier will allow it, launch Channel 5 at a few dB higher than the other signals. If there are only one or two repeaters, it's not too bad to find them, add equalisers and turn up the gain. If the installation is more complex, use a channel changer. It will cost money, but so do equalisers and so does your time.

### Channel Changers

There are many ways of moving a TV signal from one channel to another, and many reasons for doing so. This is a large subject. I will confine myself to what is relevant here: simply downconversion of one signal in the communal system to avoid equalisation problems.

This is best done by straightforward RF-RF conversion. One possible arrangement is shown in Fig. 1. Most of the specialist manufacturers and importers list suitable equipment. Expect to pay about £150 for a converter, input filters, output filters and a power supply. Specify the input and output channels when ordering.

Channel changers have their vices, the main one being spurious outputs, i.e. unwanted signals and noise across the band. An incorrectly installed converter can wreak havoc in a distribution system, with patterning on every channel including its own. If the converter is correctly installed, the results will be perfect.

The obvious thing to do is to make sure that the output is well filtered. Three tuned stages is the minimum. Be prepared to follow this with a notch filter to remove a specific interfering signal. Less obviously necessary, but just as important, are input filters. The converter itself is a broadly-tuned device, so it will cheerfully convert other channels above and below the one you require, producing unwanted signals at each side of the output. Two tuned stages at the input are the minimum. If there is a very strong signal in a channel near the desired input, it will be unavoidably downconverted, appearing in the same relative position near the desired output. Select your output channel so that this unwanted signal won't interfere with anything else. A notch filter at the input is a possible solution.

The other source of spurious output is the converter's local oscillator. The answer here is to make sure that the input signal level is correct. There isn't much leeway here, so direct RF conversion should not be used if the input signal level is likely to vary – unless a device with AGC is used. If the input signal level is too low, the output will be low relative to unwanted local oscillator output. Keep the input at no more than 6dB below the point where obvious signal distortion occurs because of overloading.

### Output Channel Selection

Some thought should be given to the choice of output channel. It should obviously be well down the band – if possible just above the existing group A channels. The accompanying table shows commonly used four-channel

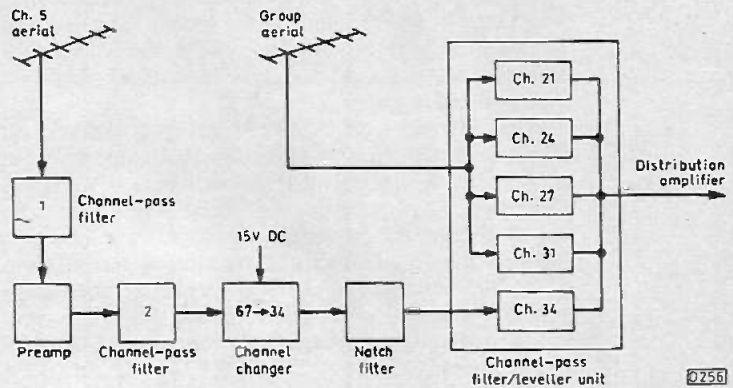


Fig. 1: Use of a channel changer to convert the incoming Channel 5 from a high channel to one just above the other four (example shows Sheffield channels).

The first, two stage channel-pass filter is in most cases not strictly necessary, but will ensure that the other channels don't reduce the preamplifier's cross-modulation threshold and will give good general protection against interference. The Taylor TCFL1 is suitable. A notch filter could also be used here if there's a very strong transmission two or three channels away from the wanted signal.

The preamplifier is used to bring the signal up to the correct level for the channel changer. If the latter has a built-in variable attenuator, set this to near maximum gain and use a preamplifier with sufficient gain to suit. This will avoid unnecessary amplification.

The two-stage channel-pass filter at the input to the channel changer is essential. It's built into the Taylor TCFLIII unit.

The following notch filter is needed only if local oscillator noise gets through the final channel-pass filter and then coincides with another channel.

The five channel-pass filter/leveller (e.g. Taylor TCFL5) is used to combine the channels. It incorporates separate, variable attenuation for each channel. The output from the channel changer is likely to be at a higher level than the other channels: this is where they are equalised. If the other channels are at a much lower level, it's better to use a preamplifier to lift them prior to the TCFL5 rather than increase the amplification after it.

sets, each with the next four available channels that avoid  $n + 9$  and  $n + 5$  clashes.

Four-channel set				Next four possibles			
21	24	27	31	34	35	37	38
22	25	28	32	35	36	38	39
23	26	29	33	36	37	39	40
23	26	30	33	36	37	40	41

This is a starting point. There are other things to consider. Despite Channel 5's own cavalier attitude to the 'VCR slot', I don't think I would want to have the output on channels 35, 36 or 37. Ch. 35 will soon be used for digital TV, so that's another reason to avoid it. Don't use a channel which is occupied by a locally available broadcast that's not carried by your system – there is a possibility of direct signal pick up, which will cause patterning.

### Other Needs for Downconversion

Downconversion to avoid the need for equalisation is the main reason why we might use a channel changer, but there are other reasons. Many systems carry signals that come from a modulator – for distributing satellite TV,

VCR and surveillance pictures for example. These may well coincide with Channel 5 broadcasts. The cause of interference will be obvious where the Channel 5 transmission is a local one, less obvious where it is a distant signal.

In the latter case the use of channel-pass filters for all aerial-derived signals should solve the problem: direct pick-up by a receiver will be unlikely. If the local Channel 5 signal is the cause, a decision will have to be made: change the frequency of either the Channel 5 signal or the signal affected. If the latter is derived from a tunable modulator, a cheap and effective solution is obvious. Retune it, feed the output through a new channel-pass filter and use the old filter to add Channel 5 to the system.

If the affected signal is not easily retunable – for example a distant ITV station on an adjacent channel to the local Channel 5 – one or other of the two signals will have to be frequency converted. To avoid direct pick-up problems, it will normally be better to distribute Channel 5 at its off-air frequency and move the other signal.

Where Channel 5 is on a channel adjacent to one already in use, either of them could be moved and one of them will have to be moved. There won't be a direct pick-up problem, but it is no good distributing two signals on adjacent channels.

### Test Equipment

Virtually everything I've said in these articles has been 'measurement related'. Thus if you wish to employ the techniques described, good test equipment will be required. The cost of test gear has never been much of an excuse for not investing in it, because good gear will pay

you back over and over again in time saved, better work and professionalism that lead to recommendations. There are also intangible benefits – less frustration and greater job satisfaction. You will go home each night a nicer person!

If you are contemplating a purchase, I suggest that you think carefully about your requirements. What sort of work do you do? What sort of work would you like to be doing this time next year? Don't buy something with features that you will never need. Instead, go for quality, in particular accuracy. Don't consider a meter or analyser unless it is properly calibrated, with a quoted accuracy figure.

I have been particularly impressed by the Promax range, which is available from Alban Electronic Ltd. (01727 832 266). There is something in this range for every installer, from straightforward TV signal level meters for the man who confines himself to simple domestic jobs right up to the all-singing, all-dancing Model MC944, an astonishingly versatile device that will enable you to approach the most complicated RF systems with confidence.

### In Conclusion

The money men and the politicians have insisted that Channel 5 should go ahead, despite the problems that technically qualified people have pointed out. The transmission plan will be unsatisfactory for both the broadcaster and the viewer. Nevertheless Channel 5 will be made to work by hook or by crook. All sorts of reception problems, great and small, will be fudged, ignored or swept under the carpet.

There will in fact be quite a mess to clear up. I expect that lots of customers will ring up wanting a teensy little favour. "The retuners came round and we couldn't get the video to play back in the bedrooms when they'd gone, but they won't come back. And now that Channel 5 has started, the satellite pictures have wavy lines on them. Could you just call round when you're passing and sort it out for me?" 'Call round when you're passing' is of course code for 'spend an hour at my house and not charge a cent'.

In my opinion we should make it clear right from the start that we will not subsidise Channel 5 indirectly by making free or cut-price service calls, by replacing channel-pass filters for less than the normal price, or by retuning TV sets and VCRs in children's bedrooms for nothing.

After the initial fuss has died down, there might be some money to be made. Apart from the obvious aerial rigging, there will be a lot of work to do on distribution systems, both private and commercial. I cannot imagine what retuners will make of a large domestic system that returns the outputs from two satellite receivers and a VCR to a head end in the loft for filtering before being combined and distributed. I suppose the best tactic will be to let them have a go, to help convince the customer that the problem is not as slight as all the publicity has suggested. In some cases the customer will be in for a nasty surprise, because the bill for new filters, a new aerial, a new modulator (for the displaced channel) and retuning every TV set and VCR in the house is going to be well into the hundreds of pounds.

In the aftermath of the Channel 5 start up, our industry will have plenty to do. I have no doubt that there will be exasperating moments, but for the most part Channel 5 should provide some opportunities to make money. I hope that these articles will help contractors to prepare for the problems and opportunities that next year will bring. ■

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### MISCELLAN



**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.**

### Sky's Satellite Repairs

Last week I advised a customer to purchase a new satellite system from one of the local multiples rather than pay me £40-£50 to repair his old system which will not receive Astra 1D. On Monday he phoned me back to say that the new systems are not available unless you are a first time subscriber to the Sky channels. He decided to cancel his card and wait until he could afford to spend some of his hard earned cash.

When my customer telephoned Sky on 0990 102030 and told them that he wished to cancel the card,

# Letters

because he could't afford to have a repair done, they offered to stop the card immediately and send a serviceman to do the repair free of all charges and only restart the card when the repair had been completed.

On Tuesday I received another satellite receiver for repair and advised the customer of this new service from Sky. Sure enough he was offered the same free of charge repair.

Now it may be hard for most of you out there to understand why I don't keep quiet about this, and I might even have trouble explaining it to myself, but in these days of hardship and recession I think it is the right thing to do. When the ordinary people of this world get back on their feet, they will still come back to me to spend their millions. In the meantime I will have the repairs from those who can't afford the subscriptions. Of course I could be totally wrong and become bankrupt as a result of this.

*Television* is a trade magazine - I would imagine that very few people choose it as casual reading matter - so this letter will not hurt the majority of repair firms. Anyway I am sure that many of you will find this information helpful. But why do customers have to threaten to withdraw their subscriptions before Sky will inform them that this service exists? One of my customers, when phoning to ask if he had a card problem, was abruptly

told that he would have to call a service engineer!

Come on Sky, it's a great service. Don't keep it quiet in the hope that not too many people will ask for it. Publish it - many people think you charge far too much for the mediocre programming you offer. You can be sure that all my customers who subscribe will be calling you when their receivers go wrong.  
*John Hopkins,  
Felixtowe.*

### Mains Problems

With regard to Hugh Cocks's problem in Portugal, I have done a few repairs out there and the mains supply is, shall we say, not as reliable as in the UK. Allegedly part of the problem is the overhead poles, which are not planted firmly enough causing broken wires and unbalanced phases. Apparently the mains voltage can rise to over 300V, and this excessive pressure can exist for typically twenty minutes or so. It may, working on the principle that it is the last straw that breaks the camel's back, be worth fitting mains transient suppressors in vulnerable equipment.

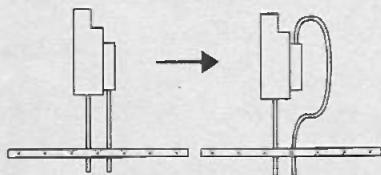
My home in the UK is fed by overhead cables (two wire) but the system is PME (protective multiple earthing), a system where the neutral and protective earth conductors are bonded at the fuse board. The house water pipes are also bonded to this point, and the main earth is a copper spin drier tub in a disused well. All valued electronic equipment has VDRs fitted (I need a great many Maplin HW13Ps). In fifteen years almost nothing has gone wrong.

Incidentally, I am quite close to the pole transformer and the mains supply is a fairly constant 245V, though in bad winters there have been numerous breakdowns. There are several techniques available to increase equipment reliability, but these all boil down to two - protection and cooling. VDRs have already been mentioned. With regard to cooling, it is often possible to improve the heatsinks. Just sandblasting the heatsinks and spraying them matt

### JVC AA-V2EK

In the October camcorder page David Woodnott refers to failure of the thermal fuse TF4 in the JVC AA-V2EK AC adaptor. There are several important points to note about this.

First, the fuse is a 130°, not 150°, type.



**Fig. 1: Modified mounting (right) for thermal fuse TF4 in the JVC AA-V2EG/EK AC adaptor.**

A substitute fuse should not be used as it is a specified safety component, the JVC part no. being PQ10243-311. Whenever TF4 has failed, it is essential to replace the MAA4150M zener diode D15 with an MAA4180M type. Finally fuse mounting must be rearranged as shown in Fig. 1: the lead lengths are increased to provide heat shunting and are bent over to give better contact with the transistor. Don't forget the thermal heatsink compound.

Because TF4 is a safety component, there could be legal consequences should an accident occur as a result of fitting an incorrect replacement.

*Steve Beeching, I. Eng.,  
Newark, Notts.*



black helps. Hot rectifiers can often be replaced with larger types. Pigtailling the leads of an axial rectifier and standing them up on ceramic beads will considerably improve the cooling.

The effect of transients can be tiresome to say the least, but there are still many people who think that the mains supply is simply a sine wave.

Some years ago a colleague told me of trouble experienced by a manufacturer of thyristor-controlled welding machines. The thyristors kept blowing, and the manufacturer was told that they were faulty. In the end it was found that the problem was caused by spikes on the mains, 6kV being the highest spike recorded! Although it lasted only a few microseconds, the spike caused damage.

The thyristor problem ended when transient suppressors were fitted. Everyone was then happy. Don't let spikes chisel you silicon!

*D. Benyan,  
Bude, Cornwall.*

## Test Case 406

I was very surprised to read in the October Test Case that Techno-supersleuth had measured the DC resistance of the erase head in a VCR. This practice is not to be recommended with any tape head, as the head will become permanently magnetised.

Residual magnetism of any item in the tape's path will lead to erasure of some part of the recorded material, beginning with attenuation of the higher frequencies. The greater the magnetism, the greater the depth of the frequencies permanently removed from the tape. Have a look in the next el cheapo cassette recorder that comes your way – you will find that a permanent magnet mounted on a swivelling bracket masquerades as an erase head!

As an aside, a small carefully controlled bias/erase current can be applied to audio tape in an attempt to reduce print through, but the trade off is a corresponding reduction in HF response.

Ingenuous ways of magnetizing a tape head – apart from measuring its resistance with your meter – include the handy magnetic screwdriver that retrieves those wayward screws, and power supply interference caused by loose or arcing mains plugs or switching other equipment on or off. Dodgy relays in the bias oscillator circuit are not that common these days, but

somebody moving metal objects near the equipment is. I'm sure we've all had occasion to remove toy cars and Lego axles deposited in a VCR by an aspiring young postman. The piece de resistance though is – wait for it – moving the equipment itself! We've all seen the effect of the Earth's magnetic field on a CRT when the degaussing circuit packs up!

So what's the fuss about? Isn't all this just a load of flux? Simply demagnetise the head and go home, right? Not quite! It depends on what you are using to do the job. If the head is sufficiently magnetised an ordinary degausser, whether of the hand-held or in-cassette type, is not up to the task. In fact I've experienced cases where an audio head has been so highly magnetised that the only solution has been to use a heavy-duty bulk tape eraser – the type that erases half-inch tape on a ten-inch metal reel at one pass! It seems that those degaussing wands could be put to further use!

Demagnetization of the tape path and erase/control head is not on every engineer's agenda when a VCR/cassette/tape machine comes in for service, but it can be necessary.

If, in those rare instances, you really must find out whether a head is open-circuit or not, enter record and measure the AC flow or, even simpler, use an inductance meter. Remember to demagnetize the head afterwards. Tape heads, like loudspeakers and moving-coil microphones, take great exception to having DC applied to them!

*Peter Graves,  
London E5.*

## The Internet

I found your article on the Internet system in the September issue interesting, in particular the mention that few people are making much money out of shopping sites on the net.

I have experience of only one Internet service provider – AOL. But if AOL's "conditions of service", as they call it, are typical nobody will ever make money legitimately out of the Internet (except the ISPs of course!). Why? – because AOL specifically prohibits the "transaction of commercial communications over the Internet". Therefore I am not permitted to buy anything via the net from any company. Even asking about products could be construed as a commercial communication.

There is nothing to prevent me

reading product advertising material of course, but what's the point? I can do that in a magazine or newspaper without paying an ISP to get it to me.

One consequence of this is that as soon as I realise a site is trying to sell me something I normally go elsewhere.

*A. Jaques,  
Manchester.*

## Channel 5 Retuners

Channel 5 retuners? Don't make me laugh. We've just had a phone call from a Ch. 5 retuner who pretended to be a customer and tried to pick our brains on how to retune a Mitsubishi colour receiver. There have been reports of excuses being given such as "the set must be faulty", also "a six-year old TV is too old to tune to Ch. 5, madam".  
*Service Department, George Heapy,  
Knaresborough, N. Yorks.*

## Aerial Riggers

While I respect Bill Wright's outstanding knowledge of aerial matters, I must say I don't think the use of an aerial alignment meter is always necessary. Having the gear is one thing, having the knowledge is another. A friend of mine used to call in my shop to collect names and addresses of customers needing aerial work done. He was paid for his labour, and I got sales of aerial gear. Together we sorted out many reception problems that the local aerial 'specialist' couldn't, even with his meter.

As Bill Wright will be well aware, many of the aerial boys think that all you need to be a rigger is the nerve to go up on a roof. We found that we were getting plenty of recommendations to sort out aerial problems in difficult areas, simply because we knew our stuff and didn't rely on the attitude that 'a masthead amplifier will cure it' or 'a 12dB attenuator will cure it' when neither may have been required. (I tried to explain to one local 'aerial specialist' how -6dB was another way of expressing a 50 per cent reduction in signal level, but it was like talking to a brick wall. He couldn't grasp that 60dB is double 54dB, so what good was his meter to him?) Most of these guys just fit standard 10-element aerials and don't seem to know of the existence of such things as the Antiference XG range or bowtie aerials, group-pass filters or what the specification of an amplifier means. So they fit lousy el cheapo wideband amplifiers with no filtering, or they don't know exactly what an attenuator is. A local electronics shop is forever getting people sent to it to buy attenuators to cure ghosting. They are sent by a local rigger who doesn't even carry an attenuator with him. He obviously doesn't really know what it does.

I do appreciate that a meter is necessary to cure some of the problems that Bill has reported in his excellent and informative articles in previous issues, but for our run of the mill work we have never needed one and have had a 100 per cent success rate.

*John Hepworth,  
Peterlee, Co. Durham.*

# TV Fault Finding

Reports from  
Philip Blundell, AMIEEIE,  
Michael Dranfield,  
Graham Colebourn,  
Robert Marshall,  
John Edwards,  
Nick Beer,  
Michael Maurice  
and Glyn Dickinson

## Hitachi G6P Chassis

This set was dead, though the fuses were OK and there was 320V at the collector of the chopper transistor. But there was no power supply activity at all. The three 82k $\Omega$  resistors were OK, so resistance checks at the power supply outputs seemed to be the next step. The 110V supply read 20 $\Omega$  to chassis – the line output transformer was faulty. P.B.

## Philips G90AE Chassis

This fault had developed during a thunder storm. There was no sound or raster and the 95V HT supply was low at 30V. The HT was still at 30V with the line output stage disconnected and a dummy load in its place, so there was a power supply fault.

With the set fed via a variac, the HT was correct at 120V AC input but fell back to 30V as the mains input was increased. A check at the collector of Tr7656 showed that there was no protection active. The voltage at the cathode of D6600 (normally 8.2V) was high however. This should be the situation in standby, but checks in the standby circuit showed that it was not being triggered. Resistance checks in this area revealed that the BAS32 diode D6653 was short-circuit. Normal operation was restored when this diode had been replaced. P.B.

## Ferguson T68N (TX92 Chassis)

When teletext was selected the screen went blank. Checks around the SAA5281 chip showed that it was producing RGB output pulses, but at a low level. The manual doesn't give a voltage for the chip's RGB reference pin, but resistance checks showed that the BC848C transistor TT01 was short-circuit base-to-emitter. A new BC848C brought the text back.

TT01 is shown incorrectly in the circuit diagram in the manual – the emitter and collector are reversed. In the set the collector goes to +5V and the emitter to CT13. P.B.

## Mitsubishi CT2227BM

Field collapse was the problem with this old timer. The 330 $\mu$ F, 50V field scan coupling capacitors C412/3 are often the cause of this, but were blameless on this occasion. Voltage checks showed that the supply to pin 12 of the timebase generator chip IC401 was missing. C403 (470 $\mu$ F, 16V) was short-circuit. P.B.

## Sony KVM19

Field collapse was the initial problem with this set. After attending to dry-joints on the field output chip IC501 and the horizontal shift potentiometer RV801 we were left with EW distortion. The cause of this was the EW modulator coil L804, which was open-circuit. Fortunately it was only the wire which connects to the pin that had fractured and we were able to carry out a repair. M.Dr.

## Philips GR1-AX Chassis

Intermittent tripping at switch on was the complaint with one of these sets. When we tested it we found that the overvoltage crowbar thyristor fired at switch on, though the HT was correct at 100V. So I removed and tested the three zener diodes D6638, D6639 and D6640

that are connected to the thyristor's gate, using my zener diode tester (see *Television*, July 1996). D6638 broke down at 30V, though the manual said that all three should be 36V types, giving a trip threshold of 108V. D6638 was marked 30V however. Maybe the wrong one had been fitted from new. M.Dr.

## Hitachi C14-P216

If the set is stuck in standby, replace R902 and R903. They are both 82k $\Omega$ . M.Dr.

## Decca 120 Chassis

The power supply would pump at switch on from cold. After about ten minutes the supplies would become steady and no amount of cooling would bring the fault back. The set had to be switched off and left until next day for that. The culprit turned out to be the mains bridge rectifier's reservoir capacitor C804 (220 $\mu$ F, 385V). It was open-circuit. M.Dr.

## Hitachi NP6C Chassis

This very elderly portable came in dead. The tip here is to use a 12k $\Omega$ , 10W wirewound resistor to bridge C910 in the power supply start-up oscillator circuit. This will keep the power supply running while you look for the cause of the fault. We eventually discovered that the line hold potentiometer was open-circuit. In fact when it was removed one leg fell off. M.Dr.

## Akura CX12

The power supply in this set was making a zinging noise. Our first check was to disconnect the feed to the line output stage, but this made no difference. We then connected a scope to the 112V HT rail and found that it was oscillating. C828 (47 $\mu$ F, 160V) was open-circuit.

If you get any strange intermittent faults with this digital chassis, resolder *all* the through-board wire links, both underneath and on top of

the chassis. Akura had a problem with the links not taking to the solder. **M.Dr.**

### **Samsung CI5332T**

The sound was at maximum and couldn't be turned down, though the on-screen display said that the volume was low. We found that R625 (10k $\Omega$ ) in the volume DC voltage integrator network was open-circuit. **M.Dr.**

### **Ferguson 3787**

This very old (1978) colour portable suffered from intermittent field jitter. Fortunately we still had the service manual. The sync pulses at pin 16 of the field module were distorted. Replacing CD22 (10 $\mu$ F, 16V) on the IF PCB cured the problem, but for good measure we also replaced the supply decoupling capacitor CD27 (10 $\mu$ F, 16V). **M.Dr.**

### **Panasonic TX24A1 (Alpha 2W Chassis)**

We've recently had a run of these sets, all with the same fault: squealing from the power supply and the 2SD1441 line output transistor short-circuit. The cause is a dry-joint, sometimes barely visible, on the line driver transformer. **M.Dr.**

### **Sony KV2153MT**

This multi-standard set from Japan produced a raster with faint snow visible. There was no sound except for a slight crackle at switch on. The controls had no effect, and the tuning line was stuck at 32V. As there was no 5V supply at pin 42 of the PCA84C640P-016 microcontroller chip we traced the source back to IC001, a 5-pin regulator with power failure management. It had no 14-5V input because ICP PS652, which is next to the chopper transformer, was open-circuit. It's rated at 1A, so we were pleased to measure just 0.09A flowing through the replacement, rising to 0.11A in the standby mode. **G.C.**

### **Matsui 1435B**

The sound was OK but there was only a plain raster. The AN8659AN chip IC401 carries out many functions, including colour decoding, brightness, contrast and colour control and generation of the line and field drive signals. There was a video input at pin 59, but the RGB outputs at pins 41-3 were missing. IC401 also carries out teletext/external video switching,

the control being at pin 53 where 0V = tuner. This was correct.

The next possibility was muting as a result of the action of the TA8751N tube biasing chip IC951 on the CRT base panel. It sets the tube's colour drives automatically. Several transistors around IC951 assist with the control and signal muting. When Q969 was removed temporarily, the correct 9.9V was restored at pin 53 of IC401. The cause of the trouble was that R981 (8.2k $\Omega$ ), in the emitter-base circuit of Q967, was open-circuit. **R.M.**

### **Ferguson A59N (ICC7 Chassis)**

A few minutes after this set was switched on the on-screen graphic for volume would appear and the sound could be seen and heard to reduce to zero. The remote control no longer had any effect. Removing the batteries from the remote control unit didn't stop the sound muting, but withdrawing the main panel or unplugging the lead from microcontroller chip to the front control panel did.

This model has a membrane, which is rather like those used in older remote control units, on the front panel. When the membrane is heated by components on the main board the tracks inside it can short together. The design of the membrane makes volume down a good candidate for this to happen. The cure is as follows. Unplug the ribbon cable from the front panel PCB, then carefully prize out the membrane from the outside of the set. The replacement membrane has a sticky pad to attach it to the set. **R.M.**

### **Finlux 9670RC**

Field collapse was the problem here. Being unable to buy a circuit diagram made fault finding difficult. The field circuit is similar to that in the Hitachi CPT2050-/Salora J chassis, but pin 13 of the TDA2653A chip is connected to a diode network.

Temporarily removing the diode and adding a 680k $\Omega$  resistor to chassis restored the raster, but there were flyback and teletext lines. A check through the circuit brought me to a plug-in board to the right of the tuner. It deals with system operation. The BC547B transistor Tt4 on this board had developed emitter-collector leakage. **R.M.**

### **Ferguson TX9 (PC1044)**

The set was dead apart from a low ticking. Various components can cause this symptom, for example

R173 (10k $\Omega$ ). But in this case L105, which is in the collector circuit of the chopper transistor TR62, had had an argument with link LK100. The result was mutual damage and flash marks on the case of C136. All this was hidden from view by TR62's heatsink. Replace LK100 with insulated wire. It may be possible to save L105. **R.M.**

### **Ferguson 51K4 (ICCS Chassis)**

Intermittent Nicam was the complaint with this set, which uses board PC1253-001. When it was first switched on there was usually no Nicam stereo sound. Then, after a while, the Nicam would come on and go off, with sound muting. Disturbing the boards would sometimes bring on the Nicam sound, sometimes it wouldn't.

Many connections had to be resoldered before the intermittent behaviour stopped. All the pins of IS01 (TA8662) and IS08 (ADC2300) required attention. Most troublesome were the connections to earth print next to the frames of screening cans. Also check the connections on the motherboard. **R.M.**

### **Grundig CUC3850 Chassis**

Although the HT voltage was correct the line timebase wasn't working. In addition the front panel display was corrupted, with various segments alight but making no sense. I found that the LM317 regulator IC656, which supplies 12V to the timebase circuitry, was permanently switched off by the SDA2080-A003 microcontroller chip IC850. A new micro restored the correct display and brought the line output stage to life. Almost immediately the tripler put on a firework display and I quickly switched off. I now knew why the chip had failed. A new tripler restored correct operation. **J.E.**

### **GoldStar CIT2068F**

This set was stuck in standby. If the power switch was held in, the timebases would start up and a snowy raster would be produced. But there would be no sound and no manual or remote control. A check at pins 31 and 32 of the microcontroller chip IC701 showed that the 10MHz oscillator signal was not present. So, with no engine the set wouldn't run! A new crystal enabled the microcontroller chip to do its stuff, and the set worked normally.

Holding the power switch in had

provided the HT relay's driver transistor with bias via the switch's pulse contacts. So the power supply had been able to feed the line output stage. But there was obviously no action from the microcontroller chip. J.E.

### Matsui 1480

If there are no signals and no channel indications, just a display of snow, you'll probably find that the primary winding of transformer T101 is open-circuit. J.E.

### Hitachi C21-P228 (G8Q Chassis)

The tuning point would vary widely. If ch. 21 was selected for example it would sometimes be found while at other times it would register some way up the scale. The basic trouble was incorrect tuning voltage, because R1501 (100k $\Omega$ , 0.25W) was high and varying in value. It's in the feed between the HT supply and the 33V regulator (our circuit diagram shows this as being a 22k $\Omega$ , 1W resistor - Ed.). N.B.

### Panasonic Z3 Chassis

This set was dead apart from a buzz from the power supply. It was an unloaded buzz as opposed to an excess load whine. Checks showed that the HT was present but there was no line drive. It was being killed by the X-ray protection system in IC101 (M51407SP). As cold checks around the nasties failed to reveal any faults I shorted pin 15 of IC101 to chassis and tried again. The set now worked normally.

So the thing to do was to find out what was triggering the protection system. When the base of transistor Q502 was disconnected the protection stopped. This suggested a beam current fault, but the picture was clearly OK. In fact Q502 was being incorrectly biased because R560 (270k $\Omega$ ) was open-circuit. N.B.

### Ferguson TX100 Chassis

One of these sets had no EW or width correction. D701 (SK4G4/04) on the little EW modulator PCB was the cause. It was open-circuit - in fact it was split wide open. A replacement restored full width. M.M.

### Goodmans 2175

Apart from the standby circuit this set was dead. We found that R102 and R103 (both 150k $\Omega$ ) were open-circuit. For good measure we also replaced the two 270k $\Omega$  resistors R104 and R105. All these resistors

are associated with transistor Q101, which carries out standby switching. M.M.

### Grundig 3500 Chassis

The fault with one of these sets was no tuning. The tuner, prescaler and IF section are all in one module. Fortunately the tuning voltage is available at pins 13 and 15. A quick check here showed that it didn't budge from 30V. Tuning pulses are generated at pin 18 of the SDA3202 chip, but it wasn't producing an output. Replacing this and the SDA2516 memory chip cured the fault. M.M.

### Sony KVA2512U (AE1C Chassis)

There was intermittent loss of colour - in fact usually no colour at all. I checked for dry-joints in the IF can, but everything was OK here. So attention was turned to the video processing board: dry-joints on the screening can are sometimes the cause of this fault, but again everything was OK. But the cause of the fault wasn't far away. TC1 on this board was dry-jointed. Resoldering it restored reliable colour. M.M.

### Alba CTV744

This set appeared to be dead. The power supply was working however and there was HT at the collector of the line output transistor. But there was no drive at its base. Coil L404 in the line drive circuit was found to be open-circuit. M.M.

### Samsung C13312Z

"Arcing then dead" it said on the ticket. When we switched on we found that the line output stage was in distress, with the HT low at 70V. I then saw that R412 was overheating. Disconnecting it brought the line output stage to life. The KA2131 field output chip was found to be leaky, probably as a result of the EHT arcing. Replacing it brought the set to life, but with the HT at 180V! R807 (11k $\Omega$ ) which is in series with the HT preset control had risen in value. G.D.

### Salora M Chassis

This was actually an Hitachi set, Model CPT6608. We found that the line output transistor was short-circuit but, after replacing it and checking for the usual dry-joints on the large capacitors, the line output stage was still clearly in distress. The new transistor was overheating, there was a defocused picture and hum on the audio. Time to ask Mr

Hitachi. He suggested replacing RB532, RB533, RB535 and RB536 (all 1 $\Omega$ ) in the line driver stage. This improved matters, but in the end TB522 (BC307), TB523 (BC368) and TB524 (BC369) all had to be replaced, as well as the usual BS208 FET in the EW circuit.

The line driver stage in this chassis doesn't use a transformer. If all is well in this stage, the line output transistor will have between -1.4V and -1.7V at its base. When resoldering dry-joints on the polystyrene capacitors in this part of the set, the print must be scraped shiny and the leads bent over before soldering. This will prevent recurrence and possibly severe PCB damage. G.D.

### Hitachi NP81CQ Chassis

When standby was pressed the HT only dropped to 70V. As a result there was a haze on the screen. Someone had already replaced the STK441 regulator chip, but had not replaced Q901 (2SA787) and ZD901 (2.7V). Replacing these two items cured the fault. G.D.

### Sony KV21XMTU

The complaint was that the picture disappeared, leaving only the channel number. Since there was nothing obviously wrong I soldered the IF coils then sent the set back. Wrong! When it returned, I left it on test for some hours. It then went off, as described.

In this state the set would tune back in, but wouldn't memorise. This gave me a clue. I found that the -30V supply to the memory chip was low at -15V, because L807 (10 $\mu$ H) in the feed was going open-circuit intermittently - there's a parallel resistor that maintains the supply at -15V.

Resoldering the high-wattage resistors with HMP solder and fitting a mains switch kit completed the repair. G.D.

### Ferguson TX100 Chassis

We are so used to the 'death rattle', meaning a faulty line output transformer, that it's easy to get caught out. In this case the transformer was innocent. The cause of the trouble was C119 (22 $\mu$ F) in the start-up circuit. It had gone low in value. G.D.

### Ferguson TX90 Chassis

There was a very loud humming noise and the picture was almost obscured by a massive hum bar. This fault is often caused by the BD839 transistor in the power

supply or the mains rectifier diodes, but a scope check showed that the ripple on the HT line was acceptable. The cause of the fault was the 12V regulator chip IC105, which was almost short-circuit. Fortunately no other damage had occurred. **G.D.**

### Akura CX35

A name to cause panic! No sound was the problem. As it is a Nicam set this was not as easy a fault as I'd hoped, especially as the Nicam board is impossible to work on in situ and is soldered in. A helpful man at Akura suggested that I replace the EPROM chip first - it stores all the settings, this being a digital chassis. He was right! **G.D.**

### Salora L Chassis

This chassis is used in the Hitachi Model CPT2658. We've had two of them in recently with the TDA4505 chip faulty, the symptom being no sound or a blank raster. Depending on the make of the chip, adjustments to the line and field hold presets may be necessary after fitting a replacement.

Before condemning this chip, try disconnecting the text panel (if

fitted). If the picture then returns, replace the wire links (about eight in all) that connect the upper and lower tracks on the panel and resolder the other components that link the two print patterns. If the text panel is still faulty, the DPU2540 chip is usually the culprit. **G.D.**

### Bush 3114T

This set was stuck on channel 3 with no tuning or remote control functions. We found that the main 5V supply was missing, because circuit protector ICP401 was open-circuit. The correct position for this had been shorted out: after a search it was found hiding behind the chopper transformer pretending to be a resistor! **G.D.**

### Hitachi CPT2024 (NP82CQ Chassis)

The fault here was field collapse. The chassis uses a discrete component field output stage, which checks showed was working correctly - not surprising, as the field scan coils were open-circuit. A rummage through the scrap sets failed to produce a replacement, but

by carefully stripping the yoke we found a break that could be repaired. These coils are no longer available. **G.D.**

### Decca 120 Chassis

There was a dull picture and the contrast control had virtually no effect. When the beam limiter line was disconnected (at the CRT base) the contrast was restored, albeit with no black-level clamping. We found that the two beam limiter biasing resistors R425 and R426 (both 68kΩ) were open-circuit. When they had been replaced the contrast could be set up correctly. **G.D.**

### Hinari CT14

There was no sound or raster though the relay could be heard, as could a momentary squeal from the line output stage. The HT was correct, and the EHT and the line output stage secondary voltages appeared for an instant. The X-ray protection input to IC301 comes from pin 4 of the line output transformer, via the 9-1V zener diode D485. This was leaky, a replacement restoring normal operation. **G.D.**

AN 3320K = 750	STK 0049 = 500	TBA 1205 = 030	2SC 901A = 350
AN 5135 = 585	STK 0050/2 = 899	TBA 120T = 030	2SC 1577 = 600
AN 5790 = 240	STK 436 = 399	TBA 1013A = 299	2SC 2200 = 250
AN 7320 = 100	STK 463 = 850	TDA 1022 = 530	2SC 3427 = 340
BA 514 = 150	STK 1050/2 = 800	TDA 1060 = 325	2SD 1391 = 300
BA 4232AL = 190	STK 2048/2 = 1299	TDA 11705 = 135	2SD 1577 = 480
BA 7767 = 180	STK 2155 = 895	TDA 1520B = 330	2SD 1887 = 435
CXA 1044P = 1485	STK 2240 = 650	TDA 1540 = 420	2SD 2125 = 415
HA 11381 = 250	STK 3042/3 = 500	TDA 1600 = 360	BU 500 = 265
HA 11714 = 380	STK 3082/2 = 725	TDA 2009 = 250	BU 508A-PHIL = 80
HA 13119 = 315	STK 4038/2 = 695	TDA 2170 = 1999	BU 508AF-PHIL = 125
KIA 8210 = 425	STK 4131/2 = 650	TDA 2506 = 500	BU 5080D-PHIL = 110
LA 3210 = 060	STK 4141/V = 750	TDA 2545 = 130	BU 2508AF = 250
LA 3350 = 199	STK 4162/2 = 515	TDA 2577 = 1299	BU 2525AF = 410
LA 4282 = 350	STK 4211/V = 1200	TDA 2577A = 200	BUT 11A-PHIL = 070
LA 4500 = 200	STK 4362 = 450	TDA 2579A = 250	BUT 18AF = 120
LA 7294 = 150	STK 4773 = 820	TDA 2600 = 425	BUT 56A = 080
LM 317T = 150	STR 4853 = 699	TDA 3300B = 2475	S 2000AF-TOSH = 175
LM 1203 = 499	STK 5322H = 450	TDA 3561A = 410	S 2055A = 165
M 710B1 = 610	STK 5331 = 300	TDA 3576B = 915	
M 190B1 = 495	STK 5337 = 485	TDA 3654 = 090	
M 51393 = 595	STK 5467 = 650	TDA 4500 = 310	
M 54519 = 499	STK 5490 = 450	TDA 4504B = 790	
M 54564 = 115	STK 7348 = 400	TDA 5850 = 375	
MC 1377P = 425	STK 8050 = 750	TDA 7050T = 170	
MC 3357P = 095	STK 736051 = 300	TDA 8153 = 1599	
MDA 2062 = 450	STR 441 = 1899	TDA 81795 = 999	
MEA 2901 = 300	STR 451 = 2999	TDA 8180 = 1815	
SAA 1026 = 450	STR 454 = 1499	TDA 8390 = 850	
SAA 1061 = 375	STR 5412 = 400	TEA 1039 = 175	
SAA 1294 = 850	STR 50092 = 550	TEA 2018A = 150	
SAA 3004P = 315	STR 50103A = 385	TEA 2164 = 325	
SAA 3028 = 845	STR 54041 = 350	TEA 6300 = 685	
SAA 5231 = 895	STR 58041 = 300	UC 3842 = 150	
SAA 5241P/A = 1000	STRD 1816 = 399	UC 3844 = 150	
SAA 7000 = 899	STRD 6008 = 680	UPC 1168 = 360	
SAA 7274 = 650	TA 8210 = 300	UPC 1216V2 = 110	
SAB 3021 = 399	TA 8205 = 300	UPC 4558C = 050	
SAB 3035P = 545	TA 8200 = 350	2SA 839 = 140	
SAB 3209 = 450	TA 8207 = 165	2SA 1232 = 250	
STK 050 = 1599	TA 8216 = 390	2SA 1302 = 300	
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# Servicing the Samsung P68 CTV Chassis

**John Coombes provides a guide to speedy fault diagnosis with these popular sets**

**T**he Samsung P68 series chassis was used in a group of models that were on sale in the 1992-3 period. They include the CI3352, CI3352XT, CI5052X and CI5052XT. Some incorporate teletext. It's proved to be a good chassis, though the faults mentioned in the following notes do occur from time to time.

Much of the circuitry is incorporated in the 52-pin TDA8362 chip IC101, which includes the vision and sound IF strips and preamplifiers, the luminance delay line, the inputs and switches for external audio and composite video signals, the sync and timebase generator circuits, X-ray protection and a PAL/NTSC decoder. There is only one preset associated with this chip, the tuner AGC control VR101. Provision is made for adding a SECAM decoder chip.

The chopper power supply circuit is shown in Fig. 1. Note that the standby switching transistor Q803 controls the B4 and B6 supplies. With the B4 supply switched off, the timebase generator stages (in IC101) are inoperative. B6 is a start-up supply for the line driver stage - during normal operation this stage is supplied by D403/C419, via D405 and R411. There's a fusible resistor in this supply, R418.

## No Results

The first thing to check is the the 3-15A mains fuse F801 (quick-blow type, part no. 34709-084-730). If it has blown, the degaussing resistor P801 (part no. 32189-609-402) or the mains spike suppression varistor D800 (type ENC431D, part no. 32169-401-040) could be short-circuit. Note that D800 can sometimes blow itself apart, with the result that a replacement fuse will restore normal operation: always ensure that D800 is physically complete. The BU508 chopper transistor Q801 can also go short-circuit, blowing F801.

If the fuse is OK, check for about 300V at the collector of Q801. Then check the voltages at the pins of the SDH209B chopper control chip IC801. The voltage at pin 4 should be about 0.145V. If this voltage is missing, check the start-up/biasing resistors R803 and R804 (both 270k $\Omega$ , 0.5W) which can go high in value or open-circuit. If the voltages around IC801 are low,

IC801 could be faulty.

If everything is OK so far, check the HT voltage (B1, 125V). If this is high C852 (470 $\mu$ F, 16V), which is the reservoir capacitor for the 8.6V supply to pin 6 of IC801, is likely to be faulty. In this case the 2SD1651 line output transistor Q402 could be short-circuit and the fusible resistor R826 (1 $\Omega$ , 0.5W) in the feed to the line output stage open-circuit.

If the HT supply is correct, check the various LT supplies. First check the B3 voltage (20V) - across C856. If this voltage is missing there will be no B4 (8V), B5 (5V) or B6 (16V) supplies. Should the B3 voltage be missing, check whether R817 (0.47 $\Omega$ , 0.5W fusible) or R812 (2.7 $\Omega$ , 3W) is open-circuit.

If the B3 supply is OK but there's no 5V supply (B5), check whether R818 (3.9 $\Omega$ , 2W) is open-circuit or IC803 (MC7805) short- or open-circuit.

If the B4 (8V) supply is missing check whether C383 (470 $\mu$ F, 25V) or IC802 (MC7808) is short-circuit.

The cause of no results may lie in the line output stage of course. We have already mentioned failure of the line output transistor, with the HT supply high and R826 open-circuit. Other possibilities in the line output stage are a short-circuit flyback tuning capacitor (C411, 7.2nF 1.6kV - 6.3nF in 21in. sets) or shorted turns in the line output transformer T444.

If necessary, check the voltage at the collector of the KSC2331Y line driver transistor Q401. If this is missing, R411 (68 $\Omega$ , 0.5W) could be open-circuit or T401 dry-jointed or open-circuit.

The line drive is generated by the TDA8362 chip IC101, which also incorporates the IF section, the colour decoder and the field generator stages. It could be responsible for loss of line drive. First however check that its 8V supply is present at pin 10. If this supply is missing, check whether R204 (1 $\Omega$ ) is open-circuit and/or C206 (470 $\mu$ F, 16V) short-circuit.

## No Raster, Sound OK

First check for HT at the collector of the line output transistor Q402. If this supply is missing, check as under no results in the previous section (Q402, R826, C852).

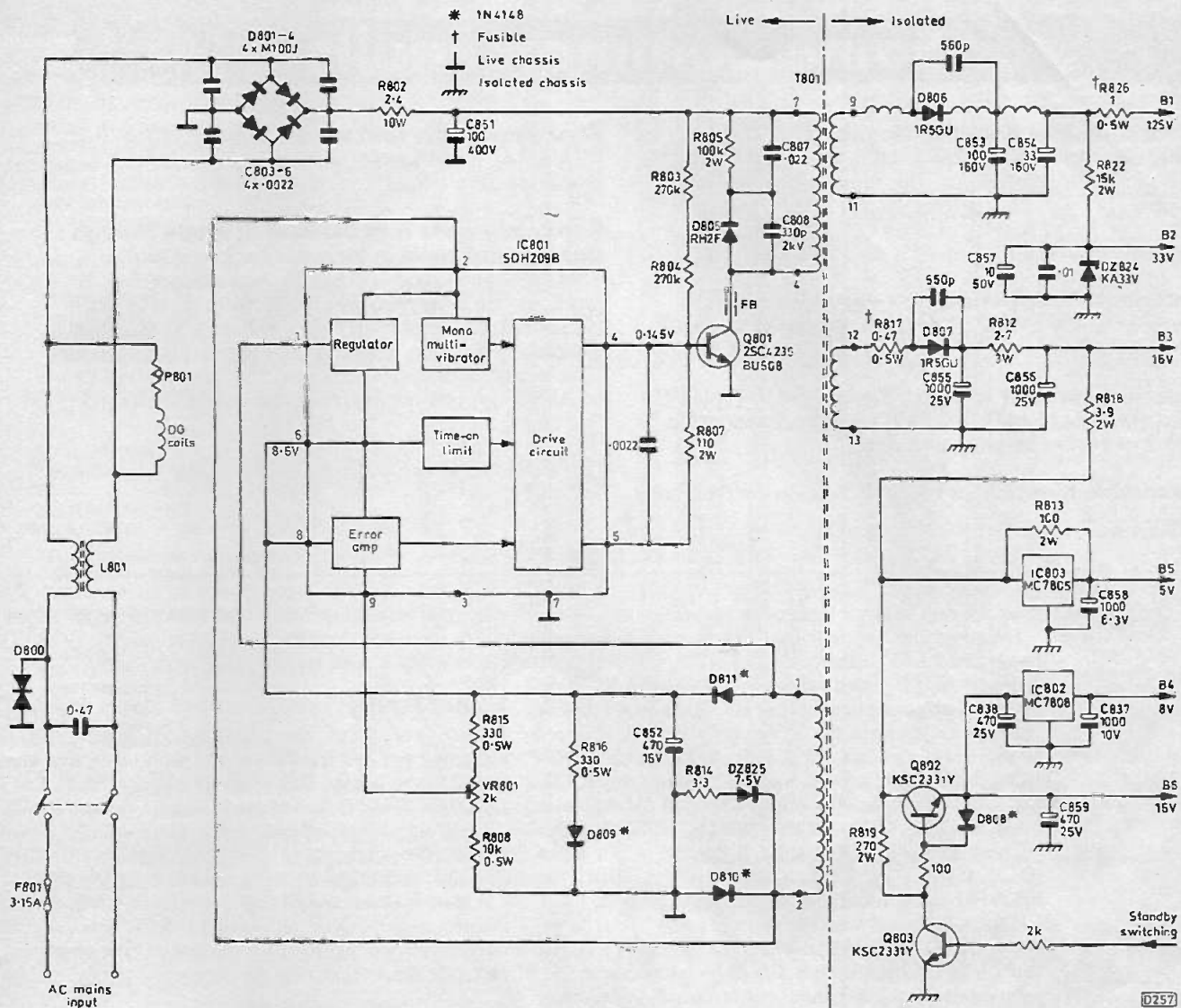


Fig. 1: The chopper power supply circuit used in the Samsung P68 chassis.

Then check the LT supplies derived from the chopper circuit (B2-B6).

If the tube's heaters are not alight, check for dry-joints at pins 3 and 6 of the line output transformer T444. then check whether R924 or R925 (both 1Ω, 1W) is open-circuit. If these points are OK, the tube's heaters are probably open-circuit.

Check that the tube's first anode supply is present (400-600V), and that the B8 supply (12V) is correct. This is derived from the line output transformer via IC402. If the supply is low or missing, check IC402 (MC7812) which could be open- or short-circuit.

If all these points are OK, check the DC conditions at the red, green and blue output transistors Q901/2/3. Check the TDA8362 chip (IC101) by replacement if necessary.

Finally, check the operation of the brightness and contrast controls. Incorrect operation could be caused by a fault in the SPM-109B PCA84C640 microcontroller chip RIC01 or the X24C02P data latch chip RIC02. Before condemning either of these chips, check that the 5V supply (B5) is present and correct and that crystal RX01 at pins 31 and 32 of RIC01 is operating at the correct frequency (10MHz).

### Field Faults

In the event of field collapse, check that the 24V supply (B7) is present at pin 9 of the AN5512 (or KA2131) field output chip IC301. This supply is derived from the line output stage. If it is missing, check whether R412 (1Ω, 0.5W fusible) is open-circuit or D401 (ERB43-04) open- or short-circuit. If D401 is open-circuit, check whether its reservoir capacitor C414 (1,000μF, 35V) is short-circuit.

If the B7 supply is OK, check whether the flyback boost capacitor C307 (100μF, 50V) is open-circuit. If C307 is OK, the field output chip IC301 is suspect. When C307 goes short-circuit, IC301 and the field generator in IC101 (TDA8362) can be ruined. So you may have to replace IC301, IC101 and C307.

Check the waveform at pin 6 (input) of IC301. If incorrect, check whether C311 (0.01μF) is short-circuit then IC101 by replacement.

A further possibility for field collapse is open-circuit scan coils.

### Tuner/IF Faults

If the picture and sound are noisy, check that the aerial socket is correctly secured. The socket can break away

# Some Common Faults

## Lack of height with the standby LED still illuminated:

D403 (ERB43-04) is leaky and R418 (1 $\Omega$ , 0.5W fusible) open-circuit. This removes the B8 (12V) supply.

**Excessive HT:** Usual cause is C852 (470 $\mu$ F, 16V).

## Intermittent or permanent very low gain:

Replace C104 (0.022 $\mu$ F) which is connected to pin 47 of IC101.

**Intermittent shift to right:** Replace D411 (1N4148) and check R416 (47k $\Omega$ , 0.5W) which is connected to pin 2 of the line output transformer.

**Excessive blue:** Check R903 (1.5k $\Omega$ ) on the tube base PCB.

**Poor sync in the text mode:** Replace TIC04 (TEA2014). It can severely reduce the sync pulse amplitude at its output.

## Randomly goes into the search mode though this has not been selected:

Check/isolate the 1N4148 option diodes RD03/4. Intermittent random functions can be a problem. The thing to do is to open-circuit pins 13-20 of RIC01, thus isolating all the front switches and option diodes, then operate the set via remote control during a soak test. The tact switches can cause various intermittent problems – search, cleared, fine tuning etc.

*Our thanks to Mike Stevenson for the above information.*

from the case, and the inner core can break.

The tuner can have a faulty RF amplifier, which will result in a snowy picture.

Ensure that the tuning voltage is correct at pin VT of the tuner. It's obtained from pin 1 of RIC01 via RQ01, whose collector is fed from the 33V supply. This is obtained from the HT line via R822 (15k $\Omega$ , 2W) with DZ824 (KA33V/574J) for stabilisation. The memory chip RIC02 (X24C02P) can affect the tuning. Check its 5V supply, at pin 8, and if necessary the chip itself by replacement.

Check that the AGC output is correct at pin 47 of IC101. If this is incorrect, suspect C104 or IC101. The LA7910 band decoder chip IC102 is also suspect.

If there is no snow on the picture, just a blank raster, check Q201 (KSC815Y) and RQ12 (KSA539Y). IC101 is also suspect for this fault. Check by replacement.

An intermittent blank raster can be caused by failure of the tuner to oscillate. We have also known IC101 to be responsible.

## Loss of One Colour

Loss of one colour can mean that the relevant tube heater is open-circuit. The RGB output transistors are type 2SC2068 – Q901 red, Q902 green, Q903 blue. Dry-joints at these transistors can cause loss of the relevant colour. This also occurs when the relevant transistor goes open-

circuit. If necessary check the TDA8362 chip IC101, which should produce RGB outputs at pins 20, 19 and 18 respectively. Check for dry-joints in this area.

## Sound Faults

If there is no sound, check that the 16V supply (B3) is present at pin 3 of the TDA1013A audio amplifier chip IC602. If the voltage here is low or missing, check C617 (2,200 $\mu$ F, 25V). If the voltage is correct, replace IC602.

There are a couple of other things that can cause loss of sound. The loudspeaker can go open-circuit, and the earphone socket can be dry-jointed or open-circuit.

If there is some sound but the volume control action is incorrect, check Q602 (KSA539Y) and if necessary the microcontroller chip RIC01 – check the DC voltages very carefully before replacing the chip.

## Remote Control Faults

If only one or maybe two channels cannot be changed using the remote control handset, the button unit is probably badly worn. It's not listed as a separate part, so replace the handset or retune spare channels at the TV set.

If there is no infra-red output from the handset, check the battery connections, check for dry-joints at the PCB connections and check the batteries themselves. Other things to check are the LED (XD01) which may be dry-jointed, the crystal XZ01 which could be dry-jointed or have broken legs because of tight fixing to the PCB, and the DC conditions around the SAA3010 chip XIC01. If there is no voltage at pin 28, check for dry-joints at XR04 (100 $\Omega$ ). The final suspect is the chip itself.

If the remote control handset is OK, check the SRSCP IR receiver PR01. There should be 5V at its B+ input. If this supply is missing, RR58 (47 $\Omega$ ) could be open-circuit. If necessary check back to its source at IC803.

To prove that the IR receiver is working, scope its output. This goes to pin 35 of the microcontroller chip RIC01. If there is no data, PR01 is suspect. If there is data at pin 35 of RIC01, check it by replacement (type SPM-109B PCA84C640).

## Supply Lines

We have come across circuit diagrams in which it is impossible to read the supply line voltages. To assist readers, these are listed in the accompanying table. ■

## PC68 Chassis Supply Lines

### Chopper derived

B1	125V (across C854)
B2	33V (across C857)
B3	16V (across C856)
B4	8V (across C837)
B5	5V (across C858)
B6	16V (across C859)

### LOPT derived

B7	24V (across C414)
B8	12V (across C420)

Other LOPT derived supplies are some 175V between the junction of C424/D402 and chassis for the RGB output stages (note that the negative side of this reservoir capacitor is connected to the 125V rail), and 17V across C419 – the rectifier is D403.



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CTV14RS	1465	AN5521	2.99	L47838	6.00	STK7226	8.50	TD41520	4.00
BABY 10	1480A	AN5500	1.50	L47839	30.00	STK7308	4.25	TD41521	3.50
CTV41	1490	AN5761	3.40	M4818B1	8.50	STK7348	4.50	TD41522	4.50
AMSTRAD	MTSUBISHI	AN5771	4.25	M4848A-84	16.00	STK7454	8.00	TD41523	7.00
CT2200	1490	AN5788	1.70	M4849A	16.00	STK7510	5.99	TD41524	1.00
CTV210	ORION	BA3402	2.50	M4849B	16.00	STK7511	5.99	TD41525	1.00
TVR12/24	149X	BA3402	2.50	M4849C	16.00	STK7512	4.50	TD41526	1.30
BUSH	PHILIPS	BA3402	2.50	M4849D	16.00	STK7513	4.50	TD41527	1.30
2021	2A	BA3402	2.50	M4849E	16.00	STK7514	4.50	TD41528	1.30
2714	3A	BA3402	2.50	M4849F	16.00	STK7515	4.50	TD41529	1.30
RDELT	KT30	BA3402	2.50	M4849G	16.00	STK7516	4.50	TD41530	1.30
FX2000	KT40	BA3402	2.50	M4849H	16.00	STK7517	4.50	TD41531	1.30
ZK3000	ZA	BA3402	2.50	M4849I	16.00	STK7518	4.50	TD41532	1.30
FERGUSON	3A	BA3402	2.50	M4849J	16.00	STK7519	4.50	TD41533	1.30
TX85/88	CTX E/S	BA3402	2.50	M4849K	16.00	STK7520	4.50	TD41534	1.30
TX90	CF1	BA3402	2.50	M4849L	16.00	STK7521	4.50	TD41535	1.30
REDSHOT	NCR	BA3402	2.50	M4849M	16.00	STK7522	4.50	TD41536	1.30
TX98	GR9 AE	BA3402	2.50	M4849N	16.00	STK7523	4.50	TD41537	1.30
TX98	PANASONIC	BA3402	2.50	M4849O	16.00	STK7524	4.50	TD41538	1.30
TX98	1490	BA3402	2.50	M4849P	16.00	STK7525	4.50	TD41539	1.30
TX98	1490	BA3402	2.50	M4849Q	16.00	STK7526	4.50	TD41540	1.30
TX98	1490	BA3402	2.50	M4849R	16.00	STK7527	4.50	TD41541	1.30
TX98	1490	BA3402	2.50	M4849S	16.00	STK7528	4.50	TD41542	1.30
TX98	1490	BA3402	2.50	M4849T	16.00	STK7529	4.50	TD41543	1.30
TX98	1490	BA3402	2.50	M4849U	16.00	STK7530	4.50	TD41544	1.30
TX98	1490	BA3402	2.50	M4849V	16.00	STK7531	4.50	TD41545	1.30
TX98	1490	BA3402	2.50	M4849W	16.00	STK7532	4.50	TD41546	1.30
TX98	1490	BA3402	2.50	M4849X	16.00	STK7533	4.50	TD41547	1.30
TX98	1490	BA3402	2.50	M4849Y	16.00	STK7534	4.50	TD41548	1.30
TX98	1490	BA3402	2.50	M4849Z	16.00	STK7535	4.50	TD41549	1.30
TX98	1490	BA3402	2.50	M4849A	16.00	STK7536	4.50	TD41550	1.30
TX98	1490	BA3402	2.50	M4849B	16.00	STK7537	4.50	TD41551	1.30
TX98	1490	BA3402	2.50	M4849C	16.00	STK7538	4.50	TD41552	1.30
TX98	1490	BA3402	2.50	M4849D	16.00	STK7539	4.50	TD41553	1.30
TX98	1490	BA3402	2.50	M4849E	16.00	STK7540	4.50	TD41554	1.30
TX98	1490	BA3402	2.50	M4849F	16.00	STK7541	4.50	TD41555	1.30
TX98	1490	BA3402	2.50	M4849G	16.00	STK7542	4.50	TD41556	1.30
TX98	1490	BA3402	2.50	M4849H	16.00	STK7543	4.50	TD41557	1.30
TX98	1490	BA3402	2.50	M4849I	16.00	STK7544	4.50	TD41558	1.30
TX98	1490	BA3402	2.50	M4849J	16.00	STK7545	4.50	TD41559	1.30
TX98	1490	BA3402	2.50	M4849K	16.00	STK7546	4.50	TD41560	1.30
TX98	1490	BA3402	2.50	M4849L	16.00	STK7547	4.50	TD41561	1.30
TX98	1490	BA3402	2.50	M4849M	16.00	STK7548	4.50	TD41562	1.30
TX98	1490	BA3402	2.50	M4849N	16.00	STK7549	4.50	TD41563	1.30
TX98	1490	BA3402	2.50	M4849O	16.00	STK7550	4.50	TD41564	1.30
TX98	1490	BA3402	2.50	M4849P	16.00	STK7551	4.50	TD41565	1.30
TX98	1490	BA3402	2.50	M4849Q	16.00	STK7552	4.50	TD41566	1.30
TX98	1490	BA3402	2.50	M4849R	16.00	STK7553	4.50	TD41567	1.30
TX98	1490	BA3402	2.50	M4849S	16.00	STK7554	4.50	TD41568	1.30
TX98	1490	BA3402	2.50	M4849T	16.00	STK7555	4.50	TD41569	1.30
TX98	1490	BA3402	2.50	M4849U	16.00	STK7556	4.50	TD41570	1.30
TX98	1490	BA3402	2.50	M4849V	16.00	STK7557	4.50	TD41571	1.30
TX98	1490	BA3402	2.50	M4849W	16.00	STK7558	4.50	TD41572	1.30
TX98	1490	BA3402	2.50	M4849X	16.00	STK7559	4.50	TD41573	1.30
TX98	1490	BA3402	2.50	M4849Y	16.00	STK7560	4.50	TD41574	1.30
TX98	1490	BA3402	2.50	M4849Z	16.00	STK7561	4.50	TD41575	1.30
TX98	1490	BA3402	2.50	M4849A	16.00	STK7562	4.50	TD41576	1.30
TX98	1490	BA3402	2.50	M4849B	16.00	STK7563	4.50	TD41577	1.30
TX98	1490	BA3402	2.50	M4849C	16.00	STK7564	4.50	TD41578	1.30
TX98	1490	BA3402	2.50	M4849D	16.00	STK7565	4.50	TD41579	1.30
TX98	1490	BA3402	2.50	M4849E	16.00	STK7566	4.50	TD41580	1.30
TX98	1490	BA3402	2.50	M4849F	16.00	STK7567	4.50	TD41581	1.30
TX98	1490	BA3402	2.50	M4849G	16.00	STK7568	4.50	TD41582	1.30
TX98	1490	BA3402	2.50	M4849H	16.00	STK7569	4.50	TD41583	1.30
TX98	1490	BA3402	2.50	M4849I	16.00	STK7570	4.50	TD41584	1.30
TX98	1490	BA3402	2.50	M4849J	16.00	STK7571	4.50	TD41585	1.30
TX98	1490	BA3402	2.50	M4849K	16.00	STK7572	4.50	TD41586	1.30
TX98	1490	BA3402	2.50	M4849L	16.00	STK7573	4.50	TD41587	1.30
TX98	1490	BA3402	2.50	M4849M	16.00	STK7574	4.50	TD41588	1.30
TX98	1490	BA3402	2.50	M4849N	16.00	STK7575	4.50	TD41589	1.30
TX98	1490	BA3402	2.50	M4849O	16.00	STK7576	4.50	TD41590	1.30
TX98	1490	BA3402	2.50	M4849P	16.00	STK7577	4.50	TD41591	1.30
TX98	1490	BA3402	2.50	M4849Q	16.00	STK7578	4.50	TD41592	1.30
TX98	1490	BA3402	2.50	M4849R	16.00	STK7579	4.50	TD41593	1.30
TX98	1490	BA3402	2.50	M4849S	16.00	STK7580	4.50	TD41594	1.30
TX98	1490	BA3402	2.50	M4849T	16.00	STK7581	4.50	TD41595	1.30
TX98	1490	BA3402	2.50	M4849U	16.00	STK7582	4.50	TD41596	1.30
TX98	1490	BA3402	2.50	M4849V	16.00	STK7583	4.50	TD41597	1.30
TX98	1490	BA3402	2.50	M4849W	16.00	STK7584	4.50	TD41598	1.30
TX98	1490	BA3402	2.50	M4849X	16.00	STK7585	4.50	TD41599	1.30
TX98	1490	BA3402	2.50	M4849Y	16.00	STK7586	4.50	TD41600	1.30
TX98	1490	BA3402	2.50	M4849Z	16.00	STK7587	4.50	TD41601	1.30
TX98	1490	BA3402	2.50	M4849A	16.00	STK7588	4.50	TD41602	1.30
TX98	1490	BA3402	2.50	M4849B	16.00	STK7589	4.50	TD41603	1.30
TX98	1490	BA3402	2.50	M4849C	16.00	STK7590	4.50	TD41604	1.30
TX98	1490	BA3402	2.50	M4849D	16.00	STK7591	4.50	TD41605	1.30
TX98	1490	BA3402	2.50	M4849E	16.00	STK7592	4.50	TD41606	1.30
TX98	1490	BA3402	2.50	M4849F	16.00	STK7593	4.50	TD41607	1.30
TX98	1490	BA3402	2.50	M4849G	16.00	STK7594	4.50	TD41608	1.30
TX98	1490	BA3402	2.50	M4849H	16.00	STK7595	4.50	TD41609	1.30
TX98	1490	BA3402	2.50	M4849I	16.00	STK7596	4.50	TD41610	1.30
TX98	1490	BA3402	2.50	M4849J	16.00	STK7597	4.50	TD41611	1.30
TX98	1490	BA3402	2.50	M4849K	16.00	STK7598	4.50	TD41612	1.30
TX98	1490	BA3402	2.50	M4849L	16.00	STK7599	4.50	TD41613	1.30
TX98	1490	BA3402	2.50	M4849M	16.00	STK7600	4.50	TD41614	1.30
TX98	1490	BA3402	2.50	M4849N	16.00	STK7601	4.50	TD41615	1.30
TX98	1490	BA3402	2.50	M4849O	16.00	STK7602	4.50	TD41616	1.30
TX98	1490	BA3402	2.50	M4849P	16.00	STK7603	4.50	TD41617	1.30
TX98	1490	BA3402	2.50	M4849Q	16.00	STK7604	4.50	TD41618	1.30
TX98	1490	BA3402	2.50	M4849R	16.00	STK7605	4.50	TD41619	1.30
TX98	1490	BA3402	2.50	M4849S	16.00	STK7606	4.50	TD41620	1.30
TX98	1490	BA3402	2.50	M4849T	16.00	STK7607	4.50	TD41621	1.30
TX98	1490	BA3402	2.50	M4849U	16.00	STK7608	4.50	TD41622	1.30
TX98	1490	BA3402	2.50	M4849V	16.00	STK7609	4.50	TD41623	1.30
TX98	1490	BA3402	2.50	M4849W	16.00	STK7610	4.50	TD41624	1.30
TX98	1490	BA3402	2.50	M4849X	16.00	STK7611	4.50	TD41625	1.30
TX98	1490	BA3402	2.50	M4849Y	16.00	STK7612	4.50	TD41626	1.30
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1N4001	0.04	ZSC2570A	0.38	AN5265	1.76	BC558C	0.18	BRX44	1.82	CD4016	0.14	RB156	2.40	TD41013A	1.56	TD466002D	4.27
1N4002	0.07	ZSC2655	0.31	AN5435	1.46	BC558C	0.06	BRX45	0.43	CD4017	0.47	RC4558	0.55	TD41015	1.37	TD46601	1.46
1N4004	0.04	ZSC3153	2.65	AN5512	1.76	BC636	0.14	BRX55	0.20	CD4049	0.35	REGBABY10	15.90	TD41035T	4.27	TD46610	4.02
1N4005	0.07	ZSC3182	1.20	AN5515	2.79	BC637	0.11	BSX20	0.35	CD4053	0.54	RGP10C	0.26	TD41044	1.43	TD46605	4.10
1N4006	0.04	ZSC3225	0.68	AN5521	1.65	BC639	0.21	B7139600	0.29	CD4093	0.32	RGP15J	0.17	TD41060	1.08	TD46650	1.76
1N4007	0.06	ZSC3330	0.52	AN6610	0.94	BC640	0.11	B7151500R	1.12	CDX62A	1.29	RGP15M	0.44	TD41085C	2.74	TD47052	1.70
1N4148	0.06	ZSC3502	0.45	AN7171K	5.56	BC848B	0.20	B7151800R	1.15	CDX82A	2.19	RGP30M	0.30	TD41170	1.82	TD47240A	2.57
1N5062	0.26	ZSC3795	2.89	BA157	0.09	BC848C	0.10	BU208A	1.46	CDX83A	2.55	S2000A3	1.54	TD41170M	2.57	TD48138	1.97
1N5400	0.11	ZSC3795B	2.21	BA158	0.07	BC858B	0.24	BU208D	1.81	CDY75B	0.52	S2000AF	1.71	TD41170S	2.85	TD48140	4.82
1N5401	0.14	ZSC3807	0.91	BA159	0.11	BC858C	0.19	BU225A	1.36	DTA114ES	0.31	S2055AF	3.74	TD41180P	1.69	TD48145	1.97
1N5402	0.12	ZSC3885A	6.82	BA3910B	6.99	BC875	0.33	BU406	0.63	DTA124ES	0.19	SA4129302	10.37	TD41515A	3.16	TD48153	16.24
1N5408	0.14	ZSC3892A	6.82	BA5406	2.14	BD131	0.20	BU426A	1.23	DTC124E	0.19	SA45012	3.34	TD41516Q	3.59	TD48170	4.70
1N6263	0.20	ZSC4204	0.68	BA5412	2.48	BD132	0.26	BU500	1.41	DTC124ES	0.77	SAB3035	1.71	TD41518Q	4.27	TD48172	2.85
1N914	0.04	ZSC4242	2.31	BA6109	1.05	BD135	0.33	BU500S	0.35	DTC144ES	0.19	SDA2516	2.89	TD41519	4.27	TD48175	6.41
1S1555	0.07	ZSC4517	4.70	BA6209	1.46	BD136	0.20	BU508A	1.29	FXT749	0.43	SGSF344	10.70	TD41520B	2.40	TD48178FS	3.98
2N2222A	0.23	ZSC4517A	2.52	BA6209M	1.27	BD137	0.46	BU508AF	1.32	HA13001	0.85	SL1430	1.92	TD41524A	2.99	TD48180	4.87
2N2369A	0.10	ZSC458	0.12	BA6219B	1.76	BD138	0.29	BU508D	1.56	HA13108	1.88	SL1431	2.82	TD41533Q	4.79	TD48190	3.59
2N3055	0.50	ZSC4742	5.11	BA6222	1.70	BD139	0.31	BU508DF	1.88	HA13117	2.05	SL1432	10.17	TD41534Q	8.12	TD48380	2.53
2N3773	1.52	ZSC536	0.30	BA6238A	2.91	BD140	0.24	BU508V	2.40	HA13118	1.88	ST441C	3.86	TD41557Q	4.23	TD49503	2.13
2N3904	0.32	ZSC8050	0.52	BA6247	1.95	BD233	0.23	BU606	1.03	HA13119	2.05	STK4132H	1.06	TD41558Q	7.63	TE4039	2.11
2N4123	0.30	ZSC945	0.12	BA718	1.08	BD234	0.24	BU807	0.51	HA13151	13.20	STK4141H	16.23	TD41670A	2.86	TE42018A	2.29
2SA1013	0.35	ZSD1207	0.57	BA785	0.96	BD237	0.31	BU908	1.68	HA51338SP3	7.69	STK4142H	9.40	TD41675A	3.95	TE42029C	7.04
2SA1015	0.11	ZSD1266	0.82	BAV21	0.21	BD238	0.24	BUR444500B	2.57	HM6251	14.32	STK4152H	10.68	TD41904	1.63	TE42031A	4.26
2SA1015GR	0.11	ZSD1275	1.41	BAW76	0.83	BD239	0.33	BUR454600C	2.99	KZ263	0.55	STK463	11.49	TD41908A	2.14	TE42164	3.40
2SA1020	0.44	ZSD1292	0.84	BAX14	0.17	BD243C	0.44	BUR454800A	4.99	KBL08	1.42	STK3331	2.87	TD42004	2.57	TE42165A	5.58
2SA1175	0.28	ZSD1397	2.31	BC107B	0.20	BD244A	0.34	BUR455600B	2.54	KAE210AH	6.15	STK3332	2.82	TD42005	1.83	TE42260	2.48
2SA1286	0.60	ZSD1398	2.14	BC108	0.24	BD244C	0.42	BUT11	0.85	LA1230	1.95	STK3333	15.00	TD42006	1.06	TE42261	3.88
2SA1370	0.43	ZSD1426	3.51	BC108C	0.15	BD433	0.29	BUT11A	0.95	LA4282	4.93	STK3342	4.87	TD42030H	0.86	TE45101A	6.48
2SA1706	0.50	ZSD1439	5.86	BC109A	0.20	BD434	0.31	BUT11AF	1.18	LA4440	3.45	STK3372H	6.04	TD42030V	1.46	TE45115	2.91
2SA608	0.24	ZSD1441	5.98	BC141	0.36	BD437	0.28	BUT11AF	0.91	LA4445	3.45	STK5471	4.52	TD42040H	4.34	TIC106D	0.82
2SA673	0.18	ZSD1453	3.85	BC147A	0.24	BD438	0.38	BUT12AF	1.87	LA4700	4.27	STK5471	4.82	TD42050	4.56	TIC225M	1.82
2SA733	0.18	ZSD1497	4.74	BC148A	0.35	BD826	0.35	BUT18AF	1.37	LA6358S	2.66	STK5481	0.12	TD42170	0.00	TIP106D	0.60
2SA759	1.29	ZSD1541	4.36	BC157	0.13	BD839	0.57	BUT18AF	1.19	LA6510	0.94	STK5482	5.52	TD42270	9.60	TIP107	0.86
2SA872A	0.35	ZSD1546	7.69	BC158B	0.12	BD901	0.52	BUT56AT	3.44	LA7520	4.80	STK7253	5.90	TD42540	1.29	TIP107	1.12
2SA933	0.38	ZSD1548	5.95	BC182L	0.14	BD902	0.60	BUV46A	0.86	LA7800	1.61	STK7348	5.74	TD42541	1.12	TIP110	0.38
2SA966	0.41	ZSD1554	3.25	BC184A	0.12	BD939F	1.61	BUV48A	1.52	LA7830	1.80	STR11006	7.37	TD42576A	5.95	TIP112H	0.95
2SA970	0.19	ZSD1555	2.85	BC184L	0.06	BD765C	1.68	BUM11A	1.63	LA7835	2.99	STR4211	9.40	TD42577A	2.99	TIP121	0.50
2SA98A	0.38	ZSD1556	5.11	BC184LC	0.10	BF180	0.38	BUM41B	1.39	LA7837	2.40	STR451	23.41	TD42578A	2.91	TIP122	0.48
2SB1010	0.35	ZSD1651	2.38	BC212	0.04	BF194	0.22	BUM61A	3.11	LC7132	4.70	STR50020	9.38	TD42579A	4.91	TIP127	0.47
2SB1143	0.77	ZSD1710	2.52	BC212B	0.19	BF199	0.04	BUM8A	1.03	LED3G	0.10	STR50103	4.46	TD42581	4.27	TIP137	0.48
2SB1243	0.60	ZSD1877	2.14	BC212L	0.18	BF224	0.21	BUX84	0.60	LED3R	0.10	STR50103A	5.56	TD42581Q	1.99	TIP29E	0.62
2SB641	0.21	ZSD1878	2.83	BC213L	0.04	BF240	0.11	BW271A	1.83	LED3Y	0.10	STR54041	1.62	TD42582	3.85	TIP305S	0.93
2SB649A	0.77	ZSD1884	3.35	BC237B	0.19	BF244	0.43	BW280A	1.97	LM3177	1.29	STR5412	10.58	TD42594	2.21	TIP30C	0.17
2SB686	2.06	ZSD1887	3.56	BC238	0.11	BF245A	0.19	BW296A	2.55	LM324H	1.48	STR58041	3.42	TD42595	3.19	TIP31C	0.00
2SB698	0.35	ZSD1887	5.98	BC238C	0.07	BF245B	0.07	BY127	0.88	LM339H	1.48	STR59041	8.11	TD42600	7.69	TIP32A	0.45
2SB716	0.43	ZSD1911	1.97	BC307	0.06	BF256A	0.23	BY133	0.08	LM358H	0.52	STR6020	6.07	TD42611A	0.84	TIP32C	0.40
2SB764	0.30	ZSD400	0.34	BC307B	0.15	BF258	0.04	BY179	0.77	MA9481	11.85	STR61001	10.86	TD42611AQ	1.32	TIP33C	1.82
2SB772	0.50	ZSD401A	0.77	BC308	0.09	BF324	0.10	BY227	0.13	MS218L	0.69	STR01816	7.69	TD42653A	4.70	TIP36C	2.14
2SB774	1.61	ZSD468	0.28	BC308B	0.19	BF391	0.21	BY228	0.26	M54544L	2.94	STR04420	11.49	TD43301B	6.75	TIP41C	0.65
2SB891	0.60	ZSD669A	0.84	BC309C	0.14	BF420	0.10	BY229	0.10	MS8655P	4.96	STR9053	1.35	TD43505	2.49	TIP42C	0.30
2SB892	0.35	ZSD716	1.63	BC327	0.10	BF421	0.24	BY255	0.14	MC13002P	7.69	T9064V	1.87	TD43560	3.86	TIP1760A	2.57
2SC1213	0.14	ZSD756	0.47	BC328	0.14	BF422	0.19	BY299	0.18	MC14065B	0.21	TA7205AP	2.87	TD43561A	5.38	TIP1761A	1.85
2SC1214	0.48	ZSD837B	1.12	BC337	0.14	BF423	0.31	BY398	0.18	MC14426P	1.29	TA7227P	2.29	TD43562A	3.90	TIP1791A	1.25
2SC1318	0.10	ZSD856	0.79	BC338	0.06	BF458	0.14	BY399	0.18	MDA2062	13.74	TA7270P	2.72	TD43562ATF	0.97	TLO72	0.00
2SC1573	0.35	ZSD898B	6.41	BC368	0.10	BF459	0.43	BY448	0.30	MU2955	0.98	TA7271P	2.70	TD43565	2.74	TLO82C	0.21
2SC1740	0.16	ZSD965	0.67	BC369	0.10	BF460	0.82	BYD14J	0.35	MU802	3.38	TA7274P	4.93	TD43566	6.41	TMP47C432APB189	15.19
2SC1815	0.17	ZSK1118	3.40	BC372	0.40	BF469	0.34	BYD33D	0.12	MU802	2.91	TA7280P	2.74	TD43576B	10.31	TMP47C434N3555	16.83
2SC1827	0.96	ZK06	0.69	BC517	0.16	BF470	0.38	BYD33J	0.16	MUE13005	0.86	TA7281P	3.20	TD43592A	4.27	TIP2732	10.85
2SC1959	0.10	ZK07	0.69	BC546A	0.11	BF471	0.37	BYD33M	0.26	MUE18004	2.05	TA7598AP	5.97	TD43640	5.98	UC289B	2.40
2SC2001	0.23	ZK40C04	0.34	BC546B	0.12	BF487	0.57	BYD10-40	2.55	MUE3055T	0.74	TAB201	3.93	TD43650	12.82	UC328A	1.46
2SC2023	3.18	ZK05	0.70	BC547	0.11	BF759	0.38	BYD95B	0.21	MUE340	0.45	TAB205AH	4.50	TD43653B	1.54	UC384A	1.28
2SC2060	0.30	ZK08	0.72	BC547A	0.04	BF763	0.23	BYD95C	0.21	MUF18004	2.85	TAB207	2.74	TD43653C	2.95	UC384H	1.81
2SC2078	1.00	ZK09	0.69	BC547B	0.11	BF788	0.52	BYD96D	0.27	MN650	3.30	TAB210AH	4.10	TD43653Q0	2.57	UC4200H	3.49
2SC2120	0.23	ZK12	0.52	BC548	0.06	BF869	0.25	BYD96E	0.53	MP5A06	0.35	TAB210H	4.79	TD43654	1.88	UC4318AV	3.85
2SC2230	0.56	ZK15	0.82	BC548A	0.11	BF869S	0.48	BYD96F	0.48	MP5A42	0.23	TAB215H	4.96	TD43654Q	2.82	UC4318C	1.70
2SC2235	0.36	ZK15	0.35	BC548B	0.06	BF871	0.11	BYD96G	0.31	MP5A56	0.23	TAB220H	9.82	TD44500	4.66	UC4318H	1.88
2SC2236	0.36	ZK12	0.35	BC548C	0.09	BF959	0.48	BYD96H	0.48	MP5A92	0.18	TAB221H	7.28	TD44501H	5.95	UC4319AC	1.92
2SC2240	0																

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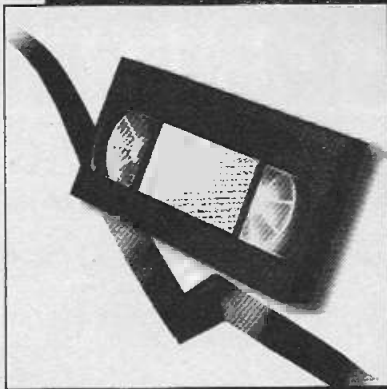
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**Adrian Spriddell,**  
**John Coombes,**  
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**and**  
**Graham Richards**

### **Sanyo VHR291E**

After service work and reassembly you may find that Nicam sound reception is accompanied by a whining noise which disappears when you switch to mono-FM TV reception. The cause is incorrect dressing of the long, white flat ribbon cable that comes from the right-hand side of the front control panel. Fold and dress it clear of the Nicam decoder board. E.T.

### **Tatung TVR7121**

This note is likely to be relevant to other VCRs that use the same Sharp manufactured deck. The problem is occasional deck shut down when the reverse search (review) mode is selected. Its cause is the mode switch, part no. QSW-R0026 GEZZ. The same part number can be used when ordering from Tatung, Sharp or Willow Vale. E.T.

### **Sharp VCA49HM**

The deck used in this machine is also used in some Tatung and other models. We have sometimes found that the pinch roller has seized solid on its shaft. The symptoms you get are deck shut down after a few

# VCR Clinic

seconds, during which there is a squealing noise and, if play is selected, a torn-up still picture. The part no. for the pinch roller/lever assembly is MLEV0281GEZZ. E.T.

### **Panasonic NVF55**

This machine's mechanism operated at a frighteningly fast speed. Checks showed that there were no FG signals from the capstan motor to the systems control chip IC6001. The cause of the trouble was soon traced to L2001, which was open-circuit. It filters the 12V supply to the capstan stator. B.S.

### **Panasonic NVFS100**

There was a problem when recording with this machine. Although the recordings were good, the real-time counter didn't work and, when it appeared, the 'write' signal was frozen on the display. The real-time counter worked in the playback mode, but the index function didn't. After some checking around in the servo circuitry I found a section of open-circuit print between D2306 and pin 12 of IC2201. The cause of the print problem was corrosion because C2311 had leaked on to the adjacent copper track. B.S.

### **Panasonic NVF75**

This machine's operation was very unreliable. It would power-down frequently and ignore all operational requests. When the machine could be induced to show some life the multi-function display produced all kinds of random indications. After much hair tearing I eventually discovered that the 1,000pF capacitor C6011 at the base of the serial data inverter transistor QR6017 was open-circuit. Replacing this surface-mounted capacitor cured all the problems. B.S.

### **Panasonic NVHD100**

This machine's mechanism kept jamming. Usually the tape would stick in the half-loaded position, with the machine powering down. As everything seemed to work normally when the mechanism was manually operated I suspected the loading motor. A replacement restored correct operation. The cause of the trouble was evident when I inspected the faulty loading motor – a plastic drive shaft pushed on the motor's metal shaft had split, with the result that it slipped under pressure. Unfortunately these drive shafts are not available separately from the loading motor assembly, which is part no. VEM0427. B.S.

### **Sanyo VHR274E**

I'd not seen one of these machines before. It was dead with the mains fuse blown and the chopper transistor short-circuit. For good measure I replaced the three other transistors in the power supply as well as the chopper transistor and the fuse, and resoldered the dry-joints on the chopper transformer. At switch on everything was fine. N.B.

### **Panasonic NVFS90**

I've had several of these VCRs with varying degrees of no playback luminance and weak record luminance. The cause of the problem is signal loss within the thick-film hybrid chip IC303, which incorporates surface-mounted can electrolytics. They leak – as they do in Sanyo camcorders. N.B.

### **Matsui VX2500**

The complaint with this machine was that it didn't respond to remote control commands. I found that the handset was transmitting, while labels showed that the machine had recently been to another repair

centre! A scope check showed that data appeared to be reaching the timer microcontroller chip. When I took another look at the handset I noticed a reset button beneath the battery cover. After actuating this and fitting new batteries everything worked correctly. N.B.

### Panasonic NVJ35

A common symptom now is noisy (lumpy) capstan motor operation when it's running slow, i.e. during play/record and loading. The cause is loss of capacitance in C1122 (330µF). As a result the supply is affected by noise. N.B.

### Sanyo VHR7200

Severe wow and flutter on sound was the problem with this machine. The customer didn't appear to have noticed the awful din it made while rewinding. The cause of both these conditions was a very dry capstan bearing. It had been getting so hot that the capstan itself was discoloured. Without too much hope I decided to strip the motor then clean and lubricate it. After reassembly I checked with the wow and flutter meter and to my delight the results were pretty good. A soak test confirmed that everything was OK. A lot cheaper than a new motor! N.B.

### Panasonic NVFS90

This S-VHS machine produced a very poor playback picture in both the S and VHS modes. Its recordings were fine when checked with another machine. Many readers will be aware of the luminance problems that arise when the hybrid chip IC301 fails, but visual inspection showed that there were no signs of leakage from the aluminium can surface-mounted electrolytics in the module.

The luminance varied with temperature, from being virtually non-existent through no field sync to being almost OK but with tearing on highlights. When I traced through the playback path everything was fine up to the sub-YC pack. Everything was OK within it up to the luminance feed to the 1H delay pack, at pin 12 of P3504. But there was complete loss of the sync pulses at the output. The incoming luminance signal passed through FL3504 within the 1H delay pack, but was being lost at the 1µF, 50V electrolytic C3501. N.B.

### Panasonic AG7500

This is an industrial S-VHS edit deck, the sort of thing most home

movie and amateur wedding filmers would die for! There was a very intermittent fault with the audio on longitudinal track one. Hi-Fi was fine, longitudinal track two fine, but the sound on longitudinal track one would intermittently be recorded at low amplitude, distorted or not at all. When the fault occurred, a scope check on the output to the head showed that the bias level fell dramatically. The cause was oscillator transistor Q10 (2SD639) going open-circuit.

An interesting point is that there are separate oscillators for full erase and for channel one and channel two bias. Dry-joints are a common problem with these transistors. N.B.

### Sony SLVE40

This VCR had a very intermittent fault. The customer's complaint was that at times it wouldn't go into play, would make a funny noise, would show 'L' in the display and leave loops of tape in the machine when ejecting the cassette. Although I couldn't instigate the fault, I suspected that the mode switch was responsible. Fitting a replacement and checking with the customer three weeks later confirmed the diagnosis. The part no. is 3-946-958-01. M.M.

### JVC HRFC100

Occasionally you will find that the power supply in these dual VHS/VHS-C machines blows up. The usual cause is the chopper transistor Q1 going short-circuit. I replace Q1 with a BUT11AF and Q2 with a BC637. After that the power supply runs normally. M.M.

### Toshiba/Ferguson VCRs

The latest machines from the IVC factory in Singapore often cause confusion with customers, especially over setting the timer – whether using Video Plus or not. It's not enough to tune the VCR to the stations on installation. You also have to set the 'channel mapping'. Otherwise the machine won't accept timer commands. M.M.

### Panasonic NVJ30

I bought this ex-rental machine untested from a wholesaler. It came with a bag of bits that contained the pinch roller, a new unwrapped tuner/booster and the demodulator PCB. The tuner was fitted to the PCB which was then fitted to the main board. On switching on however the machine was dead. A new 1µF, 400V capacitor in the power supply cured that. When a

tape was inserted the solenoid clicked but the capstan wouldn't rotate. The cause was excessive clearance between the capstan's rotor and stator. After setting this up I had a working machine. M.M.

### Ferguson 3V55

This machine came from another dealer who said that the drum rotated very fast. This was an understatement. It not only ran fast, it also ran backwards! Checks in the servo circuit brought me to the 5-1V zener diode D408 which was short-circuit. This is where things went wrong.

After removing the diode the machine was tried again: the drum rotated in the right direction but at the wrong speed. While more checks were being carried out the power supply died. Q3 and F2 had failed. Replacing these two items cured the power supply fault while replacing D408 made the drum rotate at the correct speed, though a tweak on the drum discriminator was required.

The final test was to record something. But nothing could be tuned in – the TD6359P PLL tuning chip was roasting. Replacing this restored tuning control and a new back-up battery enabled us to store the channels. The machine now worked correctly. M.M.

### Memorex VR1950

This Sanyo-based machine wouldn't rewind or wind fast forward unless you tried it several times. When it didn't work the motors whirred but the clutch wouldn't engage. A replacement mode switch restored normal operation. M.M.

### Goodmans SD1600

The problem with this machine was that it failed to load fully in the play mode. With older machines this can be caused by a stretched loading belt, but this is a fairly recent model. Removing the bottom cover revealed all: the loading motor's pulley had split in half and the belt was sitting on its shaft. A new pulley put matters right. M.M.

### Hitachi VT64

There was no display, no channel changing and very erratic tape transport. Sometimes the machine would load, sometimes it wouldn't. The wind functions were not available, though play could sometimes be selected. The tape could be ejected all right nine times out of ten. After spending hours

looking for a logic/mecha-state type fault we stumbled across C609 (47 $\mu$ F) which was leaky. It decouples the 5-6V supply to the drum servo. A.S.

### Tatung TVR7211

Fast forward and rewind were intermittent. The cause was traced to erratic operation of the wind solenoid. Replacing the cam switch provided a complete cure. A.S.

### Toshiba V703

If the machine is dead or operates intermittently, replace all the small electrolytics in the power supply with 105°C types.

Now here's a real puzzle. The last one of these machines we had in for repair with the above symptoms had another fault in addition to the power supply problem. The system would crash when a new E180 cassette was loaded with the record protection tab intact. If the tab had been removed, the tape would go into auto-play and all would be well until a wind function (fast forward, rewind, cue or review) was selected. The system would then crash. If the tape was wound in another machine until only thirty minutes or so of tape was left on the supply reel, and this cassette was then inserted, the machine would behave normally with all functions selectable. Once it was accepted, the tape could be rewound to the start and played normally. C60 tapes would not play regardless of how little tape remained. The rotation sensors were OK, and the tape-remaining readout was always correct.

Here's the solution. The customer had decided to help the flagging mechanics along by removing the top and bottom covers - "to give it a bit of a push". In doing so he had broken off the master cam's first opto blind. Fitting a new cam cleared all the symptoms. Is there anyone out there who can explain why the machine reacts in this way? A.S.

### JVC HRD520

The cause of tape ejection when in the half-loaded position is usually the mode select switch. It can also be responsible for no play or no reverse search. J.C.

### Panasonic NVSD30

Tape chewing was the complaint with this VCR. With the machine in the playback mode we saw that the tape was being chewed at its bottom edge. The back tension was very high, while the supply reel was very

stiff. A careful deck inspection showed that the end of the take-up brake arm unit was broken. A replacement restored normal operation. J.C.

### Toshiba V55

The cause of intermittent rewind/review turned out to be the capacitor across the start sensor. It was short-circuit. J.C.

### Panasonic NVSD40

Poor playback/visual search was the complaint. When we checked the machine in the playback mode the performance was very poor. A further check showed that the upper and lower drum assemblies were both badly worn. There were just lines in the forward search mode, as if the scanning wasn't locked. The cause of all this was excessive back tension because the take-up brake arm unit (part no. VXZ0313) was broken. To restore good playback we had to replace this item and the complete drum assembly. J.C.

### Logic VR960

This machine wasn't completely dead - the display was alight, and standby was operational. But it wouldn't work. Circuit protector ICP201 was open-circuit. J.C.

### Panasonic NVG7

The cause of the capstan motor running at the wrong speed was faulty CTL pulses. C248 (1 $\mu$ F) had failed. J.C.

### Akai VSF30

If there's no display and no operation, check whether the 0.72 $\Omega$  safety resistor FR4 is open-circuit. If a new one fails, suspect D5 and/or D10 - check them by replacement. J.C.

### Akai VSF440

This machine wouldn't accept tapes. On investigation we found that the lead to the supply side end sensor had snapped off the PCB underneath the deck. G.T.

### Fidelity VCR4000

There was an awful grinding noise in the fast forward and rewind modes. A replacement capstan motor cured the problem. G.T.

### Samsung VIK326

There were power supply problems with this machine. It would start up, then trip. If any load on the secondary side of the circuit was disconnected the power supply would run. The cause of the trouble

was C35. Thank you Samsung Technical for help with this one. G.T.

### JVC HRJ600

Very occasionally this machine would lock up totally. If it was switched off then back on it would work normally for quite some time. We eventually traced the cause of the trouble to the back-up capacitor C608 which was dry-jointed at one end. G.T.

### Alba VCR7000

Tuning drift was the complaint with this machine. We noticed that there was a hum bar rolling through the picture. The cause was C501, which was dry-jointed. Resoldering restored normal operation. C501 is the smoothing capacitor for the 12V regulator Q503. G.T.

### Goodmans 3400

Channels could be changed only by remote control. Trying to change channels using the on-board controls had no effect. The cause of the fault was the non-volatile memory chip IC702. We've had this fault on several occasions. G.T.

### Grundig VS510

This machine was totally dead. I removed the power supply and soon found that there was just 2V at the 12V output. Moving to the primary side of the circuit, I connected the scope to C1326 (47 $\mu$ F, 25V) and found that excessive noise was present. C1326, which decouples the 10V feed to the TDA4605 chopper control chip, was in fact open-circuit. A replacement brought the power supply back to life. I also replaced C1325 (1 $\mu$ F, 100V). After refitting the power supply the VCR worked perfectly. G.R.

### GoldStar D17 Mechanism

For tape creasing/snapping tapes, caused by the take-up lever not catching the tape, fit modified take-up lever and cam assembly part no. 333-206A. The cam is modified so that the tape take-up arm is left in the parked position when inserting a cassette. The mechanism is used in the Matsui VCP550 player and Soundwave VCRs. G.R.

### Goodmans TX1200

This machine would intermittently die because of loss of the 6V supply. Checks showed that when the fault was present RD00's base voltage was missing. There was a hairline crack between the base of RD00 and R808 (220 $\Omega$ ). G.R.

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20 character 2 line, 83x19mm £3.99 ref SM2020A

16 character 4 line, 62x25mm £5.99 ref SM1640A

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**UNIVERSAL SPEED CONTROLLER KIT** Designed by us for the C5 motor but ok for any 12v motor up to 30A. Complete with PCB etc. A heat sink may be required. £17.00 REF: MAG17

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**VIEWDATA SYSTEMS** made by Phillips, complete with Internal 1200/75 modem, keyboard, psu etc RGB and composite outputs, menu driven, autodialler etc. SALE PRICE £12.99 REF SA18

**AIR RIFLES** .22 As used by the Chinese army for training purposes, so there is a lot about! £39.95 Ref EF78. 500 pellets £4.50 ref EF80.

**VIDEO SENDER UNIT**. Transmits both audio and video signals from either a video camera, video recorder, TV or Computer etc to any standard TV set in a 100' range! (tune TV to a spare channel) 12v DC op. Price is £25 REF: MAG15 12v psu is £5 extra REF: MAG5P2

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**6"x12" AMORPHOUS SOLAR PANEL** 12v 155x310mm 130mA. SALE PRICE £4.99 REF SA24.

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**4X28 TELESCOPIC SIGHTS** Suitable for all air rifles, ground lenses, good light gathering properties. £19.95 ref R17.

**GYROSCOPES** Remember these? well we have found a company that still manufactures these popular scientific toys, perfect gift or for educational use etc. £6 ref EP70

**HYPOTHERMIA SPACE BLANKET** 215x150cm aluminised foil blanket, reflects more than 90% of body heat. Also suitable for the construction of two way mirrors! £3.99 each ref O/L041.

**LENSTATIC RANGER COMPASS** Oil filled capsule, strong metal case, large luminous points. Sight line with magnifying viewer. 50mm dia. 86gm. £10.99 ref O/K604.

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**3" DISCS** As used on older Amstrad machines, Spectrum plus 3's etc £3 each ref BAR400

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Model AA-930



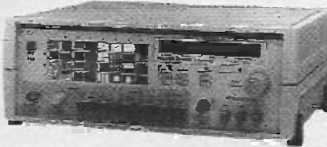
Multi-function meter. Measures distortion, wow & flutter, stereo power, signal levels in & out; generates audio test signals. Features include large clearly marked analogue meters. Performs the work of many individual instruments. £ 498

**Low Distortion Low Frequency Generator**  
Model GB-212



20 Hz to 200 kHz, harmonic distortion 0.02 % maximum over audio band. Frequency counter resolution as high as 0.1 Hz. 600 ohms impedance. Output level attenuation range 60 dB, with analogue meter for setting accuracy. Excellent output level flatness. £ 240

**Television Pattern Generator**  
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32 patterns, 32 internal memories. PAL/NTSC/SECAM standards, with I, B, G, H, M, M, N, D & K, NICAM, teletext all in one instrument. Optional on screen logotype. (Other pattern generators available from £ 210). £ 1428

**Functions Generators**  
Models GF-230 & GF-232



Two versions available: 0.1 z to 1 MHz and 0.2 Hz to 2 MHz. Producing sine, triangular and square waveforms, with variable symmetry. Excellent performance. £ 153 & £ 206

**Television Pattern Generator**  
Model GV-298



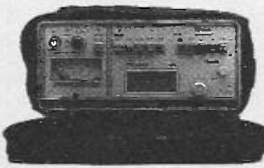
Compact high performance generator, RF and video outputs. Frequency range same as GV-698/11, 37 to 865 MHz. Circle pattern included. £ 433

**CRT Rejuvenator**  
Model TA-903



Similar to TA-901, but has three meters to monitor cathode current. Special technique allows repeated rejuvenation of CRT. Supplied in attaché style case, for easy field and workshop use. £ 498

**TV & Satellite Level Meter**  
Model MC-360



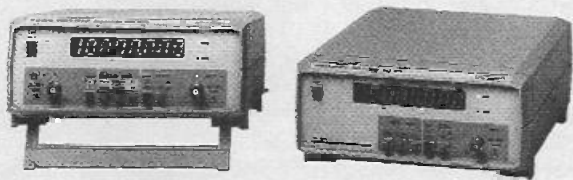
Ideal instrument for the professional installer of FM/TV aerials and satellite TV dishes. Covers 48 to 856 MHz and 950 to 2050 MHz. Lightweight, compact and rechargeable battery operated. £ 599

**CRT Rejuvenator**  
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An essential tool for every TV workshop. Promax have made many thousands. Supplied complete with a set of base adaptors. £ 235

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FD-250 covers 20 Hz to 160 MHz and FD-252 covers same plus, 100 MHz to 2.4 GHz. Large L.E.D. display. Wide performance at low cost. £ 153 & £ 206

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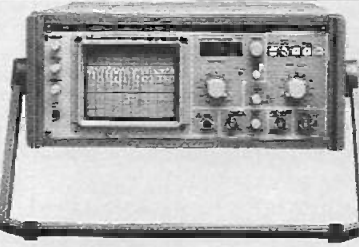
The aerial installers best friend. Calibrated for accurate signal level measurements. Digital frequency display ensures correct signal selection and identification. Built-in demodulator for easy station ident, and audible tone for easy positioning. This meter is light in weight, but has outstanding technical features. £ 299

**TV & Satellite Level Meter**  
Model MC-944



This meter has everything for the top flight installer of aerials, dishes, CCTV, MATV, SMATV and other systems. Features include TV monitor, spectrum analyser, sync pulse, teletext, printer output, 99 memories, tune-able audio subcarriers, etc. Full autocorrection for superb, unequalled accuracy! RS-232 as standard. £ 1949

**R.F. Spectrum Analyser**  
Model AE-566



1 to 1000 MHz, with 950 MHz to 1750 MHz option. Built-in tracking generator. Offers spanwidths from 1 MHz to 1000 MHz. Includes normalizer. This analyser is ideal for production and educational applications, as well as R-D. £ 2800



The company has been producing test equipment in Spain for over thirty years, earning a strong reputation for excellent engineering, quality performance at budget prices. The equipment is supported by Alban Electronics from their St Albans facility. These products are suitable for only professional and educational applications.



Prices shown exclude VAT and delivery charge. Most items available for immediate despatch.



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# What a Life!

**An answering/fax machine, VCRs, satellite receivers, TV sets and people give Donald Bullock trouble**

**S**teven has become indispensable to me. I can't repair half the stuff that comes in nowadays. It's not that I'm technically incompetent – any more than I ever was. That is – it's that I cannot operate so many of today's household electronic items. As Steven can work most of them, I need him to make sure that the dead set I'm trying to repair is dead because of a fault, not because it uses some quirky switch-on technique.

The present obsession for remote control doesn't help either. Half the time the customers don't bring the remote control units in with their sets, and when they do I've got about as much hope of working them as I have of piloting a Boeing plane across the Atlantic.

It seems that we are stuck with all these gadgets that bristle with features people don't want. Is it simply because the technology is there and the designers feel they have to incorporate it, or are the marketing people responsible? Whatever the answer, there's something wrong when a chap who fully understands the theory and practice of say colour TV can't switch one on. Why can't we have proper rotary on-off switches, and ordinary brightness and volume controls? Oh to see the back of flashing displays and masses of incomprehensible foreign symbols!

## The Fax Machine

I rue the day I spent £600 on my fax-cum-answering machine. It too looks like an aeroplane flight deck, and is a pain in the neck if I want to record telephone messages while I'm out. Although the machine is the biggest one I've ever seen, it uses a tiny tape about the size of a domino and has control buttons like tiny pills that live recessed under a flap.

Whichever button you find and press, the tape starts to race in one direction then the other, while the

machine bleeps and hoots like a demented canary. Its makers stumbled across a chip which stores a fleeting travesty of the sound that goes into it. When I record an answer message, which for my £600 mustn't last longer than twelve seconds, it goes (I think) into the chip then from the chip on to the tape. The tape dances around for a while, then the machine plays back what I've recorded. Twice. And despite my wonderfully clear diction, I end up sounding like Jimmy Durante in his cups.

I keep this machine as far away as I can – in Spain, where power cuts are frequent. Some last for only a second, but that's enough for the answering machine. While we're all wondering where the lights went, it plays my message back to us. I'm tired of this and of the machine! Will someone swap me a simple fax-cum-answering machine with two tapes, no voice chips, no all singing and dancing exhibitionism and controls that I can see and work? There's only one condition: I shall never want to see or hear of it again.

## No E-E

Yesterday we had three power cuts. As my message was played for the third time a grinning blob plodded up the drive. He was carrying a dismantled VCR.

"Ah, the man with all the answers!" said the blob.

"I don't even know the questions" I replied. At that he handed me a bottle of whiskey and I began to find him tolerable.

"All I did was to move it to another room" he said. I waved him away and decided to try the whiskey. The machine was an Amstrad 4600 Mk. 1, with no E-E pictures. Sound and playback were OK.

"Nice man" said Greeneyes, "do it cheaply. It can't be much if he only moved it to another room."

"But it's all in bits" I said, "some journey!"

I headed for the signal stages and spied a nasty-looking 1.000µF, 6.3V capacitor, C817. Was it a coupler? I set the machine to record and touched one side of the electrolytic with my scope probe. There was a nice, dancing waveform. At the other side there was nothing. A capacitance check showed that the electrolytic's value had fallen to 2µF. A new one restored the E-E pictures.

## A Pair of PRD800s

When the blob returned he was carrying a Pace PRD800 receiver. Intact, too.

"You won't believe this Mr Belcher" he bawled.

"I do believe it" I replied. That shut him up.

The trouble with the PRD800 was the usual power supply failure. I soon got it going, then found that while it produced unscrambled programmes it wouldn't produce the scrambled ones – nor even the nasty little order to insert the card. I got the manual out, felt a migraine attack coming, put it away then homed in on the decoder. Everything looked OK at first glance. Then I noticed that link L20, which sits proud of the PCB, was leaning over slightly. When I straightened the link it seemed to be loose. One end was dry-jointed. Soldering it properly cured the trouble.

## Deceptive BUT11A

When Mr Blob came to collect the PRD800 he had another one under his arm. It was identical. "This 'un's dead too" he announced.

I made for the BUT11A chopper transistor, which read all right. So did the mains fuse and the mains bridge rectifier. I then tested some of the parts I distrust. R14 (100Ω) and R8 (1Ω) were open-circuit

while C5 (22 $\mu$ F, 16V, 105°C) had fallen in value to 3 $\mu$ F. Just to be on the safe side, I also replaced the TEA2018 control chip. Then I plugged the machine in again, switched on and the fuse blew.

I sat back and reflected. Why hadn't I been a traffic warden or a social worker?

I looked at the BUT11A. Just the chap to blow fuses. So I checked it again, very carefully. It was apparently perfect. But I decided to replace it. Then I fitted a new fuse and plugged in again. This time it worked a treat.

Later I sent Steven a riddle. "When is a perfectly good BUT11A not a perfectly good BUT11A?" I asked.

"You've had Pace trouble" he replied. "I know. It seems to happen only with Pace receivers. The BUT11A reads perfectly but blows fuses. I always replace it regardless."

### Desoldering Braid

"By the way" he added "have you noticed how expensive desoldering braid is? £22 plus VAT for 100 feet! That's £66 for a 100 yards. And it's only fine screening wire impregnated with resin flux. You can buy 100 yards of heavy coaxial cable for less than a third of that."

"You can always make your own" I said. "Buy a 100-yard reel of light screened wire and a half litre of resin flux. It's not much of a job to strip the screening off to make your own."

### An Akura VX150

Harry Hogwash is a likable chap. It's just his silly manner. He called in yesterday with a VCR that didn't produce a clock display – an Akura Model VX150

"Only got back from Mexico last week" he said. "Wife dropped dead yesterday, and my daughter's just run off with an Eskimo."

"I suppose this recorder thing's troubling you as well" I said.

The video looked new but was out of guarantee. Being a budget machine, I could work it. The VCR accepted a tape, then immediately returned it.

I opened the machine and removed the top PCB. This took longer than it takes to say, because all the plugs and sockets have to be parted. Having won, I found that the cause of the trouble was obvious. Safety resistor R601 (2.2 $\Omega$ ) had been located in its holes but left unsoldered at one end. As a result it was making intermittent

contact. Resoldering it did the trick.

Harry, pleasant as ever, collected it the next day. "Must trot along" he said after paying up, "my father's had a heart attack, our garden wall has just fallen down and my boss has gone mental. Just one thing after another, innit?"

### Flighty's ITT TV

Then Mr Flighty pranced in with an ITT TV set. Greeneyes likes Flighty. I don't.

"Ha ha, Donny old chap. You're looking older, my boy. What is it now? Seventy? How's that lovely wife of yours? Never could see what she saw in you!"

Greeneyes appeared, smiling nicely. "Ooh hello Mr Flighty" she cooed, "nice to see you again. What's new?"

"I'm glad you asked that" he began.

I interrupted. "What's up with the KB – I mean ITT, Flighty?" I asked.

"Whining" he bawled, waving his arms. "Well it would here, wouldn't it? Har har har!!" And off he skipped. I gave Greeneyes a dirty look and she clopped off.

The set was one fitted with the CVC803 chassis, and the squeal was coming from the power supply. The HT voltage was very low. I've had this on several occasions. The cause is C757 (10 $\mu$ F, 350V), the smoothing capacitor at the HT output from the series chopper circuit. This one had fallen in value to 3 $\mu$ F. A replacement restored normal operation.

### A Gentleman?

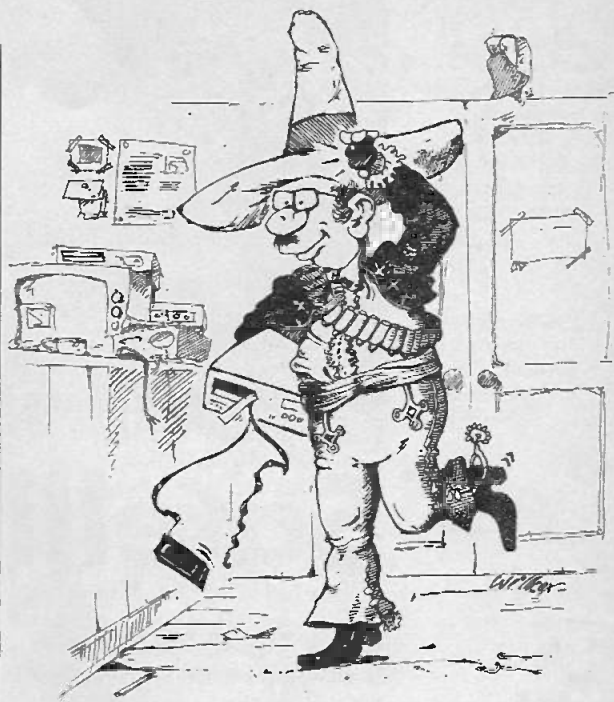
Our next customer looked normal enough. And well dressed too. I felt grateful. He came in, smiled and raised his hat. Then he waved to another fellow to bring the set in from his car.

"Pleased to meet you Mr Bullock" he said. "My name is Hodd. My set has been very good but has gone all snowy. Mrs Smith recommended you. I'd be glad if you would have a look at it."

"With pleasure" I replied.

The set was a Grundig C7500 (CUC731T chassis). There was no picture or sound, just a snowy raster. I made for the large tuner/IF can, opened it and found a burnt spot on the panel. After removing the carbon I bridged the print and up came a picture. But it was juddering, and there was no teletext. Two extra faults, field and text? As this seemed unlikely, I stayed with the tuner/IF unit.

After a thorough visual



examination I adopted my usual approach in such cases. I carefully removed the electrolytics, starting with the lowest values, and checked them on the bridge. Some were low and were replaced. When I switched on again I was rewarded with a good picture and perfect teletext. Just as I'd boxed the set up, Greeneyes came in with the tea.

"We need more customers like that" I said. "It's a treat to deal with a normal, tidy gentleman for a change. Makes you feel the job is almost worth doing."

Mr Hodd's big car showed up again next day. He came in, smiling, and raised his hat. Then Greeneyes came in and he raised his hat to her. A perfect gentleman.

"Ah, I see it's ready! Very good of you Mr Bullock" he said. "I hope it wasn't too much trouble."

I smiled, said it wasn't and reached for the bill.

He called his man in to carry the set to the car then, after a few moments' pleasant conversation, buttoned up his coat.

"Watch this, Mr Bullock" he said.

With that he walked out to his car, got into it and closed the door. The engine fired into life and the car purred smartly away.

Greeneyes watched it disappear, then turned to me. "Did he pay?" she asked.

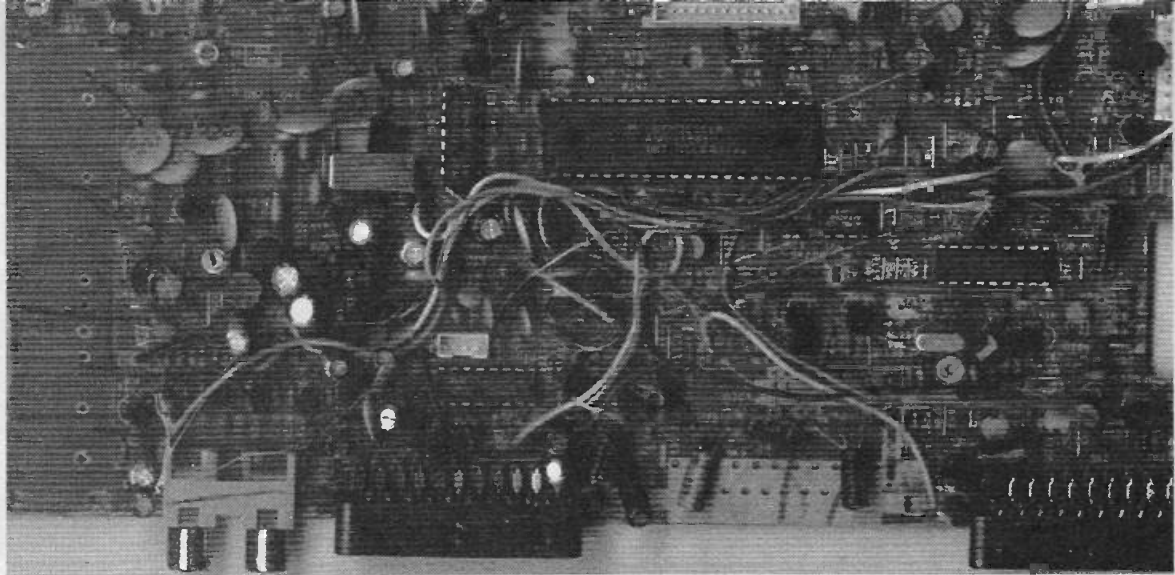
"No" I said.

She looked me up and down and shook her head. "So he's a normal gentleman and you want more like him!"

"I didn't know he'd turn out to be Hodd" I said, "I mean, er, odd." ■

"Only got back from Mexico last week"

Our picture shows a section of the Amstrad SRD510



# Satellite Notebook

Reports from  
Hugh Cocks,  
Chris Watton  
and  
Pete Haylor

## Weak Signal Problems

It's well known that the larger the dish the sharper its beamwidth/acceptance angle. Alignment is thus twice as critical with a 1.8m dish as a 90cm one. Quite a few of our customers watch the BBC Prime service via Intelsat 601 (27.5°W). To receive reasonable pictures from this satellite here in the Algarve the minimum dish size is 1.8m – and the dish usually has to be fixed to a concrete base in the garden.

We were recently called to check a system where the signal had deteriorated to the point at which the the MAC decoder was switching on and off. Normal causes of such problems can include insects in the feedhorn and receiver mistuning, but neither of these was to blame. The only other vertically polarised signal available from this satellite is Country Music TV, which looked very weak – thus absolving the MAC decoder. The dish was a fixed one and showed no signs of having moved in the wind.

When we connected the signal strength meter to the output from the dish we found that its elevation needed to be reduced fractionally. What often appears to happen is that the soil beneath the base dries out in the dry, summer weather. As a result the base moves a little. Unfortunately a 1.8m dish is a very good detector of such movement! Repeaking the dish produced excellent results.

To add to the difficulty of the already low signal strength, on rare (fortunately) occasions the strength of BBC Prime can fall by 1-2dB, possibly because of uplink site maintenance. This is enough to stop a MAC decoder doing its job. Unfortunately with MAC the

reception doesn't just become sparkly. Apart from some graininess with a weak signal, if its strength declines the decoder stops. This is infuriating, and leads to anxious phone calls from customers. You could say "get a larger dish". But if there's already a 6ft monster with a good LNB in the back garden, how much larger would you go?

Surely it would be quite simple to provide an on-screen indication when the power is reduced? Years ago this used to be done with terrestrial transmissions. H.C.

## Corroded Scart Plug

The reported fault, in a holiday villa, was "no sound". The picture was apparently perfect. I told the owner to ensure that the switch at the back of the Panasonic TV receiver wasn't in the "external speakers" position, as this disables the internal ones, but the setting was correct.

When I called I found that the sound could be restored by pushing very hard on the scart plug. This suggested poor scart socket connections within the set. After removing the plug however I saw that the pins were all badly corroded. The obvious thing that sprang to mind was that water had been spilt on the TV set, but it was working perfectly and there was no evidence of any spill elsewhere.

The back of the set was highly polished, as was the table on which it sat. It transpired that spray polish was regularly used on the back of the set as well as the front. It had leaked into the scart plug, causing the corrosion! H.C.

## Pace SS9000

The problem with one of these

receivers was loss of sound after it had been on for a while. "It just hisses", the owner said. The link to the TV receiver was at RF, so there could have been either UHF modulator or audio demodulator trouble.

We took the receiver back to the workshop and gave it a prolonged soak test. The fault seemed to be very reluctant to show up but eventually, after several hours, the receiver did indeed hiss – with a scart as well as an RF connection. This exonerated the modulator.

No audio at all could be heard. But when we went into the mono variable mode and tuned through the station we found that the hiss varied with the tuning voltage applied to varicap diode D19, which sets the local oscillator frequency. Flexing the board a little made no difference.

My first thought was that no baseband signal was arriving at the NE612N oscillator/mixer chip U18, but the scope said otherwise. Replacing the chip restored normal operation. It appeared to be oscillating all right, but didn't produce a 10.7MHz output. H.C.

## Palcom 650 IRD

According to its owner this receiver "would occasionally switch off". Switching on again would restore normal operation. The incoming mains supply was at around 215-220V and, judging by its weight, the receiver had a conventional power supply.

When I removed the top I found a small subpanel by the mains transformer. It housed a 220-240V reversible plug/socket assembly, the transformer being connected via the 240V tap. There was no label about

this anywhere – it simply said “220-240V AC” on the outside. I reversed the plug and the receiver has so far worked all right. The voltage must have been going just low enough for the receiver to switch off. We have a lot to thank switch-mode power supplies for – regulation for one thing, and the repair work they create when they go wrong for another!

It was also impossible to store channels. This was a problem because a new dish and an Astra 1D LNB had just been installed and all the channels had to be retuned. The only way to do this is by using a recessed button in the remote control unit. But the button had succumbed after being prodded over the years and now wouldn't work, though the remote control unit was otherwise OK. The remote control PCB 'store' area had slight marks/scratches, but appeared to be intact.

The solution to this problem was simple: I turned the remote control unit's rubber pad through 180°. As a result a normally sized rubber button was situated above the 'store' PCB area. I had to do some cutting out on the metal front to enable the button to protrude, but at least the channels could now be stored.

The remote control unit worked normally after this operation, though button eight was missing as this was now the damaged store button. The receiver lives in a bar, and remote channel change was not required. **H.C.**

### Cable Problems

We've had a spate of poor picture complaints recently as a result of the use of a particular type of coaxial cable between the dish and the receiver. Water seems to get in between the outer sheath and the braid during winter storms, though the pictures are not greatly affected at the time. Come the high summer temperatures however and the picture degradation is very rapid. Sometimes all frequencies are equally affected, suggesting that the LNB might be responsible, but more often the top end of the IF band is affected first, with sparklies on CNN and Disney.

The particular type of cable concerned has a solid inner conductor and copper foil/braid. Apart from slight braid tarnishing, the cable appears to be OK. What gave the game away was a badly corroded Belling-Lee coaxial plug connected to an early Grundig

receiver with a coaxial input socket.

All the installations involved were elderly, and some had self-amalgamating tape on the LNB connection. After a few years this becomes hard and brittle. With heavy rain, water can get in.

To cap this story, we've recently taken delivery of a quantity of Spanish-made coaxial cable. This works all right apart from a notch, about 20MHz wide, centred at 1,410GHz. If you don't mind not having Sky Sports 2 (or Pro 7 with an old 10GHz type LNB) it's just the cable for you! Previous batches of the same cable were OK. An interesting point is that even a short length of the stuff will notch out the signal. **H.C.**

### Amstrad SRD400

There were a number of complaints with this receiver: weak pictures; ragged verticals; intermittent sound; fast vertical jitter; and no on-screen messages with encoded signals. The intermittent sound was caused by TV receiver muting when the signal was poor. We've disabled the audio muting in our workshop monitors as it can be misleading.

We suspected the power supply, but its outputs were all correct and free of ripple. Checks in the video stages then showed that the unclamped signal was poor. Tracing the signal path back towards the tuner we came to coupling capacitor C704 (470µF, 10V) which was almost open-circuit. Fitting a replacement cleared all the symptoms.

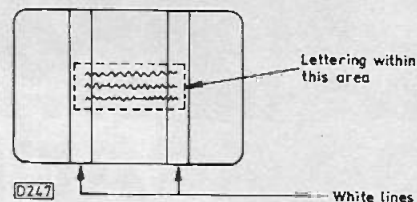
It's hardly surprising that the capacitors in these receivers fail: they heat up because people lay TV guides and such like on top. **C.W.**

### Amstrad SRD510

There was no picture though the sound was OK. Checks showed that there was no video input to the UHF modulator. The correct amplitude video waveform was present at pin 19 of the scart socket, and at pin 4 of the 4053 switching chip IC9. There was no signal at the base of TR17, but the signal was OK at the other side of R57 (1kΩ). Cold checks around transistors TR12 (2SA933) and TR17 (2SC1740) showed that they were both leaky. Replacements restored the modulator's video output. **C.W.**

### Tape

We were called to a system that has an 80cm dish with two LNBs, one for Astra and one for Eutelsat. Astra



**Fig. 1: The factory test display that appeared on a Pace MSS500 after a power cut.**

reception was OK, but Eutelsat was very poor, with MCM only just visible. A check at the dish, which was at a low level in the back garden, showed that nothing was loose and nothing had moved. But the tape on the LNB was not the self-amalgamating type originally fitted. So we removed it and checked the F connector.

There was a white powder around the threads. When this had been cleaned off normal reception was restored. It appears that this oxidation had occurred within about two months. So beware! **P.H.**

### It had to Happen!

There's always an argument about who should pay when equipment fails to work after a power cut. It has finally happened to me! Contractors working in the street outside cut the supply. The first thing I knew about it was when I returned to the workshop and noticed that the clock was flashing. I tried all the items that were in daily use. As they were all OK I forgot about it until several days later, when I switched the bedroom satellite receiver (a Pace MSS500) on and was greeted with the display shown in Fig. 1.

A call to Pace Technical revealed that this is a test pattern used in the factory and should not be obtained in normal service. If a general reset didn't provide a cure, it would be best to return the receiver to the factory. So each micro on the reset line within the receiver was reset, to no avail. A trip up north was looking likely. But the receiver was left on the shelf for later.

Later was several days after, when I switched the receiver on so that I could take an exact note of the fault symptom. Guess what? It had cleared! The picture was back to normal. Any ideas? **P.H.**

### Tip of the Month

**Ferguson SRD6:** To adjust the LNB's oscillator frequency, press menu then 4 then 9 and hold for four seconds. This puts you into the LNB set-up menu. **P.H.**

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# INTERNET MATTERS

**Why should I want to use the Internet? Martin Pickering helps you to find out if this new technology is for you. . .**

It's estimated that by the year 2006 everyone in the developed world will have an e-mail address. Not having one will be a little like nailing a board across your letter box! E-mail is already taking over from conventional mail in many ways. While it can never replace the parcel post, it will inevitably replace most letter post. Apart from the convenience of being able to send and receive letters, the Internet is also an unparalleled source of information. It's like living next door to a vast library that never closes. So, if you want to be able to send mail or have access to information of almost any kind, the Internet system is for you.

## What is the Internet?

Various organisations around the globe (mostly universities and other educational establishments) have set aside parts of their computer systems for use (free) by anyone. These computers are interlinked by a network of fast telephone lines so that they can send messages to each other continually.

Other organisations have set up smaller systems in cities and towns. These smaller 'Internet Servers' are connected into the main global computer network, acting as local access points - rather like your local post office. By means of a local phone call, most people can make a connection to one of these Servers and use it for access to

the entire facilities that the Internet offers. The service is not free. You have to pay a monthly fee (usually around £10) to the Service Provider, and you also pay your telephone company (BT, Mercury, ACC, Hull Telecom or whoever) for the duration of each phone call.

Bear in mind however that most business users spend rather more than £10 a month on envelopes and stamps, so there is actually an enormous cost saving to be had. Private users will not usually see a cost benefit for e-mail alone, but might justify the cost on the basis of convenience (not having to go to the post box or post office) and access to information (not having to go to the reference library or make endless long-distance phone calls to obtain travel information - trains, buses, air flights, for example).

## What equipment do I need?

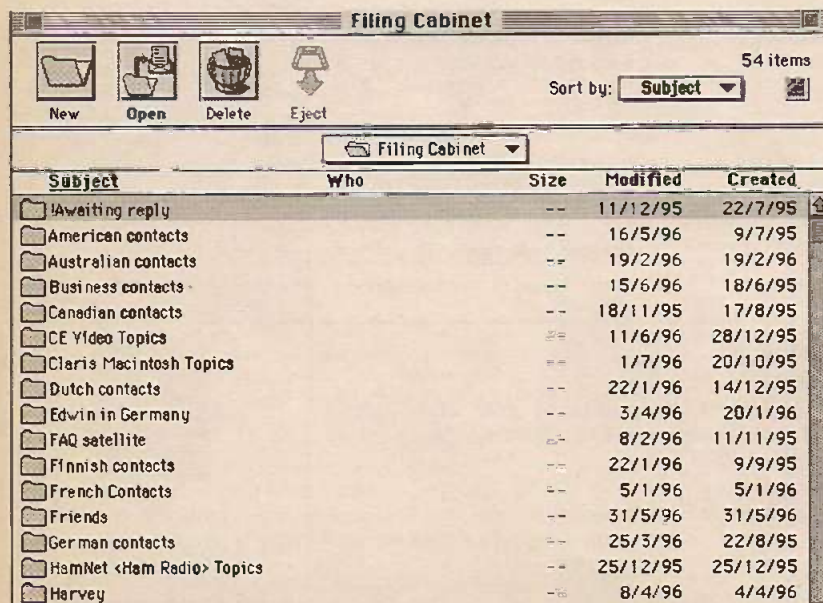
You will need a computer, a modem and a telephone connection, which you will use only occasionally while you are linked to the Internet facilities: for the rest of the time it will be free for other use, so your normal home telephone line is adequate. The computer should ideally be a Macintosh or one which supports some sort of 'Graphical User Interface' (GUI) such as Microsoft Windows. The limiting factor is that Internet software must be available for the one you choose. Many makes of computer, such as Atari, are quite well supported in terms of software availability, but it's wise to check on this if you intend to buy one specifically for Internet use.

In fact for e-mail purposes you don't need a GUI since e-mail is purely text-based. For ease of use and for providing access to other facilities however you would be well advised to buy a moderately fast computer that has some sort of Graphical Interface. I use a Macintosh because, historically, this has always been the standard for writers and publishers. Virtually any Macintosh model will cope adequately with Internet access. For IBM and IBM clones using Windows, you will need as a minimum a 386 with adequate memory or, preferably, a 486DX or faster to make it easy to use.

Beyond that a really fast Macintosh or Pentium machine will give very little advantage, because your modem speed is the limiting factor.

## The modem

A modem is a little box that translates your computer messages into tones which are fed down the telephone line. For e-mail use you could manage with a modem that runs at a speed of 2,400 baud, but this would be useless for anything other than e-mail. Ideally you should use at





least 14,400 baud. If you are buying new, the extra cost of a 28,800-baud modem is worth considering. You can sometimes save money by buying an 'internal modem' that fits inside your computer. If your computer has no facility for this, you must use an external modem and connect it to the appropriate socket (usually the 'modem' socket on a Macintosh, though some use the 'ADB' keyboard socket). With other computers it's likely to be the serial port. Be absolutely sure, when you buy a modem, that it has the correct instructions and connecting cables for your computer. If it has no BAPT Approval sticker (green circle) you might find it has an American telephone socket and will need an adaptor.

If you get a fax-modem you will also be able to send and receive facsimiles by computer. This is another consideration that comes down to cost and convenience. For example, although I have a dedicated fax line in my office, I use it mostly for receiving. Orders and fax messages are easier to send direct from my computer via the normal voice line.

### How do I get connected?

I would astrongly recommend that a newcomer signs up with CompuServe or America On Line (AOL). Provided you are using either a Macintosh or Windows, they will supply you with free software. It contains everything you will need, and installation is much easier than anything else available.

CompuServe and AOL will provide you with e-mail facilities and access to 'forums', where you can type questions and receive replies - rather like a bulletin board. There is a forum for just about every subject imaginable. It will cost you around £6 per month subscription, plus some additional charges for forum access plus your telephone charges. Note that unless you are a company and can get a monthly credit account CompuServe accepts subscriptions only by credit card. You can cancel at any time - there's no minimum commitment of twelve months or other frights in store!

If you find that CompuServe or AOL does not give you the facilities you want you can subscribe to a local Service Provider. In this case you will probably have to rely on 'shareware' program software, which is not as easy to set up. Some Service Providers are more helpful than others, and provide this software plus any technical help without charge. Others either don't provide software or else charge for it. My advice is to ask your friends about their experiences. Read Internet magazines to get comparisons of the performance of Service Providers, also their telephone numbers.

Macintosh users will need to obtain copies of 'ConfigPPP', 'MacTCP' and 'PPP'. This is to enable the modem to communicate with the Service Provider's computer. For e-mail you will need something like 'Eudora' (free) or 'Claris EMailer'. For other types of Internet services you will need 'NetScape', which is currently at version 3.0 (but version 2.0 is fine). NetScape is also available for Windows. For e-mail you might prefer 'Free Agent' to begin with (free), or you could buy 'Agent'. 'Pegasus' is another. There are many other software choices available for both platforms, so ask your friends and get a demonstration if possible.

### What should I buy?

I'm not going to consider the cost of the hardware: you have a choice of buying new or second hand, and the variety of equipment is enormous. If you've never used a computer previously, my advice would be to buy a Macintosh. This is not the cheapest option initially, but it is easier to set up and use and you won't need to buy a lot

Messages in folder "Australian contact"

Files Reply View Forward Edit File... Opt

From: Martin Pickering, 100353,6002 Sent:  
 To: 1 Martin Pickering, 100613,2105 Rcvd:  
 Subject: PICKERING 993 c

Hi Martin,

Thanks for your note. No I had not known of a town called P Yorkshire but have certainly visited Yorkshire and have fond memories of my visit to Mother Shipt Knaresborough? as a boy. (1971)

I was born in Welwyn Garden City in Hertfordshire in 1963 an Australia with my parents in 1966. We came to Australia voluntarily which as you point out is the origins of the Pickering name! (Which by the way I was

Relatives on my mother's side are mainly from Lancashire whi not far from Yorkshire. My father's side originate from Whitburn which I think is near

of extra hardware later on. Make sure that you get the supplier to 'bundle' as much Internet software as possible with the computer.

If you are a real 'techie' you've probably already got a Windows machine with additional 'sound blaster' cards, memory SIMMS and the knowledge to get it all to work!

### Is e-mail easy to use?

Once the software has been installed and the appropriate information added, you should find e-mail no more difficult to use than the simplest wordprocessor. The initial setting up is the most frustrating time. There are a few terms, such as 'IP Address', that are quite baffling and require you to type in a series of numbers. You will probably want or have to use a password. All in all, you can expect to spend at least an hour on the telephone while somebody from the Service Provider talks you through the setting up procedure. It took me about a week of telephone calls to CompuServe before I could get e-mail to work. If you can find someone locally who has the same type of computer and Internet access they should be able to guide you.

You will also have to set up your Internet software to control your modem. Again, there's a baffling series of

Messages in In Basket

Messages Reply View Forward Edit File... Options Delete

From: Tomasz Urbaniec, INTERNET:urb@polb.com.pl Sent: 18/6/96, 1:19 pm  
 To: 1 Martin Pickering [uk1], 100613,2105 Rcvd: 18/6/96, 4:20 pm  
 Subject: Parts needed 1538 characters

Sender: urb@polb.com.pl  
 Received: from uucp.polb.com.pl (uucp.polb.com.pl [194.92.233.31]) by ...  
 Received: from urb@polb.com.pl (dialup220.polb.com.pl [194.181.68.220])  
 OAA16881 for <100613.2105@CompuServe.COM>; Tue, 18 Jun 1996 14:18:48 +0200  
 From: urb@polb.com.pl (Tomasz Urbaniec)  
 To: 100613.2105@CompuServe.COM  
 Subject: Parts needed  
 Date: Tue, 18 Jun 1996 14:07:35 +0200  
 Message-ID: <HwpxxkMACajf084yn@polb.com.pl>  
 Lines: 23  
 X-Mailer: uka\_ppp 1.1

Martin,  
 thank you for the SPD600 info first.

I would very much appreciate your fast response on the following

Fixed Margin

characters to type in. If you are in doubt, my advice is simply to use 'AT' as the modem initialisation string. This is often sufficient to get it running. You can always 'fine tune' it later.

**What can I use e-mail for?**

Look at the letterheads and business cards of friends and acquaintances. If any of them include an e-mail address, you can contact them immediately. Otherwise you will have to write to them by conventional 'snail mail' to ask if they have an e-mail address. Once you begin to use the forums in CompuServe or AOL you will rapidly make contact with other users, and the danger is that you will end up with too many friends!

With e-mail you can type your message off-line (i.e. without being connected to a telephone), just like a fax. You can type several messages, then connect to the Service Provider and 'post' them all with a single, short duration, low-cost local call. If you are sending faxes you will probably have to make several separate telephone calls, some of which will not be local. In fact if you fax

America or South Africa from England it can be quite expensive. A further advantage of e-mail over fax is that you can send copies of a message to a large number of recipients. This is an extremely cheap way to carry out a mail-shot! You type the message once and 'upload' it to your Service Provider via one local telephone call. Afterwards, while you are no longer connected, the Service Provider's computer sends your message to each recipient.

A word of caution here. You must not send advertising mail shots to people who might not wish to receive them. Not only is this frowned upon, but it could result in your incoming 'mail box' becoming swamped with complaints. For sending information bulletins to colleagues or friends however it's ideal.

If you have friends or relatives abroad, keeping in touch suddenly becomes much easier.

**Next time**

In a follow-up we'll look at other facilities that the Internet provides. ■

# 20% reader discount Audio signal generator

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

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

**AG2601 audio generator – specifications**

**General**

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

**Sinewave characteristics**

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

**Squarewave characteristics**

Output voltage	15V pk-pk, min
Rise time	0.5µs

**Synchronization input**

Input impedance	10kΩ
Maximum input	10V rms

**Supply**

115/230V, 50/60Hz

**Physical data**

Dimensions	150 by 250 by 130mm
Weight	2.5kg

\*Test leads supplied as standard



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

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Company (if any)

Address

Phone number/fax

Total amount

£.....

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

Card type (Access/Visa)

Expiry date

Card No

Please mail this coupon to Vann Draper Electronics, together with payment. Alternatively fax credit card details with order on 0116 2773945 or telephone on 0116 2771400. Address orders and all correspondence relating to this order to Vann Draper Electronics at Unit 5, Premier Works, Canal Street, South Wigston, Leicester LE18 2PL.

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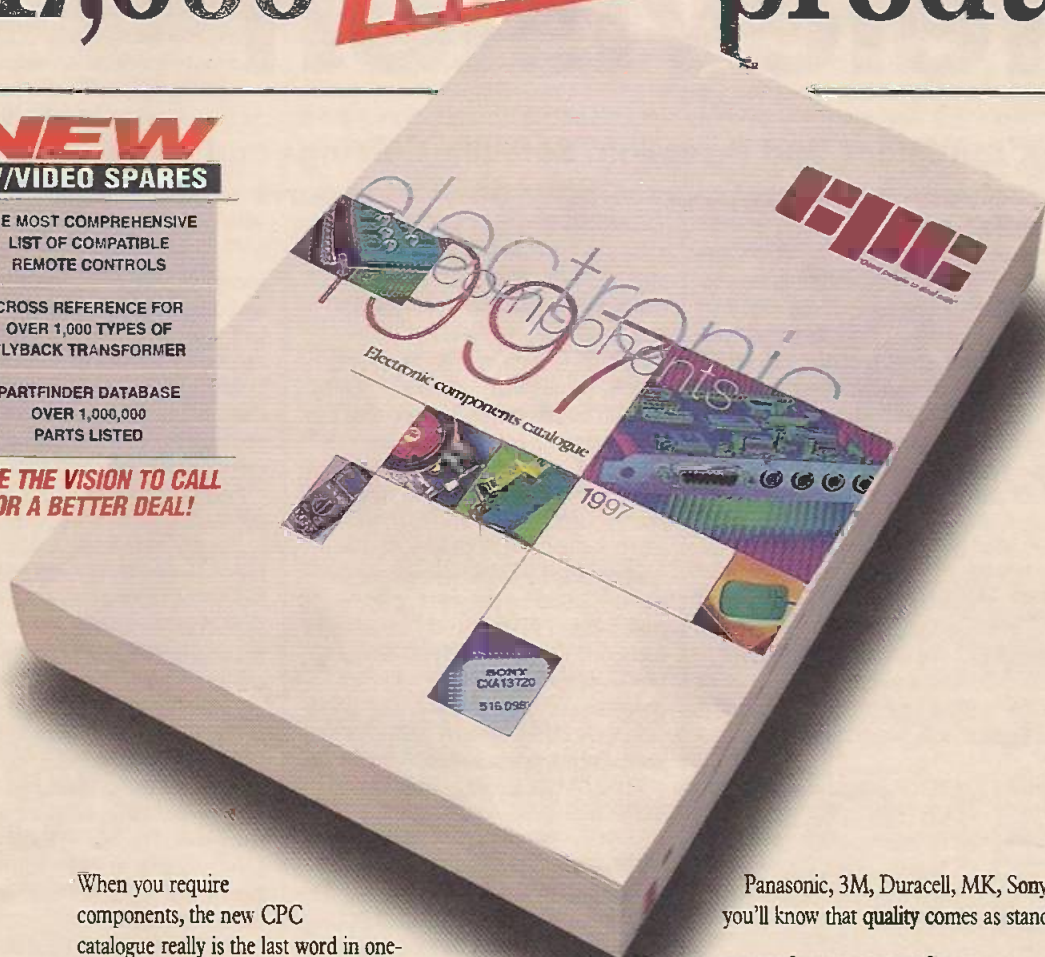
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# Long-distance Television

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

The beginning of October brings us to the quietest time of the year for DX-TV reception. Prior to this there had, in contrast with earlier expectations, been a remarkably poor Sporadic E season. Those with experience in this field have come to expect excellent SpE conditions when the sunspot cycle is at its minimum. This particular solar cycle presented us with the opposite.

Autumn often brings settled, high-pressure weather conditions, which produce good tropospheric reception conditions. We are still waiting. In all, it has been a very poor year.

Here are the sparse SpE loggings for September:

- 8/9/96 RTP (Portugal) ch. E3; TVE (Spain) E2.
- 23/9/96 RTS (Serbia) E3; HRT (Croatia) E4; TVA IA and Video E2 (both Italy).
- 29/9/96 TVE E2.

There was a slight lift in tropospheric conditions on September 15th, giving Band

III/UHF reception from France and the Benelux countries in the south and south-east of the UK.

George Gaskin reports that reception in Gibraltar has been very poor.

Todd Emslie (NSW, Australia) has been using an Icom R7000 scanner with a 14-element wideband Yagi array to listen out for Band III meteor scatter signal pings in chs. 6, 8 and 11. It enables weak tropospheric-scatter video carriers just above the noise level to be detected at up to 450 miles. Band I is relatively clear at his location. The few 49MHz cordless phones there mainly use vertical polarisation. The problem they cause is largely eliminated by using horizontal aerial polarisation.

The 50MHz amateur radio magazine *Six News* reports that the first solar spots in cycle 23 were seen on May 10th. It concludes that "the minimum between cycles 22 and 23, and the official start of cycle 23, may not occur until May 1997". A US source suggests that the solar spot minimum will occur between May 1996 and January 1997 however.

There's general agreement that the 1996 SpE season got off to an excellent start during late April, continued through May into early June then simply faded away.

## Satellite Sightings

There have been many analogue TV signal feeds via Orion 1 at 37.5°W in recent weeks. IBM leased a large chunk of transponder time on September 25th, and at 1500 hours launched a presentation on the company's new OS-2 software package. The launch, in San Francisco, started early in the morning, with live street scenes, vox pops and the use of a large presentation theatre. A pity that there was a

complete lack of lip sync, with the audio leading the video by perhaps half a second. This was undoubtedly caused by the use of several in-line field stores and standards conversion. IBM should buy its facility house an audio delay unit before the next commercial launch!

Another transatlantic offering that day consisted of a live mid-morning space presentation, with interviews between NASA (Earth) and the MIR/Shuttle space vehicles – Dr Shannon Lucid was returning from MIR to terra firma after six months in orbit.

As the leaves fall from the neighbouring trees here, the signals from Eutelsat II F3 at 16°E are clearing of mega sparklies. September 24th produced a feed from RTL Bucharest back to Luxembourg, at 2215, with the Newsforce UKI 71 truck providing the uplink facility.

The Pope's 1996 Tour de France was carried live via Telecom 2C at 3°E on the 21st. It was a moving and remarkable occasion. Coverage continued on the following day, culminating in his departure via Air France, complete with guard of honour.

There's been much for golf enthusiasts, with the Loch Lomond championships on the 20th via Orion, at 11.58GHz vertical, for the BBC. The Sarajevo uplink was used by UKI 148 to provide a feed to Reuters TV, London, which now uses Intelsat K (21.5°W) – this is a very strong signal. During the war period the Sarajevo uplink had usually been via Intelsat 603 at 34.5°W.

There have been several reports of reception of test pictures from the new Arabsat 2A craft at 26°E. The signal level is very low, considerable

**PALplus 16:9 aspect ratio test pattern transmitted by Nozema Ned 2 and displayed by a Sony Trinitron receiver.**



threshold extension being required to lock the picture. Qatar-TV has been seen at 12.521GHz horizontal and ARS-TV at 12.536GHz vertical. The satellite has at least 12 Ku band transponders plus 132 medium- and 7 high-power C band transponders.

Julian Redwood (Christchurch) is now monitoring both the Ku and C bands. He has improved his Corotor 2 Chaparral feed by fitting a locally-machined feed holder – it's made of a tough plastic called Delrin. This has resulted in a slight improvement in band C but a considerable enhancement in band Ku. There has been comment about the Corotor 2's reduced efficiency in band Ku: it looks as if Julian has overcome the problem. New signals he mentions include a Russian channel, M49, via the satellite at 40°E (frequency 3.992 GHz), and the TVM feed to Madagascar via Express 2 at 14°W (frequency 3.818GHz).

Dave Hawkey (London) has provided information on the sound-in-sync (SIS) system, which was invented by the BBC in the late Sixties. While Dave was working in the industry on the '88 Olympics, he took in a clean stereo feed from Seoul with the audio digitally encoded into the field blanking period, a system called VIMCAS. When a standard SIS OB feed also carries conventional subcarrier audio it should be possible to recover both signals easily. You sometimes get this with the Eutelsat II F4 feeds (at 7°E). The SIS decoder is inserted to extract the SIS audio, while at the same time taking the conventional carrier. Often the two audio signals are a mix of commentator and effects, the audio carrier being just for effects.

John Locker (Wirral) reports that the autumn Solar Outrages occurred over October 10-16th, with a partial afternoon eclipse of the sun on the 12th. The Solar Outrage period occurs twice a year, when the sun tracks east-west across the sky directly behind the satellites in geostationary orbit. As the sun passes behind each satellite, dishes are aligned with both the satellite and the sun. Thus solar radiation is picked up, adding noise to the signal.

### Terrestrial News

**UK:** Channel 6 is the name of a proposed low-power text/audio based TV service planned for Edinburgh. The free transmissions would consist of a local radio programme plus hundreds of text information pages, using ch. 34. A licence is being sought from the DTL.

The five-year allocation of ch. 35 for the Channel 5 service will enable more higher-power transmitters to be used, particularly in the south where output powers are restricted in ch. 37 because of possible interference on the Continent.

It seems that the Restricted Service Licences (RSLs) used for temporary 28-day low-power MW/FM transmissions may be extended to TV use – there would be potential for DX-TV RSL chasing! The FM radio transmissions usually operate at up to 25W with an aerial no more than 20m above local ground level. So users select a high hill for the remote transmitter and as a result coverage can be extensive.

Now that there is a PMR (private mobile radio) allocation in Band I, Diplomat Communications has introduced fixed/mobile VHS transceiver Models SX-T and SX-S, which include operation at 55.75-67.5MHz, offering 19 or 95 channel options, trunking etc. Band I PMR is likely to become active early next year.

**Slovakia:** A new national commercial service, TV Markiza, has opened. Initial coverage is over sixty per cent of the population.

**Finland:** Widescreen transmissions have started from Tampere. The MTV-3 service has applied for the fourth national TV franchise. City-TV has applied for a licence to operate in Helsinki.

**Lithuania:** For the record, Baltijos Televizija is using PAL and Secam transmissions at different times of the day!

**Azerbaijan:** The new 310m high TV tower at Baku has opened, carrying radio as well as TV transmissions.

**The Netherlands:** The Rotterdam-Waalhaven ch. E49 transmitter, aerial and all equipment have been removed: the ZH-TV service will not be resumed.

**Australasia:** The ABUN Glen Innes ch. 0 transmitter in NSW has closed, moving to ch. 50. Very few ch. 0 transmitters are still in operation in Australia – but new Band I transmitters continue to be opened in New Zealand.

### Satellite News

John Womersley (Yorkshire) tells us that in the new year AFRTS (the American Forces Radio and TV Service) is to drop B-MAC and adopt



**A Chaparral LNB fitted to a prime-focus dish. Amalgam tape is used on the F connector and the knuckle bend to prevent moisture ingress. Tape the cable to the LNB support arm, then use a plastic tie. It's essential that the tape and tie hold the cable without crushing or pinching it, otherwise signal loss and standing waves will be experienced.**

MPEG-2 compression. At least one UK firm has been selling B-MAC decoders for AFRTS, so be warned.

French Telecom's 2D satellite has been successfully launched. It will take up position at 5°W, alongside 2B.

Music channel VH1 is expanding its coverage across Europe, with a Scandinavian service via Sirius at 5.2°E and a service to eastern Europe via Hot Bird 1 at 13°E. These services will be free initially, dependent on advertising revenue.

There has been some confusion recently about the Intelsat slots for

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(All above prices are inclusive of VAT, delivery by courier £9.00)

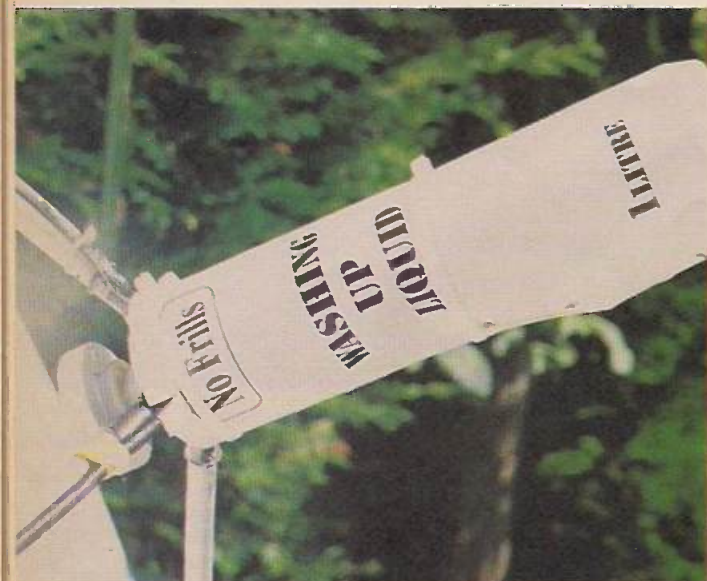
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# Aerial Techniques

**11 Kent Road, Parkstone, Poole, Dorset BH12 2EH**  
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**A washing-up liquid bottle can be adapted to provide a cheap yet effective weatherproof housing for an expensive LNB used with a prime-focus dish.**

coverage of the Atlantic region – Intelsat is in the habit of shifting its satellites around. John Locker has checked via the Intelsat Web site and reports that, as of late August, the situation is as shown in the box below.

Intelsat VIIIA (not included in our table) is listed as being at 56°W and 40.5°W! The organisation has announced its intention to position a high-powered Ku band satellite at 65°E to provide DTH services in SE Asia, Australasia and the Pacific rim.

56°W	Intelsat VII	27.5°W	Intelsat 601
53°W	Intelsat 706	24.5°W	Intelsat 605
50°W	Intelsat 709	21.5°W	Intelsat K
40.5°W	Intelsat 512	21.3°W	Intelsat 515 & VIII
34.5°W	Intelsat 603	18°W	Intelsat 705
31.4°W	Intelsat 506	1°W	Intelsat 707

News Corporation plans to start a 12-channel JSKY service for Japan in mid-1997, via the JC-SAT-3 craft, expanding to 100 channels by 1998 with the prospect for more.

A Star TV DTH service is planned for India early next year, via PAS-4. AsiaSat-3 is to be launched during 1997 at 105.5°E, replacing AsiaSat-1 which will move to 122°E. AsiaSat-4 is to be launched in 1999, with C, L, K, Ku, Ka and X band transponders. Apstar-1A is now in position at 134°E and is at present downlinking six Chinese TV channels.

Yousuf Ebrahim has sent us a copy of his authoritative newsletter *Satellite Search*. He also runs a satellite supply/installation company called Xpert Services. The newsletter covers Asian channel developments and orbital positions. Readers in this part of the world can contact Yousuf at 15-C, Ittehad Lane #2, Phase II

Ext., Defence Housing Authority, Karachi, Pakistan. Phone 588.0285/fax 589.3963.

#### Guide to Sat-zapping - 4

There remains the receiver itself to consider. You can of course go for the most expensive type available, with all the add-ons, but this is not necessarily the best approach. A simple manual receiver will give you as much pleasure. I've long favoured manual receivers of the Echosphere SR1000, SR50, RR50 type from Benjamin/Winersat. Many other manual receivers are available on the second-hand market, often at very cheap prices. They are still produced in vast quantities for the Asian markets.

Manual receivers are easy to use. You will often find that variable IF and audio bandwidths are available as front controls. Such receivers are generally simple to modify, say with a threshold extension board to change a typical 7dB threshold to 3-4dB. But perhaps the most important point is that the whole FSS band (10.95-11.7GHz) can be checked from one end to the other in about ten seconds for say the vertically-polarised channels, then checked back for a further ten seconds to cover the horizontally-polarised channels. A current remote-control receiver will, if it displays frequency, take up to a hundred seconds for a single sweep.

Manual receivers rarely indicate frequency, though one Benjamin-sourced, Turkish-badged receiver was calibrated in IF. The standard coverage of manual receivers is 950-1,750MHz, never with enhancement. The second IF is usually 70MHz, which can cause image problems (2 x 70MHz) if you use a large dish (1.5m) with say Hot Bird. Few manual receivers seem to have decoder looping, so the descrambled video must go to a TV receiver's scart socket or a VCR video input socket.

New manual receivers can be obtained from Aerial Techniques (see advertisement on page 135 for the address etc.). Being special imports they tend to be expensive: Satellite dealers or the 'for sale' section of *What Satellite TV* are the best places to go to for a second-hand manual receiver.

Current models that feature on-screen menus, IR remote control and hundreds of memory channels are used by many DXers. Some have a low threshold as standard, say around 5dB, with extension reducing this to under 3dB.

As a guide to successful sat-zapping, you need to be able to tune/scan quickly and display the frequency, preferably on the receiver's front panel when there is no OSD output option to the TV set (often via a scart lead). Normal functions – polarisation/skew, bandwidth, audio tuning, threshold (if available), IF extension and decoder looping – should be readily accessible, also such options as filtered, clamped/unclamped baseband video, 14/18V LNB switching and, if you are into C-band operation, video polarity inversion etc. Speed is the vital point, so that when you find that rare, exotic feed from say the Cook Islands you don't have to get involved with menu hunting for parameter changes.

In addition to my favourite manual machines I use two remote-control receivers. The Echosphere LT730 is an easy receiver to operate. It has a front panel frequency/parameter readout, no OSD and all the basics except, oddly, no decoder looping, and is still available for around £240. The relatively new Chaparral M60e is a menu-driven receiver that works very well for the price, about £210 retail (it's actually a badged unit that comes from Taiwan). You'll find that after an hour or so of practice it is simple to use – there are only three short menus to skip through (plus sub-menus) and all the facilities you need. Decoder input selection (BB/PAL/MAC etc.) is by means of internal links, which is rather inconvenient. A disadvantage is that the chopper power supply radiates MW/SW interference. Neither of these receivers has an internal positioner.

I've also been using a current Provision V receiver that comes from Korea and has a price tag of about £280. This is a more formidable – and beautifully made – unit with an internal positioner. It's heavily menu driven: though the parameters available are very extensive, I find it laborious to use when quick results are the main aim. But I know many enthusiasts who have bought these receivers, operate them successfully and are more than happy with them.

Another sat-zapper enthusiast I know uses the latest SCT Monterey receiver. It has all the add-ons, is combined with domestic entertainment and costs over £2,000.

The choice is yours and depends on your home and personal needs. If any readers wish to write in to comment on their experiences with particular receivers, please do.



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# Caltek CM2700

## Test Report

# DMM

**Steve Beeching examines an inexpensive digital multimeter that's ideal for the cash-strapped engineer or workshop**

Lack of funds is something we are accustomed to in the consumer electronics servicing industry. One consequence of this is that engineers are not known for their enthusiasm for purchasing new gear. So a new digital multimeter from Caltek is welcome. Why? Because it's good, and cheap. Known as the CM2700, it does not sacrifice performance for price.



### Specification

The display is of the 3 3/4 digit type, with the fourth digit restricted to displaying 1 or 3 (because of the ranges – see below).

DC voltage ranges are 320mV, 3.2V, 32V, 320V and 600V. AC ranges are from 3.2V to 600V. Accuracy is within 1.2 per cent plus two digits – with the 320mV range it's 0.8 per cent plus two digits.

DC and AC ranges are 320µA, 3.2mA, 32mA, 320mA and 10A. There's a separate connector for the 10A range, which has a limited measurement period of 15 seconds – the meter may be damaged if this is overlooked.

Resistance ranges are 320Ω, 3.2kΩ, 32kΩ, 320kΩ, 3.2MΩ and 32MΩ. For most ranges the accuracy is given as 1.2 per cent plus five digits. With the 32MΩ range it's 3.5 per cent plus five digits. This is substantially more accurate than required to check whether a high-value resistor has gone even higher, as they tend to do.

The same rotary switch position selects a continuity test or diode check. At switch on you get the continuity test: the centre push-button at the top switches over to the diode check, toggling between the two.

Take care when carrying out continuity checks: the drive voltage can be as high as 1.2V, which could damage an IC. If the loop resistance is above 18Ω, the continuity beeper may not sound. In the diode test mode, forward

voltage between 0.4-0.7V can be measured. Not much use you may say, but more and more VCRs are using diodes as voltage droppers from a 6V line to obtain the more critical 5V microcontroller supply. The meter cannot measure diode reverse leakage.

### Plus Points

I particularly liked the bar graph below the reading, to indicate where you are within the measurement range. This is useful when the expected reading is not known. Ranging is automatic, but you can set it to manual and then step up or down, using the bar graph as an under- or over-range indicator. The meter reverts to auto operation when the selector switch position is changed.

There are two voltage test conditions. I wasn't sure why until I read the small print. The first provides automatic AC/DC selection. Under certain circumstances however the meter can be fooled, for example when a high AC ripple is present on a DC voltage. To overcome this problem the second position is used, with the centre, top push-button giving manual selection of AC or DC. The current ranges are all automatic.

I've saved the best feature until last – the hold button. How many times have you carried out a measurement then, after removing the probes, forgotten it? So you have to check again. By storing the measurement until you release it, the hold button saves you from these memory lapses. I have to admit that with two hands holding the probes in a difficult position it can be tricky pressing the hold button – think about it!

### Verdict

Overall it's a nice, accurate little meter. There's an optional rubber boot that can be fitted on to provide protection when the meter is slung about in the workshop or toolbox. Price? Just £34.50 plus VAT – about half the usual price of a basic digital meter.

The Caltek CM2700 is available from Willow Vale Electronics Ltd., 11 Arkwright Road, Reading, Berks RG2 0LU (01189 876 444, fax 01189 867 188) under order code 12270CM. My thanks to Willow Vale for providing the sample to play with. ■



## TELEVISION INDEX/DIRECTORY AND FAULTS DISCS PLUS REPRINTS SERVICE

### INDEX DISC

Version 4 of the computerised index to TELEVISION magazine covers Volumes 38 to 45 (1988 – 1995). It has thousands of references to TV/VCR fault reports and articles, with synopses. A TV/VCR spares guide, an advertisers list and a directory of trade and professional organisations are included. The software is easy to use and very quick. It runs on any IBM or compatible PC with 512K RAM and a hard disc. Price £30 (3.5"HD, alternatively 3.5DD" or 5.25" if required) Those with previous versions can obtain an upgraded version for £15. Please quote the serial number of the original disc.

### FAULT REPORT DISCS

Each disc contains the full text for TV, VCR, camcorder, satellite TV and CD fault reports published in individual volumes of TELEVISION, giving you easy access to this vital information. Note that the discs cannot be used on their own, only in conjunction with the Index disc: you load the contents of the Fault Report disc on to your computer's hard disc then access it via the Index disc. Fault Report discs are now available for Volume 39 (November 1988 – October 1989); Volume 40 (November 1989 – October 1990); Volume 41 (November 1990 – October 1991); Volume 42 (November 1991 – October 1992); Volume 43 (November 1992 – October 1993); Volume 44 (November 1993 – October 1994); Volume 45 (November 1994 – October 1995). Price £15 each (3.5"HD, alternatively 3.5"DD or 5.25" if required)

### REPRINTS

Reprints of articles from TELEVISION back to 1986 are also available: ordering information is provided with the index, or can be obtained from the address below. Hard copy indexes of TELEVISION are available for Volumes 38 to 45 at £3.50 each.

All the above prices include UK postage and VAT where applicable. Add an extra £1 postage for overseas EC orders, or £5 for non-EC overseas orders. Cheques should be made payable to SoftCopy Ltd. Allow 28 days for delivery (UK).

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## Answer to Test Case 408

- See page 93 -

Microcontroller faults can be difficult to deal with, especially when there are three separate processors that have to work together before anything can get going properly. But surely Sage can handle this sort of thing? After all, he's supposed to be the bee's knees when it comes to technical conundrums. But we've seen where his real interests lie: in the pleasures of the flesh, it seems, rather than the delights of digital fault diagnosis.

Sage's quest finally took him to pin 23 of the timer chip IC751. A 50Hz squarewave input derived from the mains supply should be present here, perhaps to pace the real-time clock. Perhaps, but whatever it does it's certainly vital to the functioning of the chip. In fact pin 23 was stuck at 5V, because transistor Q754 in the feed to it was cut off. There was no discernible activity at the base of this transistor, though a healthy 50Hz feed from the power supply was trying to get through the coupling capacitor C756.

Downstream from C756 one comes to the 1SS133 diode D753, which was the culprit. It was leaky – the meter produced a reading of about 1kΩ.

A new diode brought the whole shooting match back to life, notwithstanding the signs of corrosion on the front panel. When these had been cleaned off the machine went back to the customer, with a bill for labour that was about a thousand times the price of the diode. . .

## NEXT MONTH IN TELEVISION

### Servicing the Philips G90AE Chassis

The G90AE was introduced in 1989 and proved to be a popular and reliable chassis. As in other chassis introduced at the time, extensive use is made of surface-mounted components. Faults are mainly restricted to the power supply, for which Philips has introduced a repair kit. Richard Newman on the best way to tackle these sets.

### Substitute for the Sanken STR442/453

The Sanken STR442-STR453 series of three-terminal chopper ICs have been obsolete for some time. As a result, prices have soared. This can be a problem with the wide range of models in which they were used. Michael Dranfield provides an economical solution: an easy-to-build, discrete-component plug-in substitute module.

### The TV Forum

The video/TV trade faces many problems today, a lot of which are just left to solve themselves as best they can. Some feel that this isn't good enough. So we are opening our pages to views and suggestions. Michael Maurice kicks off with a look at the current situation and some proposals for improving the service offered to the public – and the rewards to those in the trade.

### Digital Discoveries

Hugh Cocks has been experimenting with the Pace DVR500, a digital satellite receiver-decoder. In the course of his tests he discovered quite a lot about digital reception. Read all about it!

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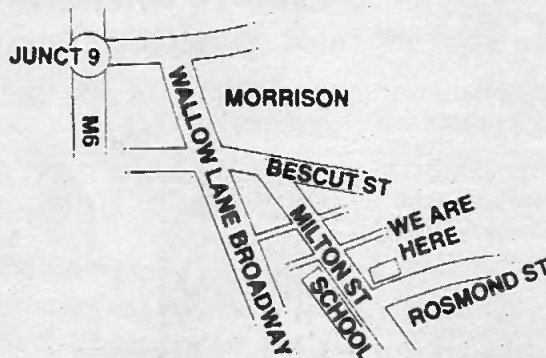


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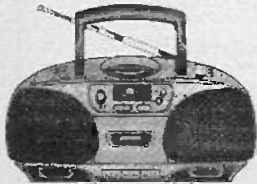
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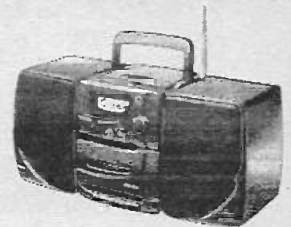
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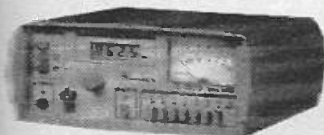
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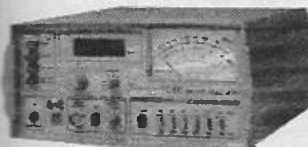
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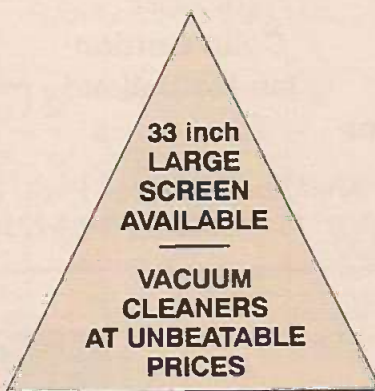
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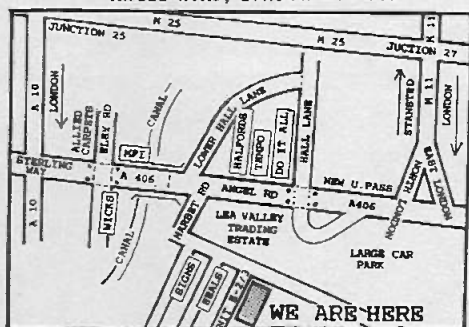
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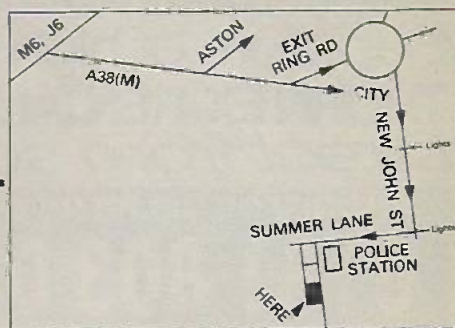
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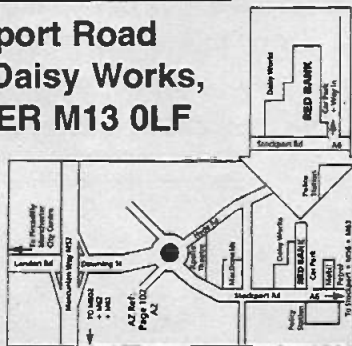
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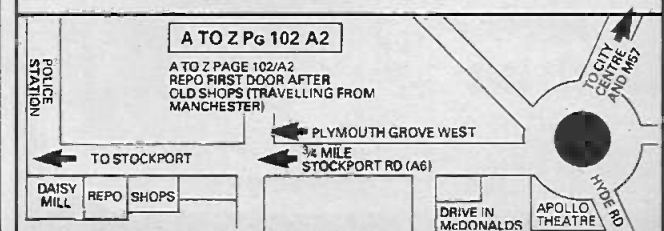
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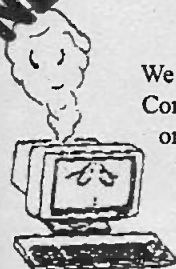
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ST6385BB 1/BFY	£2.00	Main IC ZC409233P	
SN96551 NL	£3.00	£8	
SAA1061	£3.00	<b>HITACHI VT 753E</b>	
SAA3018	£1.00	Text Panel	£20
STR58041	£4.00		
BF870	£0.20	STR4211	£5
BF869s	£0.20	STK4793	£5
UPD6376CS	£3.00	LA7830	£1
BC550C	£0.20	LA7831	£1
M58658P	£1.00		
M708 ABI	£1.50	ST6391BI/BC	£2
M708 LBI	£1.50	FERGUSON ICC7	
BY208-800	£0.10	T/V Amplifier	
BYV28/200	£0.10	2 way Gain 7DB	£8
2435121	£10.00	1500 Matsui	
2436792	£10.00	EQV Orion D2096 Head	£20
2436797	£10.00		

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Infra-red TX100 Receiver ICSL486	50p	TX100 Chassis	
Hitachi Issue 6 Teletext PWB F.S.T.	£15	Yellow Spot	
Hitachi PC315-11 Issue 7 Teletext Panel	£15	VHF/UHF	
Hitachi PC232A5 Issue 4 Teletext Decoder	£15	AND.C CAM	£20

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2435085			K40	£2
Etri 240v fan 6in	£5	Recorder Remote VA260	£5	
DL701 Delay	50p	TMP47C634N/2685		
DL711 Line	50p	£1		

Matsui VX3000 Hand Set	£3	25C4589	
VCR Head VX3000	£10	Switching or Line O.P.	
Matsui VSRI500 Head	£5	transistor 10A-1500V	£2
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Power Supply	£5	No 5587881	£5
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Capstan Motor IC No M56730 ASP	£15	Send for list of video panel	

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4.4 T/V XTALS	Each	TX89-TX98-TX100	
8.8MHz T/V XTALS			

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Fidelity - Decker - Tatung	£4 each	L298N	£4
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Mitsubishi RMM35 Hand Set Video	£5	7806	20p
Nokia RC202 Hand Set	£4	7809	20p
Siemens Hand Set 1994 Model T/V Video	£5	7812	20p
		7812F	20p

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64 pin Main IC HD6140815	£1	Car adaptor charger	
		VA308 and battery	£20

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IF PANEL	£4		
TX85 8 Push Button Unit			
TX86 8 Push Button Unit	£5		
TX85 Switch MOD			
TX86			
TX89			

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TX98 Tubase Panel	£5.00	50p each	
TX99 Tubase Panel	£5.00	Canon Motor 12v 50p	
2N2/2KV		Capstan Motor £4	
4N7/4KV		Mitsubishi HSE-41 IC on Motor	
5N6/2KV		MS178ZASP	
6N2/2KV		Burglar Alarm Kit - Professional	
9N1/2KV		unit, open and closed circuits, entry/	
11N/2KV		exit delay, adjustable, audible,	
		arming, panic, anti-tamper siren	
		driven direct, 12V DC, fire quality	
		glass rollertraced PCB	£7.00
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8 Way Tuning Pots	50p	battery	
UIIF Small Tuner UE30 and UE33	£3.00	£20	
4944 Tuner	£3.00	<b>Switch Mode</b>	
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		5 volts 6 amps	
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		12 volts 1 amp	
		Small in case	
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Power Supply 12V - 3amp			
for Ferguson Video Star Camera	£4.00		
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Positor 2322 662 98012	50p		
3 Pin POS. PT11451 Black Type	50p		
PERISWITCH 11	£6.00		

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FERGUSON UPPER DRUM YDM2018B	£10.00	BDV658 50p	
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FERGUSON HEAD & DRUM FV612V	£15.00	SAA 5241 A/P	
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FERGUSON HAND SET FV41R/3V59	£20.00	SAA 5246 A/P	
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S-VHS	£20.00	4 I.C. 1544-033C	
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MATSUI VP9501 POWER SUPPLY & REG TYPE		<b>Ferguson</b>	
STK5343	£8.00	Modulator SP212315	
MATSUI 1500 REMOTE HAND SET	£5.00	£5	

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TDA8190	£3.00	25D1266	£1.00
TDA8703	£3.00	25D1398	£1.00
TDA8349	£3.00	25D1415	£1.00
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SS2000AF	£1.00	Amstrad 6800	£4.00
line o.p.	£1.00	Amstrad 6000	£15.00
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BU208	£1.00
BU208A	£1.50
BU208D	90p
BU222	£1.00
BU326	£1.00
BU407	60p
BU508A	90p
BU508AF	£1.00
BU508D	80p
BU705	£1.00
BU896A	£1.00
BU807	£1.00
BU808DFI	£1.00
BU826	£1.00
BUK454/600	£1.00
BU824	50p
BUT11	50p
BUT11AF	£1.00
BUT13 600V-28A	£1.00
BUT18AF	£1.00
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BYW20-08-9	£1.00
BYW95	10p
BUX39 25A-150V	£1.00
BUX84	50p
BUY49	20p
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TDA3505	£3.00
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Tuners	each £5.00
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Tuner. IF TERC8-022A TBJZ4-002A	
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