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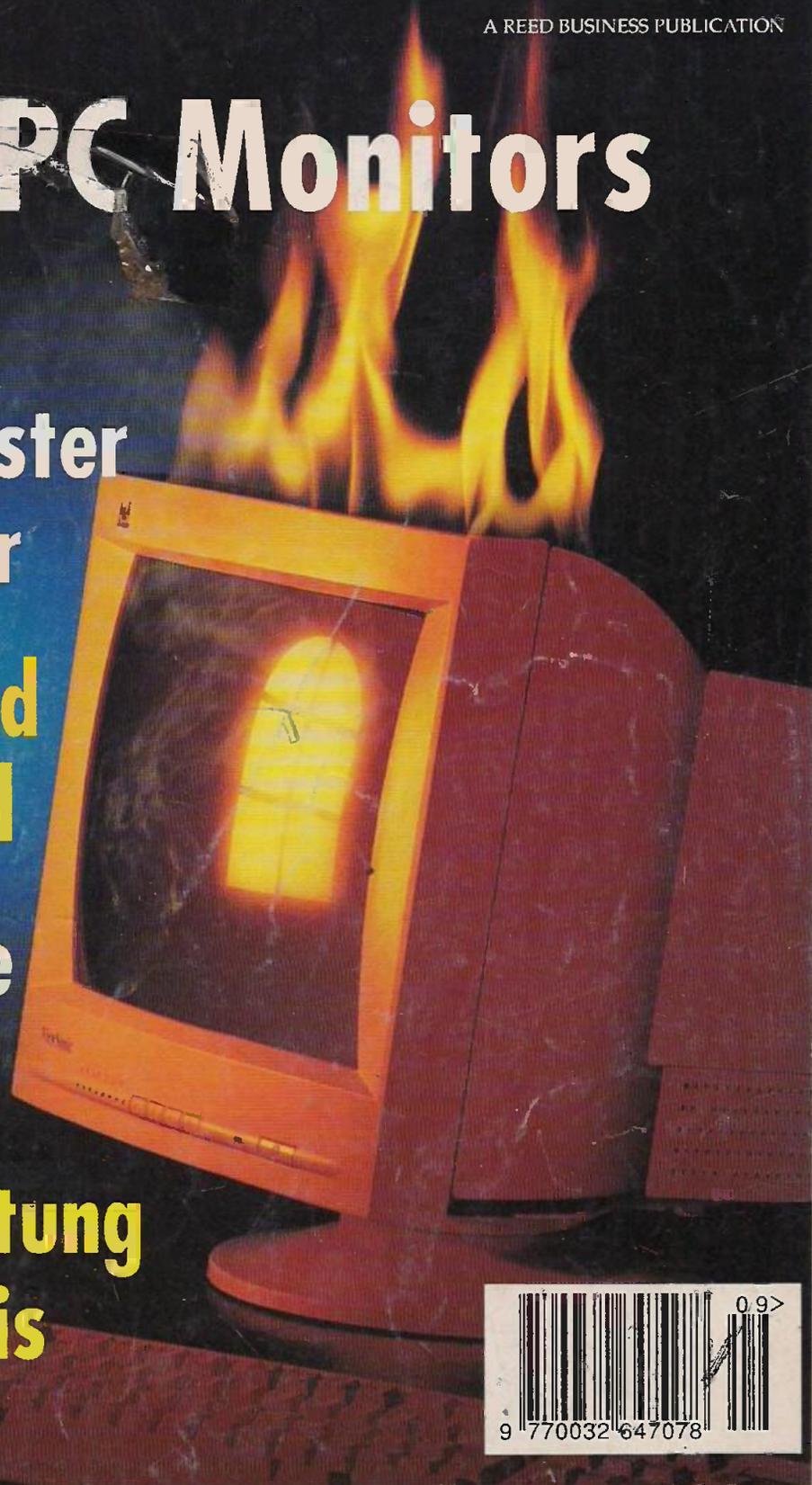
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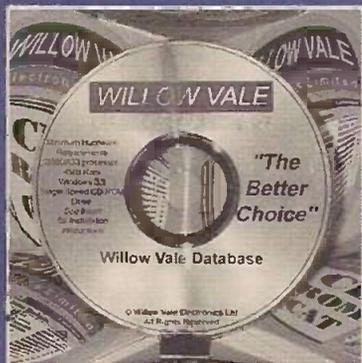
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False Alarm?

Concern about the prospect of servicing the new generation of digital TV and video equipment is understandable. The new and unknown always seem to be something of a threat. Will we be able to cope? Or will we be totally out of our depth? Will completely new and unfathomable problems present themselves, making life even more difficult for the already hard-pressed service engineer? And will we be able to afford highly specialised new test gear? It's easy to become despondent, and there are always those who seem to want to dramatise what lies ahead.

There are good reasons not to be unduly worried however. For a start, what exactly is so new about the digital technology? We've had teletext for over twenty years now. Nicam and CD players have been with us for over a decade. We are used to microcontroller chips, memories and bus systems. Digital servo systems in VCRs are nothing new. Sets that process video and sound signals in digital form have been around for ten years now, though they never caught on (see Chris Walton's current articles on the Salora M chassis). Digital transmissions are no longer new to satellite enthusiasts, and don't seem to have caused any great problems. Most technicians will have had some dealings with computers.

What will be new is the arrival of a digital signal at the input to the tuner. But why should this be such a quantum leap, in view of teletext and Nicam? It will after all be a form of modulation, which will call for demodulation and decoding. These operations will be undertaken by those little black plastic things, quite

likely just one of them (see Teletopics last month). We are used to a Nicam signal going into a chip to be sorted out, just as we are used to a composite analogue video signal going into a colour decoder chip to emerge in RGB form.

Digital chips don't frighten anyone nowadays. The checks to make when one is suspect are straightforward and logical. Is the supply getting to the relevant Vcc pin? Are there inputs and outputs? Are there pulses on the control lines? Is the clock working? Does the reset operate? And are any critical pulse feeds present? It takes longer than looking to see whether an EF80 is alight, but the fact that the technology has evolved naturally over the years means that most of us have got used to the idea of change, and the changes themselves.

You can be certain that the chip makers and set assemblers will have gone to great trouble to ensure that their devices and receivers work reliably, and that the associated circuitry will have the minimum of adjustments. They would be in awful trouble if they didn't. Since guarantees are mandatory, no manufacturer could afford to market equipment whose performance is uncertain. Improved manufacturing tolerances will mean that most adjustments can be designed out.

Yes, it will be a nuisance and unsettling to open up the back of a set or, more likely for the first few years, a set-top box and be confronted by unknown (initially) chips. But the systems and technology won't be completely new. Above all, a power supply will be required, and this is where most problems will arise. TV sets will require scanning, as always.

Flat-screen displays, if and when their performance becomes good enough for them to compete with the CRT, will call for a different approach. But here again it will be a matter of checking that drive pulses and supplies are present.

The technicians who will be really in at the sharp end will be those with responsibility for in-guarantee repairs. But these are basically down to the manufacturers and their specialist agents. They will crack any problems and issue modification details as necessary. The idea that the average workshop will have to invest in tens of thousands of pounds worth of equipment is a nonsense. But if the worst did come to the worst and there were lots of problems, the traditional workshop could provide a screening service, dealing with the vast majority of relatively simple faults and sending the more intractable ones to specialist centres. In practice it's likely that the most trying problems will continue to be surface-mounted devices, complex/compact modules and difficulty in getting at and into equipment. Nothing all that new here either.

To start with, digital TV reception will for most people be a matter of using a set-top box. Such devices lead a relatively stress-free life. It's when the digital circuitry gets in amongst the EHT and hefty current flows in a TV set that chip failures accelerate. This is again a design problem.

We've survived change and the introduction of new and novel electronic techniques and systems in the past. There is no reason to suppose that this will suddenly alter. Having said all that, I feel better already!

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2SB1243	0.60	2SD1858	0.43	BC212L	0.18	BD911	0.52	BU4B4	1.03	BZ61987V2	0.09	RG2	0.64	TD42006	1.06	TD49059	2.29
2SB560	0.43	2SD1877	2.14	BC237	0.12	BDT64C	1.18	BY227	0.20	BZ61987V3	0.09	RG2	0.64	TD42030H	0.91	TD49059	2.29
2SB643	0.29	2SD1878	2.63	BC237B	0.19	BDT65C	1.68	BY228	0.26	BZ61987V4	0.09	RG2	0.64	TD42030H	0.91	TD49059	2.29
2SB647	0.57	2SD1879	3.16	BC238	0.11	BF194	0.22	BY2291000	1.31	BZ61987V5	0.09	RG2	0.64	TD42050	4.56	TD49059	2.29
2SB649A	0.77	2SD1884	3.35	BC238B	0.16	BF195	0.07	BY255	0.14	BZ61987V6	0.09	RG2	0.64	TD42270	12.08	TD49059	2.29
2SB688	1.61	2SD1887	3.56	BC307	0.06	BF197	0.18	BY299	0.18	BZ61987V7	0.09	RG2	0.64	TD42540	1.29	TD49059	2.29
2SB698	0.35	2SD288	0.85	BC307B	0.15	BF199	0.18	BY397	0.20	BZ61987V8	0.09	RG2	0.64	TD42541	1.12	TD49059	2.29
2SB716	0.43	2SD350A	1.97	BC308	0.09	BF258	0.04	BY398	0.16	BZ61987V9	0.09	RG2	0.64	TD42577A	3.45	TD49059	2.29
2SB772	0.50	2SD381	1.66	BC308A	0.09	BF420	0.21	BY399	0.12	BZ61988V0	0.09	RG2	0.64	TD42578A	3.20	TD49059	2.29
2SB774	1.61	2SD400	0.34	BC308C	0.26	BF421	0.24	BY448	0.30	BZ61988V1	0.09	RG2	0.64	TD42579A	4.91	TD49059	2.29
2SB891	0.60	2SD401A	0.77	BC309B	0.10	BF422	0.19	BYD14J	0.35	BZ61988V2	0.09	RG2	0.64	TD42581Q	2.57	TD49059	2.29
2SB892	0.35	2SD468	0.28	BC327	0.10	BF423	0.14	BYD33D	0.12	BZ61988V3	0.09	RG2	0.64	TD42582	3.85	TD49059	2.29
2SC1008	0.24	2SD667	0.38	BC328	0.14	BF459	0.43	BYD33J	0.16	BZ61988V4	0.09	RG2	0.64	TD42583	3.85	TD49059	2.29
2SC124	0.48	2SD669A	0.64	BC337	0.14	BF471	0.37	BYD33M	0.26	BZ61988V5	0.09	RG2	0.64	TD42593	1.12	TD49059	2.29
2SC1318	0.19	2SD718	1.90	BC338	0.06	BF487	0.57	BYD40	2.55	BZ61988V6	0.09	RG2	0.64	TD42600	7.69	TD49059	2.29
2SC1473	0.21	2SD756	0.47	BC368	0.18	BF491	0.41	BYD50B	0.21	BZ61988V7	0.09	RG2	0.64	TD42611A	0.64	TD49059	2.29
2SC1573	0.52	2SD837B	1.12	BC369	0.18	BF494	0.12	BYD50C	0.28	BZ61988V8	0.09	RG2	0.64	TD42611AQ	1.32	TD49059	2.29
2SC1675	0.14	2SD856	0.79	BC372	0.53	BF759	0.38	BYD50D	0.27	BZ61988V9	0.09	RG2	0.64	TD42653A	4.70	TD49059	2.29
2SC1685	0.21	2SD882	0.43	BC546A	0.11	BF869	0.38	BYD50E	0.53	BZ61988V0	0.09	RG2	0.64	TD43190	2.05	TD49059	2.29
2SC1740	0.16	2SD888B	6.41	BC546B	0.12	BF871	0.41	BYD50F	0.31	BZ61988V1	0.09	RG2	0.64	TD43330	14.21	TD49059	2.29
2SC1815V	0.11	2SD965	0.67	BC547	0.11	BF959	0.18	BYD50G	0.21	BZ61988V2	0.09	RG2	0.64	TD43350	2.40	TD49059	2.29
2SC2001	0.23	2SD965R	1.05	BC547A	0.04	BF960	0.30	BYD50H	0.20	BZ61988V3	0.09	RG2	0.64	TD43350	2.40	TD49059	2.29
2SC2023	3.18	2SK1117	3.40	BC547B	0.11	BF970	0.43	BYD50I	0.50	BZ61988V4	0.09	RG2	0.64	TD43350	2.40	TD49059	2.29
2SC2073	1.03	2SK1118	3.40	BC548	0.11	BF990A	0.68	BZV10	1.34								

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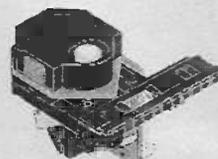
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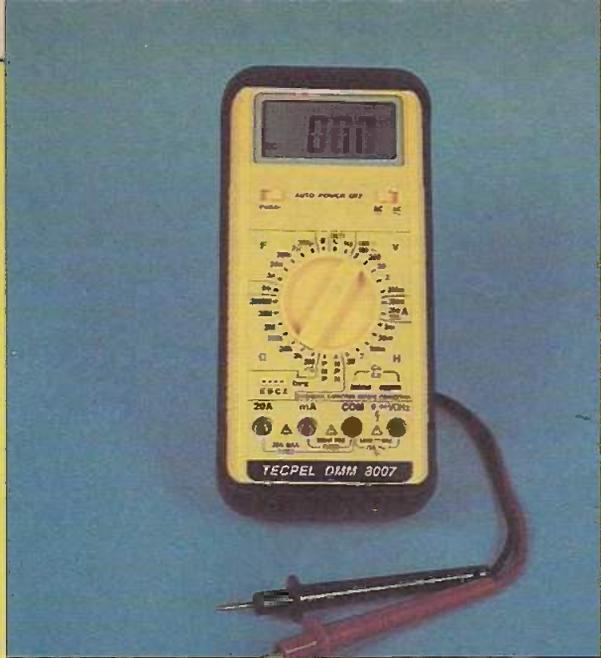
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Specifications

Voltage

DC volts	200mV, 2V, 20V, 200V, 1000V	$\pm(0.5\%rdg+1dig)$
AC volts	200mV, 2V, 20V, 200V 750V	$\pm(1.2\%rdg+3dig)$ $\pm(2\%rdg+3dig)$

Resolutions	100 μ V, 1mV, 10mV, 100mV, 1V
AC range	50 to 500Hz
I/p protection	1000V dc or 750V rms
I/p impedance	10M Ω

Current

DC	20mA, 200mA 20A	$\pm(1\%rdg+1dig)$ $\pm(3\%rdg+3dig)$
AC	20mA, 200mA 20A	$\pm(1.5\%rdg+4dig)$ $\pm(3.5\%rdg+4dig)$

Resolutions	10 μ A, 100 μ A, 10mA
AC range	50 to 500Hz
Overload	Fast-blow fuse

Resistance

Ranges	200 Ω 2k Ω , 20k Ω , 200k Ω , 2M Ω 20M Ω 2000M Ω	$\pm(1\%rdg+4dig)$ $\pm(0.8\%rdg+2dig)$ $\pm(2\%rdg+5dig)$ $\pm(5\%rdg+10dig)$
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Resolutions	0.1 Ω , 1 Ω , 10 Ω , 100 Ω , 1k Ω , 10k Ω , 100k Ω
Overload prot.	500V dc or rms ac

Capacitance

Ranges	2nF, 20nF, 200nF, 2 μ F, 200 μ F	$\pm(5\%rdg+10dig)$
Resolutions	1pF, 10pF, 100pF, 1nF, 10nF	

Inductance

Ranges	2mH, 20mH, 200mH, 2H, 20H	$\pm(5\%rdg+10dig)$
Resolutions	1 μ H, 10 μ H, 100 μ H, 1mH, 10mH	

Frequency

Range	2kHz-20MHz (20Hz-20MHz)	$\pm(0.5\%rdg+3dig)$
Selection	Autorangeing	

Transistor test

Range, h _{FE}	0-1000
Base current	10mA

V_{CE} 3V

Diode test

Current	1mA
V _{test}	3V
Overload	500V dc

Logic test

High threshold	2.8V
Low threshold	0.8V
Duty cycle	>20%, <80%
Pulse width	25ns min.
Overload	500V dc or rms

Physical

Power	Standard 9V battery
Accessories	9V battery, test leads, manual, holster

20% reader discount

DMM8007 is a versatile hand-held meter featuring measurement ranges for:

- Frequency to 20MHz
- Inductance 20H
- Capacitance to 200 μ F
- DC and AC current to 20A
- Resistance to 2000M Ω
- Transistor gain

These ranges are in addition to the usual digital multimeter measurement ranges. This 3 1/2-digit meter also has a logic test facility for checking digital signal level plus audible continuity test. Supplied in a rubber holster, the DMM8007 is a heavy duty design – drop-proof to 10 feet – and has a full twelve month guarantee. Overload protection is built in too.

This meter normally retails at £88.13, but Vann Draper is making the instrument available exclusively to *Television* readers filling in the coupon below at the special discount price of just £69 fully inclusive of VAT and UK postage (overseas readers please contact Vann Draper for details). Vann Draper can be reached on 0116 2771400, or by fax on 0116 277 3945.

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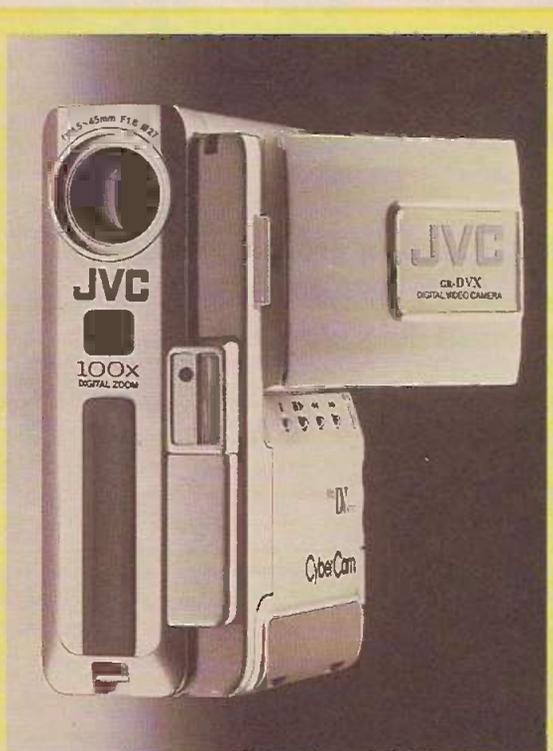
TELETOPICS

End of Recommended Retail Prices

The government is to implement the Monopolies and Mergers Commission's proposal that manufacturers' recommended retail prices on a wide range of electrical goods should be banned. Goods affected include TV sets, VCRs, camcorders, hi-fi equipment, washing machines, driers, dishwashers and refrigerators. Discrimination by manufacturers against warehouse clubs that sell discounted goods to their members is also to be ended (it was a complaint by Cargo Club that led to the MMC's enquiry being set up in 1995). The MMC's report was published on July 30th, and there is to be an eleven-week consultation period.

Independent retailers are likely to be hardest hit by the new rules, which could encourage supermarkets and other non-spe-

cialist retailers to enter the brown and white goods markets. The two leading specialist retailers, Dixons with 19 per cent of the market and Comet with 10 per cent, have both stated that the changes will have no effect on their selling prices. In view of the slim margins in the trade, it's unlikely that consumers will benefit much. Retailers will seek lower prices from manufacturers, who are already operating with low margins – one per cent after costs but before tax according to Panasonic. Retailers such as Comet are understood to operate with net returns of about three per cent. If retailers cannot make a worthwhile profit, the outcome could be fewer outlets with reduced competition and higher prices.



JVC has just launched two new digital camcorders, Models GR-DVX and GR-DVX2 (see photograph). Both incorporate a high-resolution LCD colour monitor. The GR-DVX, which is expected to sell at around £1,600, has an analogue docking system for simple, quick signal transfer to a VCR. The GR-DVX2 has PC compatibility that provides editing and viewing without the need to purchase any additional software. This version is expected to sell at around £1,800.

Digital Television

The BBC is to invest some £1bn over the next five years on going digital. About nine per cent a year on average of licence fee revenue will be devoted to new equipment and launching new free and subscriber channels. A 24-hour news service and more widescreen programming are planned. These moves will probably represent the biggest changes in the BBC's history. The Corporation will aim to cut twenty per cent from its current expenditure during the period – according to the BBC's director general John Birt “more programmes will be made by fewer staff”. The BBC says consultations with viewers suggest that 77 per cent approve of its plans for digital TV.

The Digital Video Broadcasting (DVB) Project has issued the DVB Blue Book Implementation Guidelines for the use of MPEG-2 Systems, Video and Audio in Satellite, Cable and Terrestrial Broadcasting applications. The specification includes provision for Standard Definition (SDTV) and High Definition TV (HDTV) for both 50 and 60Hz countries.

NetProducts has launched the first European Internet access device that links up with a TV set. The NetStation can be used with PAL or NTSC receivers, connection being made via a scart link or phono sockets. Cost is about £300.

Pace Micro Technology has

added an Impulse Pay-per-View feature to its DVC200 digital cable receiver. This feature gives subscribers the opportunity to pay for programmes as they are being broadcast rather than booking in advance for pre-scheduled events. A contract to supply a further 22,000 cable receivers to the Italian multimedia provider Stream has been awarded to Pace. The company has also received a “substantial increase” in orders from Canal+ to provide digital satellite decoders for the French market – the receivers will use SECA's Mediaguard conditional access system.

United News and Media and NTL, the companies behind Digital Television Network (DTN) which lost out to British Digital Broadcasting for the UK's main digital terrestrial licences, are to take a 49 per cent stake in SDN (S4C Digital Networks). SDN has been awarded DTT multiplex A.

One-use DVDs

A cheap, throw-away video disc system, called Zoom TV, is being considered by Hollywood studios. The digital video discs would be encoded to allow only a single viewing and would cost around \$5. Discs could however be reactivated, for a further recording, via a modified player connected by telephone line to the film's maker, distributor or an agent.

Business News

Botts and Co., a small London-based merchant bank formed ten years ago, is to be the eventual owner of Grundig. It has bought a 26.6 per cent stake from Philips and a 16.4 per cent stake from the German asset manager Hohenstaufen, and has agreed to buy the 52 per cent stake currently held by the Max Grundig Foundation when this is due to be bought by Philips in 2004. Philips will retain a 5 per cent interest.

Botts has no immediate plans for restructuring Grundig, which it feels "can be resurrected". Philips will be relieved to have largely extricated itself from the loss-making Grundig. Relations between the two companies have become increasingly bitter in recent times. In view of Grundig's losses, Botts could end up paying little for its investment. How it could make anything of Grundig remains to be seen.

Pace Micro Technology increased turnover by twelve per cent in the year to May 31st 1997. Profit before tax was slightly higher at £18.4m (£18.2m). The company has been going through a difficult period in recent months. Analogue satellite receiver sales have declined, while digital equipment sales failed to meet expectations. The company has invested in the digital side, but delays in the start of services have held back growth in this area.

China's largest TV set manufacturer, Sichuan Changhong, intends to start selling receivers in the USA in 1999 and to open an overseas production plant. The company is to acquire two domestic rivals this year, increasing its share of the Chinese TV receiver market to 33 per cent.

Multimedia Training

Multimedia Training U.K. has been formed as a new company to handle the training needs of the consumer electronics industry in the coming age of digital broadcasting. Its three partners have over 75 years' experience in the industry, ranging from hands-on servicing to in-depth technical training. The company will undertake technical and product knowledge training for manufacturers, large retail companies, groups of independent retailers and any organisation that has training needs in the consumer electronics field. Services offered include engineer technical training, product knowledge for sales staff, representation or support at exhibitions etc. and general technical liaison. For further information contact the London office at 0181 661 7590, the Midlands office at 01623 490 200 or the Scottish office at 01314 452 761.

EC Proscribes Piracy

The European Commission has issued a proposed Directive that would outlaw devices designed to avoid payment for TV, radio and on-line services. It would require member states to prohibit smart cards, decoders and software that provide unauthorised access to services such as pay-TV, video-on-demand and electronic publishing offered subject to payment. The manufacture, import, sale, advertising, possession, installation, maintenance or replacement of illicit items would become illegal, with member states having to provide effective sanctions.

DASA is in Business

The Domestic Appliance Service Association (DASA) has enrolled its first consumer electronics manufacturers and independent service organisations as members. DASA will now be extending its network of independent service organisations that manufacturers can support and trust. The Association and its related company EESEL, which is con-

cerned with helping engineers to achieve NVQs, have moved to new offices. For further information and an application form contact Chris Hayter (Director), DASA, 71 The Maltings, Stanstead Abbots, Hertfordshire SG12 8HG (01920 872 464, fax 01290 872 498).

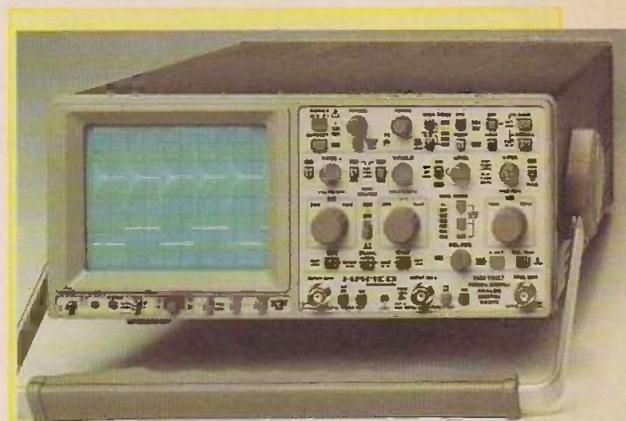
First D-VHS Recorder

The first Data-VHS (D-VHS) recorder, Model HM-DSR100, is to be launched by JVC in the USA this October. It has been developed with digital satellite operator Echostar, and includes a built-in decoder for Echostar transmissions. A bit-stream recording system is used to store the data on VHS tape. The data can then be fed back to the digital decoder for decoding and display.

The D-VHS standard has a record data rate of 14.1Mbits/sec. Up to seven hours of video can be stored on a single cassette. This is equivalent to 44.4Gbytes of data.

Other features include an eight-head system (a DA four-head system for VHS video, two FM audio heads

and two D-VHS heads), a V-chip to enable parents to control what their children watch, a Dolby AC3 output socket and a programme-browse system that enables the user to channel surf while watching a current programme. The first D-VHS machines are expected to arrive in Europe next year. The price in the USA is likely to be the equivalent of around £700.



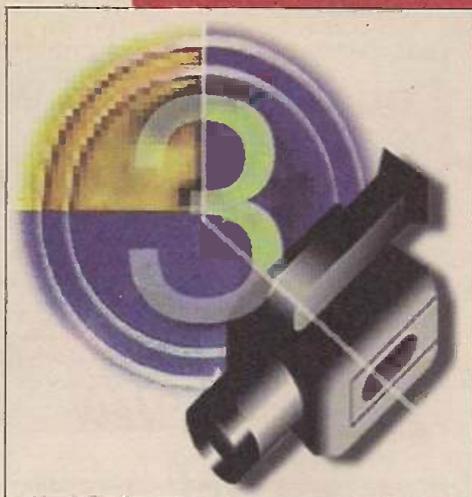
Hameg has introduced a new analogue/digital oscilloscope, Model HM1507 (see photograph), a new version of the HO500 computer interface, and the HM8133-2 1GHz signal synthesiser.

At £1,355 + VAT the HM1507 sets an outstanding price/performance standard in analogue and storage operation. It includes the Hameg component tester and has a second timebase that can be triggered after the delay time, providing alternate and delay timebase facilities in both the analogue and storage modes. The 150MHz bandwidth is complemented by a 200MS/sec sampling rate in the store mode - with four 2K x 8 bit memories. Up to ten front panel set-ups can be saved and recalled using the ten internal memories, or any number using a PC (via the RS232 socket). Two-way data transfer is also possible via the RS232, so that the PC can log and print waveforms.

The new version of the HO500 computer interface is for use with the Hameg range of low-cost spectrum analysers. There are four models in the series: a spectrum analyser; an analyser/tracker up to 500MHz; and two similar units up to 1GHz. The interface card is supplied inside the analyser, and is connected directly to a PC RS232 serial port. Any of the four HM5000 series spectrum analyser/tracker generators can be delivered with the HO500 installed.

The HM8133-2 signal synthesiser provides continuous coverage from 1Hz to 1GHz with a resolution of 0.1Hz and an accuracy of better than 4×10^{-7} . Two frequencies (400Hz and 1kHz) are available for internal or external amplitude or frequency modulation.

For further details apply to Hameg Instruments Ltd., 70-78 Collingdon Street, Luton, Bedfordshire LU1 1RX (01582 413



Reports from
David C. Woodnott

Sony CCDF500E

The reported symptom was no operation. We found that the cassette housing would open and close without a tape, but wouldn't close with a tape inserted. The reason for this was the fact that the drum did not rotate. It would twitch, but failed to operate correctly. We replaced five leaky electrolytic capacitors in the drum commutation circuitry. This restored normal operation. D.C.W.

Hitachi VM600E

This full-size VHS oldie behaved erratically. It would sometimes operate reasonably well, and at other times not. With this model we generally replace the pinch roller assembly, the mode encoder switch assembly and fit a new set of belts (three). You have to replace the complete pinch roller assembly, with operating arm – replacing the pinch roller only is often ineffective, as the riveted pivot comes loose. It's also worth checking the CAM/VTR switch, which can give trouble.

These measures plus a service will usually restore the unit to good health. D.C.W.

Sharp VLC790H

One of these units arrived with the cassette housing open and the mechanism in the eject mode. It would power up, and the E-E pictures were OK. We began by checking the mechanism alignment, which proved to be correct. We then set the mechanism to the stop mode manually and powered up. The cassette housing instantly

Camcorner

opened and refused to close!

We now realised that this wasn't going to be as simple as we had at first thought. So we decided to check the syscon and mode motor circuits, and found that the A/D 5V supply to the mode control circuitry was missing. C802 (22 μ F, 16V) had leaked and corroded the print, thereby rendering the supply open-circuit between D804, pin 2, and Q810 (switch).

We replaced C802 then cleaned the damaged print and fitted a link across it. This time the cassette housing behaved as it should when the unit was powered up. D.C.W.

Sanyo VMD5P

This uncommon model (to us, anyway!) had an E-E picture with striations and a low luminance signal level. Playback was similarly affected. The cause was (surprise, surprise!) a number of leaky capacitors on the main PCB. In all we had to replace 23 – after the usual washing session etc. with the PCB. This restored the unit to full working order.

The VMD5P seems to have been based on the earlier Model VMD3P, about which we've written before regarding its capacitor problems. D.C.W.

Canon E6E

This is a hybrid model – part Sony (TR55 mechanism and main PCB). It was brought in because of a sound problem: the recorded sound would disappear and reappear at will, making life a little tiring for the owner (and me!).

There are two audio PCBs in this model. The fault was on audio PCB 2. After replacing C1215, C1216, C1219, C1223 and C1224 the unit provided a consistent audio level. D.C.W.

Sony CCDF340E

We had to chuckle over this one. It arrived with striations on the E-E and playback pictures – the AV and EVF pictures were both affected. As usual, the cause was leaky capacitors. After replacing C494, C497 and C499 on the main PCB (VA41) we had clear pictures at the

AV connector, but the EVF picture was still covered with striations. The cause this time was C909 on the EVF PCB (good job we checked the viewfinder!). D.C.W.

Sanyo VMD9P

No power up the report said. It's an unusual situation with this model – except for broken battery contacts! The cause was simply the 3A ceramic fuse F3001, which was open-circuit. We could find no cause for its failure. D.C.W.

Panasonic NVMC6B

This VHS-C model wouldn't power up. We found that the fusible link (R1037) on the main PCB was open-circuit because zener diode D1003 was short-circuit. Replacing these two items restored normal operation.

To avoid further problems later we usually replace the mode encoder switch when servicing these machines. D.C.W.

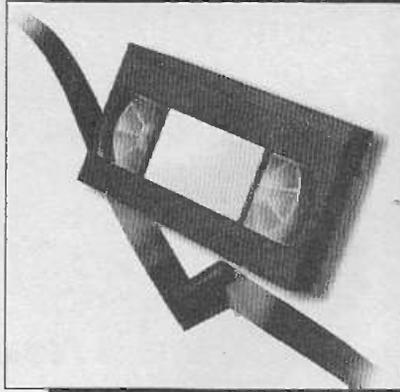
Sharp VLC690H

An E-E picture with striations is commonly caused by the failure of C210 (33 μ F, 16V) on the YC PCB. We recommend that all the electrolytics are inspected for leakage, as age is now taking its toll with these camcorders. D.C.W.

Sanyo VMEX220P

Playback was OK, but there was no E-E picture: only vertical lines were visible at both the AV connector and the EVF in the E-E mode. It's not uncommon to experience connection problems between the CCD and the camera main (CA-2) PCBs when one of these popular machines has been dropped – the connector on panel CA-2 can become detached from the print. We checked on this first, and found that the connections were intact.

Checks around the CCD drive chip (SSG) then showed that two of the V drives were missing. The CXD1257AR timing chip IC916 was faulty, all other outputs being OK. A replacement chip restored the E-E picture, and a service completed the repair. D.C.W.



Reports from
Eugene Trundle
Adrian Spriddell
Paul Hardy
Michael Maurice
Nick Beer
Chris Watton
Terry Lamoon and
Gerald Smith

TDK Tapes

A JVC HRD520 was brought in with the complaint that it would rewind only fifteen per cent of the tape, after which it would stop. Further goes with the rewind button had no effect. On test we found that the start-sensor photodiode voltage, which is normally 5V in darkness, fell to 3.8V as rewinding progressed. At this point the machine shut down.

The tapes were the cause of the problem. Four TDK ones, which were semi-translucent. When we shone torchlight through them we could see more light than with four other brands we tried. Hopefully this is a one-off batch problem. Has anyone else encountered this problem with TDK VHS tapes? **E.T.**

Akai VSG225

One rare occasions the cassette cradle would oscillate to and fro when a tape had been ejected. It wasn't possible to make a definite diagnosis, but a new mode switch and start tape-end sensor (righthand side) cured the fault. **E.T.**

Amstrad DD8900

There was no tape slack removal and the wind operations were erratic. As an alternative to a clutch arrangement, these decks have a limited drag lubricant applied to the reel arms during manufacture. With this machine the lubricant

VCR Clinic

appeared to have become runny. As a result, it didn't apply sufficient torque to make or retain secure reel drive cog engagement. To resolve the problem we cleaned off the old lubricant and applied a coating of 'Kilopoise' which is available from Farnell. **A.S.**

Goodmans GVR3450

Tape chewing is a problem we've had with several of these machines, because of a warped play idler arm which has fouled the cassette tray baseplate. The arm is actually a Daewoo part, from the G1 mechanism. It's readily available from SEME as deck YC item no. 33. **A.S.**

Amstrad TVR3

Loss of the -27V supply from the VCR section prevented the TV section from working. We replaced zener diode D603 and the timer chip IC803, which was dragging down the -27V supply, fitting a 14DN487 in place of the 14DN332A, also the unnumbered 1N4148 protection diode that feeds it. After testing the unit for two days it was returned to the customer.

Two weeks later it was back again, with apparently the same fault. Couldn't be, we thought. But it was. All the same components had failed for the same reasons and were replaced FOC, this time together with the real culprit – the fluorescent display. **A.S.**

Sharp VCH81H

This machine would sometimes fail to make a timed recording. It had been seen by two of my colleagues during the previous couple of months for the same reason. The power supply had been checked thoroughly and the machine had been given a service, yet here it was again on the bench with the same problem.

Bearing in mind all that had been done, I wondered where to start. In the end I decided to replace the mode switch, even though the other modes all seemed to be OK. The machine then tested OK – but it always did! We returned it and asked the customer to report back if any more problems were encountered. A phone call to him some months later proved that all was well. **P.H.**

Goodmans GVR5500

Wind and rewind were very noisy – the reel idler kept jumping away from the reel turntables. The problem had been caused by a previous repairer, who had fitted an incorrect idler. I found that a refurbishment kit for the Sentra VX8500 had been used – because I attempted to use the same kit! It's the same superficially, but the reel idlers are slightly different when viewed from underneath. The Sentra idler has a larger diameter retainer disc, which fouls on the underside of the chassis as the idler reaches the end of its travel in the guide slot.

Spares for this model are available from Daewoo Electronics UK Ltd., Rathernraw Industrial Estate, 62-82 Greystone Road, Antrim, N. Ireland BT41 1NU (01849 469 696). **P.H.**

Akai VS55

This machine was dead. As there was ripple on all the major supply lines I replaced C6, C10, C15 and C17 – they all measured low value when checked with a capacitance bridge. At power up the machine still refused to do anything and there was no clock display. There was no response to front panel or remote control commands, and the machine wouldn't accept a cassette.

Both the oscillators associated

with IC900 were running, but there was no serial clock or data and there were no pulses on the switch strobe lines.

As I was working on it the deck started to shuffle and finally initialised. Everything except the clock then worked. If the power was disconnected from the machine and it was left for half an hour, the above process would be repeated.

I suspected IC900. When I went to remove the fluorescent display to get at the chip one of the end legs fell off. Someone had obviously had a go, and had broken the display while trying to get at IC900 – which hadn't been replaced. Whoever it was had even attempted to solder the broken ends back on to the bits of leg that were still visible at the edge of the display!

I replaced both items, then confidently powered up. But there were still no functions. After half an hour everything started to work. The cause of the trouble was eventually traced to transistor TR104 on the main board – it was dry-jointed. I had to remove the board to solder the joints, which are hidden beneath a couple of cables. TR104 provides the BU5V supply for the operations panel. P.H.

Roadstar 7272

This machine wouldn't drive the spools. The cause of the problem was the reel idler assembly. One of the pulleys incorporates a clutch assembly that makes it swing from the supply to the take-up spool. A new clutch assembly cured the fault. M.M.

Hitachi VTM640

There was loss of capstan lock because the control pulses were missing. They were not low in amplitude but completely absent, though the AC head didn't appear to be worn. Scope checks showed that the gain of the control pulse amplifier was low. C631 (47 μ F, 16V) was responsible for this, a replacement curing the problem. It's in the feedback loop.

I subsequently had another machine with exactly the same fault. M.M.

JVC HRD820

When a tape was inserted it would be loaded to the half-load position. If play was then selected the pinch roller would move down but the guides would stay where they were. On examining the underside of the mechanism I found that the pin and

circle which hold the plate assembly in position with the guide arm gears had come out. So I refitted it. Then, when play was selected, the machine jammed.

What had happened was that the machine had received attention elsewhere. The previous engineer had glued up the brass part of the entry and exit guides – and managed to glue the guides to the deck! I had to strip the guides from the deck, remove all traces of Superglue from the guides and the runners in the deck, then relubricate the runners and reassemble. This cured the problem.

If the brass part parts company with the guide, remove the guide, use one drop of Superglue and refit the brass part. Wipe any excess from the guide quickly. I normally remove the head drum assembly to refit the guides. Use the stoppers to attach them to the guide arm. Before returning the machine to the customer, check several times that the guides go to the play position fully. M.M.

Hitachi VTM830

This machine was dead, with fuse F852 blown. When a replacement had been fitted the machine accepted a tape but wouldn't lace up. The XRA6209 (BA6209) loading motor drive chip had failed. After fitting a replacement I found that the machine loaded very slowly. The cause was the loading motor, which was taking amps off load! A new loading block, which incorporates the motor and mode switch, cured the fault. M.M.

Toshiba V705

I've had a couple of brand new machines with no hi-fi sound. The cause of the problem has been that the lid earthing spring plate on the AV connection PCB across the back, behind the mechanism, is fitted incorrectly. The spigot is not located in the hole in the PCB, with the result that when it's fitted the earthing plate shorts out pin 1 of connector BN003 (the audio FF signal) to the lid. This means that the fault often clears when the lid is removed! N.B.

Akura VX150

This machine gave the impression that its heads had failed. As a replacement upper drum was in stock we fitted it, but there was no improvement to the picture. Further checks, around the head amplifier, revealed the cause of the fault: the snap-fit connector that joins the foil wire from the lower drum was loose. Effectively, only one half of the drum was connected. All that was

required to restore the machine to full working order was to refit the connector. C.W.

Akai VS25

The playback picture was marred by thin lines that looked like the result of RF interference. I'd had a similar problem before, caused by defective capacitors in the power supply, but the symptom remained as bad after replacing all the electrolytics. To cut rather a long story short, the cause of the trouble was the MSM9565-3 chip IC202. C.W.

Toshiba Core Deck VCRs

If the problem with one of these VCRs is low gain or tuner drift, replace the tuner/modulator module. T.L.

JVC HRD860

The complaint with one of these machines was that playback was sometimes OK, sometimes there was only half a picture and sometimes none at all. The cure is easy: replace the 4.7 μ F, 63V capacitor on the head drum PCB. This is becoming quite a common fault with these machines. T.L.

Toshiba V703

There was no power and no display, no functions could be selected and a very slight whistle came from the power supply. A check on the supply lines showed that the Ever 14V supply was missing. The simple cause was that protector Z821 was open-circuit. T.L.

JVC HRD22

Intermittent tape damage was the complaint with one of these machines. On investigation we found that when the machine stopped from rewind the brakes didn't come on. As a result, tape was spilled out inside the machine. The mode switch was the cause of the trouble. G.S.

Samsung VIK310

When a tape was inserted this machine would sometimes jam and go to standby. Alternatively, when a cassette was ejected the indicator would sometimes keep flashing and the capstan motor would continue to turn. The mode switch was faulty. G.S.

Hitachi VT530

There was sound wow in both the record and playback modes. The capstan and pinch roller were both fine. I traced the source of the wow to the clutch assembly. G.S.

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CT145	25C51	BA5422	2.50	MA5444L	2.99	STK73410	6.99	TDA1582	7.00
CT1455	25C51	BA5422	2.50	MA5444L	2.99	STK73410	6.99	TDA1583	7.00
CT1478	25C51	BA5422	2.50	MA5444L	2.99	STK73410	6.99	TDA1584	7.00
CT1493	25C51	BA5422	2.50	MA5444L	2.99	STK73410	6.99	TDA1585	7.00
CT1484	25C51	BA5422	2.50	MA5444L	2.99	STK73410	6.99	TDA1586	7.00
CT1486	25C51	BA5422	2.50	MA5444L	2.99	STK73410	6.99	TDA1587	7.00
CT1487	25C51	BA5422	2.50	MA5444L	2.99	STK73410	6.99	TDA1588	7.00
CT1488	25C51	BA5422	2.50	MA5444L	2.99	STK73410	6.99	TDA1589	7.00
CT1489	25C51	BA5422	2.50	MA5444L	2.99	STK73410	6.99	TDA1590	7.00
CT1490	25C51	BA5422	2.50	MA5444L	2.99	STK73410	6.99	TDA1591	7.00
CT1491	25C51	BA5422	2.50	MA5444L	2.99	STK73410	6.99	TDA1592	7.00
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CT1494	25C51	BA5422	2.50	MA5444L	2.99	STK73410	6.99	TDA1595	7.00
CT1495	25C51	BA5422	2.50	MA5444L	2.99	STK73410	6.99	TDA1596	7.00
CT1496	25C51	BA5422	2.50	MA5444L	2.99	STK73410	6.99	TDA1597	7.00
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There are important differences between the operation of a monitor and a TV set. These differences can cause problems for those not aware of them. Russ Phillips provides essential guidance for the newcomer to monitor repairs



Servicing Computer Monitors

About six months ago I started a new job with the local education authority. It involves repairing TV sets and VCRs, as I've been doing for most of my working life, and also computer monitors. The prospect didn't worry me as, like most TV engineers, I thought that a monitor was simply a TV set without the tuner/IF section. Over the last six months however I've discovered that there are important differences. Some, if you are not aware of them, can cause difficulties.

The purpose of this article is to help other TV engineers who wish to take on the repair of computer monitors. Hopefully it will enable them to do so without the teething problems that I had. I'll concentrate on the differences between monitors and TV sets, and not go in detail into areas where they are very similar – assuming that readers will already know about TV receiver repair.

Test Signals and Equipment

Before discussing the operation and repair of monitors, we'll consider the test signal required. Some sort of test signal is essential as, unlike a TV set, many monitors will not run unless a signal is applied to the input – the frame and line oscillators will not work without the presence of sync pulses.

Unfortunately your trusty old signal generator will probably be of no use when it comes to computer monitor repair. Different monitors use different video systems (CGA, EGA, VGA etc.): each one has different line and frame frequencies. Typical frequencies are listed in Table 1. Note that the values are not fixed. This is especially the case with SVGA monitors, which can operate at line frequencies anywhere between about 35.2 and 48.5kHz.

An added complication is presented by the fact that both 9- and 15-pin D plugs are in use to connect the output from the video board in the computer to the monitor.

One option is to use a PC as a test signal provider. This can be a cheap option if you already have a PC in the workshop, especially as software that will generate all the most widely used test patterns can be purchased very cheaply. The main disadvantages are that a PC is bulky, and that only those monitors which will interface with the video board in the PC can be tested.

The other option is to purchase a specially-designed monitor signal generator. Ideally this should be able to drive both digital (TTL) and analogue monitors, have 9- and 15-pin D sockets, and cater for all the video systems listed in Table 1. If you cannot afford a generator which can do all that, the most important points are a 15-pin D socket and the ability to drive VGA and

continued on page 794

Table 1: Monitor video systems.

System	Line frequency	Frame frequency
CGA	15.75kHz	60Hz
MDA/Hercules	18.432kHz	50Hz
EGA	21.85kHz	60Hz
PGA	30.5kHz	60Hz
VGA	31.5kHz	60 or 70Hz
SVGA	35.2-48.5kHz	56 or 60Hz
8514A/XGA	31.5kHz	60Hz
XGA	31.5kHz	70Hz

Test report

Channel Master 1005IFD Satellite Signal Level Meter

An upmarket meter at a downmarket price. **Mike Hancox**, Technical Director of Satellite Scene, finds this meter robust, accurate, sensitive and inexpensive

It is not often that a top brand company takes a chance and plunges into something quite separate from its usual products. But once in a while the gamble is taken. If the development is a success, it deserves our support.

Channel Master has recently done just this. The company is one of the world's leading manufacturers of satellite dishes and accessories. How it came to decide that there was a lively market for a low-priced satellite signal strength meter baffles me, especially as so many inexpensive meters are already available. But the result is a winner.

We came by the meter quite by chance, as manufacturers usually send us products to try out, looking for feedback from the sharp end of the business. I happened to be at Eurosat Distribution in Walsall on the day when this meter was first put on display. The usual "what do you think of?" conversation started.

A Bargain

There was only one way to find out. We needed a new meter for the Dinky toy side of our satellite installation business. So rather than wait for one to come in for review, I actually bought one! This has enabled us to test the meter properly over an extended period

of time, throughout the whole range of our activities.

The paying up bit was a pleasant surprise. I'd estimated the trade price at around £200 (Eurosat had not even had time to produce a price ticket). When the computer finally came up with a price for this new item, at well under £100, it was a very pleasant surprise indeed.

That was day one. We've handled a large number of alignments since then, and still feel that we got a bargain. Why? Because it's a totally reliable, bomb proof, foolproof, easy to use meter with comprehensive facilities. It is tough enough to be dropped from a great height without damage and be soaked in the rain without detriment: sensitive enough to be used with weak satellites such as Eutelsat II F4 at 7°E; and has a range of features that would not be out of place in a meter costing around £300.

Features

What you actually get for your money is as follows: a whacking great analogue dial for visual signal peaking; an audio tone for peaking when you can't see the dial; 13/18V switching; a battery test reading; a receiver output voltage reading; an LNB consumption reading in mA; signal level on/off and audio tone on/off switching; LEDs for 13/18V indication; LNB signal input via an F connector; receiver power input via an F connector; a separate gain/attenuator control knob; a plug-in AC/DC adaptor/charger; a really substantial metal Tonka case; a tough carrying handle; a separate shoulder strap; and change out of £100!

On Test

We tested the meter on all kinds of installations every day and in all types of weather for over two months before writing this review. During this time we found that the meter was totally accurate and consistently sensitive, even with the lower power available after very long use.

We have been particularly impressed with the range of the gain/attenuation control and the audio tone alignment option. The latter is really useful when you are atop a set of triple ladders in the pouring rain and it is hard enough to hang on, let alone try to read an analogue dial.

The LNB consumption button has been a great help for detecting faulty LNBs. We have also used it in conjunc-



tion with the gain control to obtain accurate assessments of the performance of LNBs.

Nice touches are the ability to switch off either the audio tone or the analogue dial reading, and the separate tone that sounds automatically to confirm completion of the circuit prior to the use of the gain control.

We also liked the ability to use either internal batteries or the receiver's LNB supply to power the meter. Use of the receiver's supply would be useful if your batteries were running a bit low, though it must be said that we never had this problem. It is really nice to be able to complete a full motorised system alignment using the internal batteries, without the need of a feed from the receiver – a feature you normally get with only the more expensive meters.

The button that selects either 13V or 18V for an LNB provides a neat way of checking whether it has lost the horizontally or vertically polarised channels. This is a very common fault: it's easier to detect when you have this meter.

Verdict

All in all this is a really good all-round meter that's worthy of the name Channel Master. A full back up service is provided. You can't really go wrong at the price. Why not treat yourself?!

For further details contact Channel Master (UK) Ltd., Premier Business Park, Whitebirk Industrial Estate, Blackburn, Lancashire BB1 5UE – telephone 01254 680 444, fax 01254 672 299. Eurosat Distribution can be reached on 0192 239 299.



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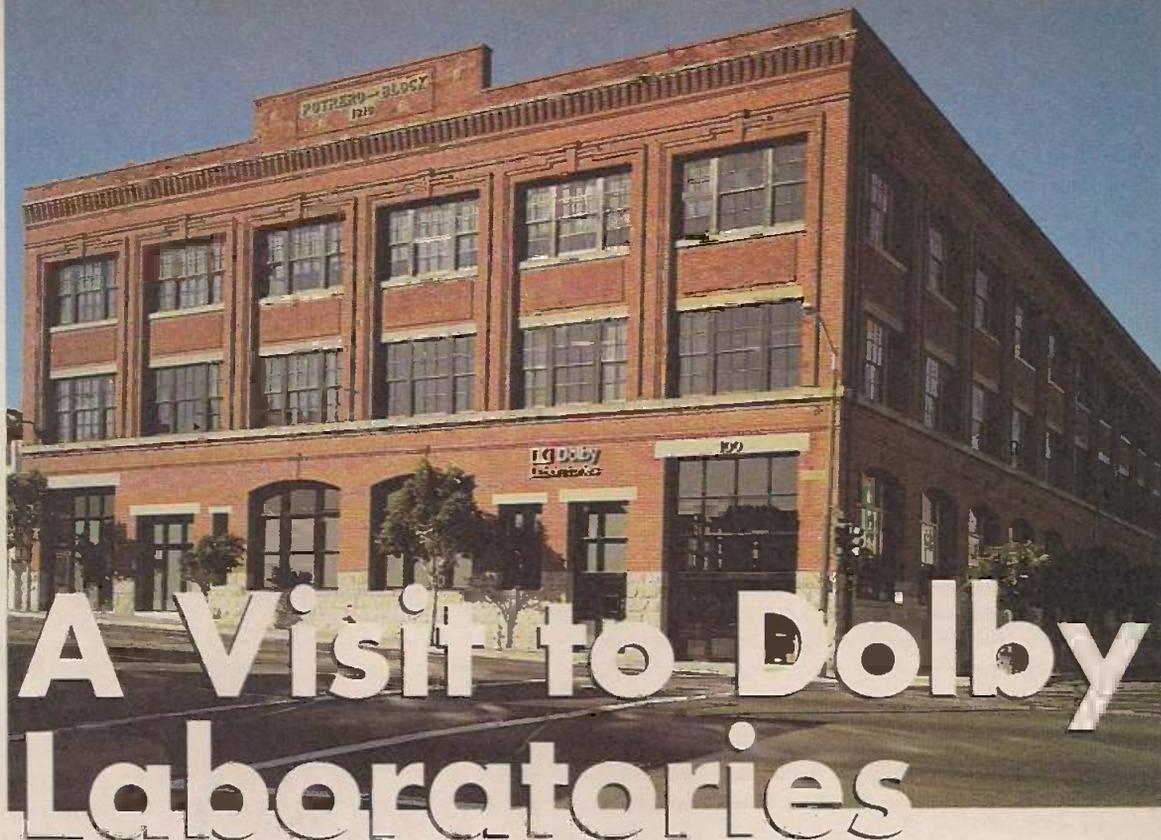
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A Visit to Dolby Laboratories

For a long time Dolby Laboratories was seen primarily as a cinema sound and hi-fi company. Dolby is also involved in the TV, home cinema, DVD and HD-TV markets however. **George Cole recently visited the Dolby headquarters in San Francisco to catch up on the latest developments**

Ray Dolby, an American engineer and physicist, founded Dolby Laboratories in 1965. He had been a member of the group of engineers at Ampex who, in 1956, developed what was the world's first practical videotape recorder, the Quadruplex. It used an FM recording system and ran 2in. tape past four video heads which were mounted on a drum that rotated at 240 times a second, laying down transverse tracks on the tape. The Quadruplex became the standard videotape recorder in broadcast studios across the world.

Noise Reduction

Dolby Laboratories was founded to develop noise-reduction systems for the professional and consumer markets. Its best-known system in the domestic market is probably Dolby B, which was introduced in the Seventies. The system helps to remove tape hiss by applying non-linear pre-emphasis in the recording process. This, basically, boosts the HF audio signals being recorded, a complementary de-emphasis system being used to reduce their level, along with much of the tape noise, during playback.

Dolby B became in effect the standard audio cassette noise-reduction system, despite the development of more powerful versions (Dolby C and S), and remains the dominant format. Although rival noise-reduction systems were developed, they gained only a small foothold in the market and subsequently died off.

Dolby B was also used by a number of mono and linear stereo VHS recorders in the early Eighties. But the introduction of hi-fi VHS – and consumers' acceptance

of hiss with mono machines – led to Dolby becoming obsolete in the home VCR market.

Licensing

Dolby is probably best known for its licensing operations. But a presentation given by company executive Ed Schummer revealed that licensing accounts for only around thirty per cent of the company's income, the manufacture of processors, recorders and encoders accounting for the major share (sixty per cent). The remaining ten per cent comes from services to the recording and film industries.

There are over 600 million Dolby licensed products in use worldwide, with 2,500 hardware licences and over 300 patents in 34 countries. A clever move was the registering of the Dolby trademark, because when the patents run out the company's unlicensed competitors cannot advertise the fact that they are using Dolby products!

There are three potential areas for collecting licensing fees: from chip manufacturers, hardware manufacturers and software companies. In practice Dolby collects royalties only from hardware companies, such as manufacturers of AV amplifiers or Surround sound TV sets. Dolby argues that this strategy encourages chip companies to develop ICs that can then be used by the hardware companies. Dolby is used by software companies as a quality mark.

Dolby Surround

The Dolby Stereo system was introduced in 1976 and became the accepted sound system in the cinema world: over 7,000 films have been encoded with it. Dolby Stereo is a matrix system that adds two extra channels (centre for dialogue and surround for effects) to a conventional two-channel stereo signal. The extra channels can be transmitted with a stereo signal such as Nicam, and can be recorded on VHS tapes and LaserDiscs. There are more than 700 audio CDs and over fifty video games encoded with the system.

The advantage of the system is that a Nicam transmission that carries Surround sound information is compatible with all TV receivers: a mono set will provide a

mono replay signal, while a Nicam stereo set will ignore the Surround sound information and produce two-channel, stereo sound. A set with a built-in Dolby decoder, or one that supplies a stereo output to an external decoder, will enable the extra channels to be extracted. Similarly VHS tapes encoded with Dolby Surround sound information are compatible with all types of VCR. This has given rise to a lively home cinema market.

Two analogue Dolby Surround systems have been released on the consumer market. The first to arrive, Dolby Surround, offered left, right and surround channels. It has been superseded by Dolby Pro Logic, which offers left, centre, right and surround channels. Toshiba launched the first Dolby Surround TV sets in the early Nineties, while Hitachi was first to introduce Dolby Pro Logic sets. A number of companies have launched stand alone Dolby processors as part of home AV/cinema systems. Of the 26 million Dolby Surround decoders in use worldwide, half of them are in the USA where home cinema is big business. Two million are in the UK. Dolby dominates the analogue Surround market: it faces a greater challenge in the digital field.

Quality Control

Martin Lyndsey, general manager of Dolby's Quality Assurance Division, explained how the company checks all products that bear its name. Part of the licensing agreement includes a clause that gives Dolby the right to test products and to demand improvements wherever this is considered necessary. Much of the equipment that Dolby tests is supplied by manufacturers. Dolby also buys equipment off the shelf however, visits production centres and selects hardware at random.

Testing is carried out by about a dozen engineers. It's interesting that 39 per cent of products fail the initial evaluation. Testing is exhaustive. For example a Dolby processor undergoes 25-30 tests involving over a hundred measurements. Some failures are caused by cost-cutting measures adopted by manufacturers. These started with production being moved to low labour cost countries, and continued with the use of fewer and then lower-quality components.

Dolby Digital

The Surround sound market is no exception to the relentless move in the digital direction. During the Eighties Dolby developed two algorithms that use a perceptual coding system (see later) to compress or reduce the quantity of data required for digital audio playback. The AC1 system was first used for satellite TV transmissions in the USA and Australia. AC2 was used in professional markets.

Steve Vernon of Dolby Laboratories gave an excellent presentation on the most important system, AC3 – much of the information presented here is derived from it. Work on AC3, which is aimed at the cinema, broadcasting and consumer markets, began in 1991. Indeed AC3 is part of the DVD specification and the US Advanced Television Systems Committee specification for digital HD-TV. Systems that use AC3 coding are known as Dolby Digital. The system offers data rates between 32 and 384kbts/sec, providing various options from mono sound to stereo sound with up to six discrete channels.

Data Compression

Data reduction is required because a PCM (pulse-code modulated) audio system uses comparatively large amounts of data. Take for example a digital audio system that has 48kHz analogue signal sampling followed by 16-bit digital coding to provide a two-channel stereo

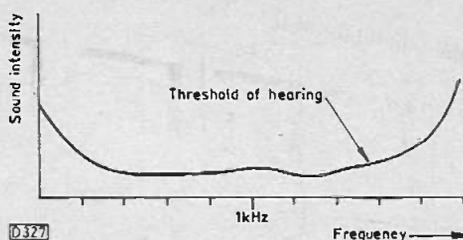


Fig. 1: The threshold of hearing curve. Human hearing sensitivity decreases at lower and higher audio frequencies.

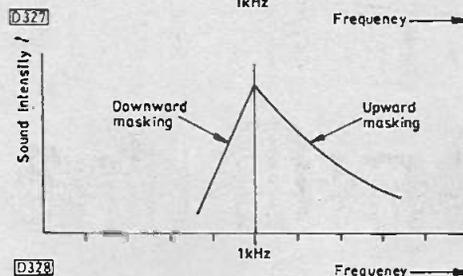


Fig. 2: Frequency masking. Louder sounds mask quieter ones, the effect working in both the HF and LF directions.

signal – DAT for example. This will result in a data rate of 1.536kbts/sec ($48k \times 16 \times 2$). For six-channel sound the data rate expands to 4.608kbts/sec.

There are basically two types of data compression system, lossless and lossy. The former produces decoded data which is identical to that entering the encoder. The advantage is that the output, e.g. an audio signal, is indistinguishable from the original. The disadvantage is that there is only limited scope for data rate reduction – it tends to rely on factors such as redundancy. A typical compression ratio is 2:1. With a lossy system the decoded output is not identical to the original signal, though the results can be acceptable to the end user – some say that smart encoding can result in the end user finding it impossible to tell the difference between the compressed and the original data. This is what AC3 does – so do other compression systems on the market, such as Sony's ATRAC (Adaptive Transform Acoustic Coding) which is used with Mini Discs. Incidentally ATRAC uses some Dolby patents.

Perceptual Coding

AC3 is a perceptual coding system. The difference between the data output and the original data is known as the quantisation noise. Perceptual coding systems work by exploiting the limitations of human hearing to shape the quantisation noise so that it is inaudible. As a result, compression ratios between 8:1 and 12:1 can be achieved.

The sensitivity of the human ear is less at low and high frequencies, sound below the threshold of hearing (see Fig. 1) being inaudible. Dolby AC3 makes use of a phenomenon known as frequency domain masking – basically, a louder sound makes a quieter sound inaudible. This masking works in both directions from the frequency point of view, i.e. quiet higher frequencies are masked by loud lower ones and vice versa, see Fig. 2. Another phenomenon, known as critical band frequency resolution, makes use of the fact that human hearing has finite frequency resolution, certain frequency bands sounding alike. This means that some bands can be removed without the overall sound being affected.

The key to successful perceptual coding lies in the development of algorithms that come close to matching the characteristics of human hearing. Dolby's perceptual coding algorithms have been designed so that they can be adapted as the technology improves.

Encoding and Decoding

A simplified illustration of the operations carried out in a Dolby Digital encoder is shown in Fig. 3. The ana-

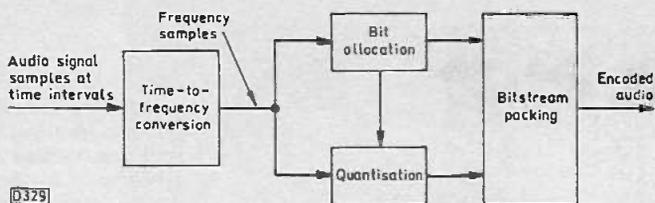


Fig. 3: Basic Dolby Digital encoding.

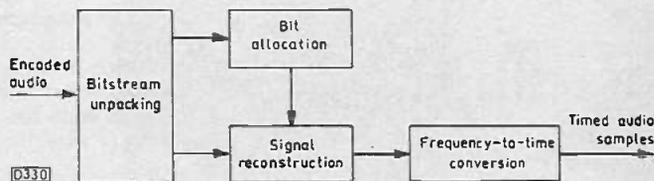


Fig. 4: Basic Dolby Digital decoding.

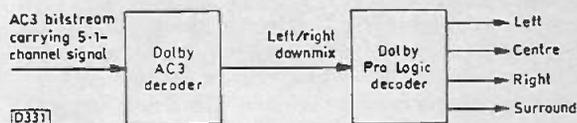


Fig. 5: How Dolby Digital works with Dolby Pro Logic to provide multi-channel sound.

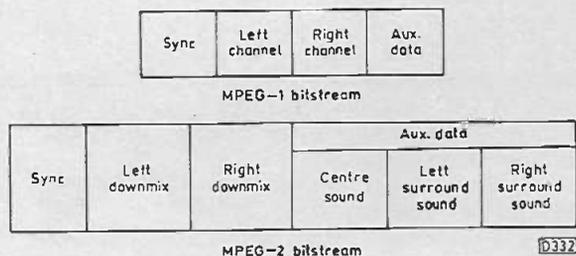


Fig. 6: MPEG-1 and -2 bitstreams. The MPEG-2 system is designed so that the decoder can also read MPEG-1 signals. The left MPEG-2 down-mix consists of $L + 0.7C + 0.5LS$. The right down-mix has the same proportions. C = centre channel sound, LS = left surround sound, RS = right surround sound.

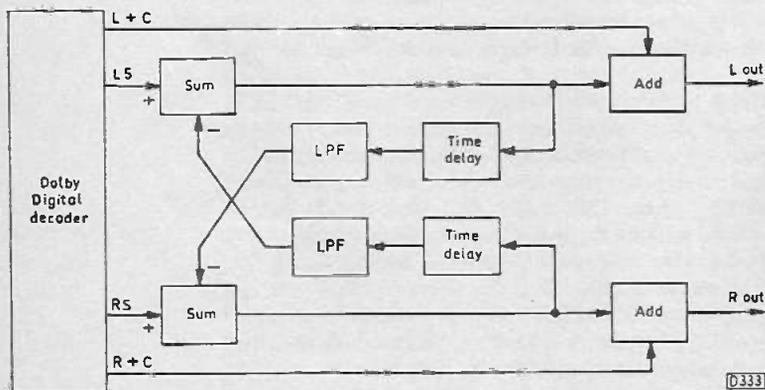


Fig. 7: Virtual Dolby Surround processing. Application of cross-cancellation to the Surround signals and mixing with the front signals.

logue audio signal is first sampled, producing a series of samples at time intervals. These are converted to frequency samples, using a modified discrete cosine transform (MDCT). This is a version of a Fast Fourier Transform (FFT), which uses complex mathematical calculations and processing to convert a waveform into a series of harmonic functions.

The bit allocator determines how many bits are to be used for each frequency sample. After quantisation, which rounds each frequency sample to the specified number of bits, the samples are packed into a bitstream.

The Dolby Digital decoder (see Fig. 4) unpacks the bitstream, analyses how many bits were used for each frequency sample, and then reconstructs the signal. An inverse MDCT transform is used to convert the frequency samples back to time samples.

Results

The result of all this is that Dolby Digital can provide a mono signal using a data rate of just 96kbts/sec (an 8:1 compression ratio), a two-channel stereo signal using a data rate of 160kbts/sec (a 10:1 compression ratio), or a 5-1-channel Surround sound signal (left surround, left, centre, right, right surround and sub-woofer) using a data rate of 384kbts/sec (a 12:1 compression ratio).

Dolby Digital also offers a decoder down-mixing facility. In other words, if you feed a 5-1-channel signal to a decoder that's connected to fewer than six speakers, down-mixing is used to combine channels. If there are more speakers than there are coded channels, the unused speakers are muted.

The system works with Dolby Surround. A 5-1-channel signal can be applied to an AC3 decoder to provide a down-mix for feeding to a Dolby Pro Logic decoder which produces multi-channel sound, see Fig. 5.

Marketing

Dolby Digital was launched in the cinema market in 1992. Some 9,000 cinemas worldwide have installed the system, and about 900 films are encoded. The Dolby Digital data is inserted in blocks in the gaps between the sprocket holes at the edge of the film print. It is clever technology, but Dolby Digital faces strong competition from another cinema digital surround sound system called DTS.

In December 1996 the US Federal Communications Commission (FCC) announced that Dolby Digital was to be used as the audio system in the US digital HD-TV format developed by the Advanced Television Systems Committee. ATS is expected to be launched in 1998. The US cable industry has also opted to use Dolby Digital. So has the Primestar satellite TV service.

Dolby has been pushing AC3/Dolby Digital in the consumer market. About 200 LaserDisc titles feature Dolby Digital sound. This feature is possible only with NTSC discs however - they have room in the waveform to accommodate the AC3 soundtrack. Conventional NTSC LaserDiscs carry analogue video plus two FM sound channels and PCM sound. This ensures compatibility with older LaserDisc players, which offer only analogue video and sound. To add Dolby Digital to a LaserDisc, one of the FM channels is used to store the data. The result is a LaserDisc which has PCM sound, Dolby Digital and a mono FM sound channel. The first Dolby Digital LaserDiscs were launched in the USA in 1995: millions have since been sold.

About seventy companies market Dolby Digital decoders for the home market. They include Denon, Kenwood, Pioneer, Technics and Yamaha. Toshiba has



Quality control testing of Dolby Laboratories.

announced plans to launch TV sets that cater for Dolby Digital 5.1 audio.

Dolby Digital is part of the DVD specification, but there is some controversy here. The format is mandatory for DVD discs intended for NTSC markets, but is optional for PAL DVD discs which must use MPEG-2 audio. This split was called for by European manufacturers, who wanted DVD to be backwards compatible with MPEG-1 audio, as used by Video CD and CDi.

Dolby argues that its system is superior. For example in order to remain backwards compatible, the MPEG-2 bit-stream consists of a left and a right channel down-mix that can be read by an MPEG-1 decoder, see Fig. 6. An MPEG-2 decoder also reads auxiliary data which provides it with centre, left surround and right surround data. Dolby argues that the quantisation noise is different for each channel, and thus doesn't cancel. In addition MPEG-2 uses a higher data rate (640kbits/sec compared with 384kbits/sec) to avoid artifacts when the channels are extracted from the matrix.

In practice there is little to choose between the two systems. But few would dispute that Dolby has done a good job in marketing Dolby Digital.

Virtual Dolby Surround

Roger Dressler, Dolby's technical director, talked about the company's latest development, Virtual Surround sound. Basically this means attempting to create Surround sound effects from a pair of built-in TV receiver speakers.

A number of companies which market Surround sound receivers have found that many consumers like the idea of Surround sound but not the idea of extra leads and speakers in the home. JVC was the first company to tackle this problem, with its 3D Phonic system. Although the format was criticised by many home cinema reviewers, it has been popular with the public. So much so that other companies, including Hitachi, Panasonic and Sharp, have launched sets that offer a similar feature.

Dolby has now decided to joint this market. Its Virtual Dolby Surround system was originally developed for the PC market, the idea being that computer users with games and multimedia software could have the benefit of

surround sound effects from a pair of PC speakers. Virtual Dolby Surround is now being aimed at the TV market as well.

Virtual Dolby uses a sound cancellation process to create 'phantom speakers'. Consider sound coming from a left stereo speaker. It arrives at both ears. The short time difference between the left and right ear telling the listener that it comes from the left front. If the right ear is covered, the sound appears to come from the left side. Virtual Dolby Surround creates this effect by using a cancellation signal that's equal and opposite to the right-ear signal, thus cancelling it.

Fig. 7 shows how virtual processing works. The Surround information from a Dolby decoder has first to be isolated: this works with either analogue or digital Dolby systems. Cross-cancellation is next applied to the Surround signals, which are then mixed with the front left and right channel signals.

There is no such thing as a free lunch. In the case of Virtual Dolby Surround, the trade-off is a narrow but deep 'sweet spot' (where the effect is most noticeable). When Dolby demonstrated the system to us we sat in rows, each person sitting behind the other. As one listener commented, "fine if you like watching television while sitting in a canoe"! Dolby used the system with the film *Outbreak*. The general feeling was that Virtual Dolby Surround offers more than a conventional stereo system but falls well short of the results obtained with a full-blown system.

Roger Dressler agreed, but argued that only ten per cent of US homes have a Surround sound decoder, and that systems like Virtual Dolby Surround are a way of introducing more people to surround sound.

A number of chipmakers, including Intel, Matsushita and Texas Instruments, are manufacturing ICs for the system. There was no news about which setmakers will be launching receivers that feature Virtual Dolby Surround however. But one suspects that a fair number will adopt the system.

Acknowledgement

Many thanks to Dolby's UK and US staff for their help in the preparation of this article.

Satellite WORKSHOP



Jack Armstrong

I write this during the lightning season: my workshop has been filled with allegedly 'lightning damaged' receivers, most of which had simply refused to start up after being unplugged from the mains supply for a while. This is usually a because of low-value electrolytics, nothing to do with lightning damage.

The story with one Pace MSS100 receiver was rather different however. It worked perfectly except for the terrestrial TV loop-through, which produced very grainy, colourless pictures. The satellite TV channels were perfect. But the receiver's owner was not satisfied with only 250 channels – he wanted the other five as well!

I had to replace the surface-mounted TDA8725T UHF input amplifier chip U201 (part no. 909 0872501), also the components between its input pin 5 and the UHF aerial socket – R219 (39Ω, part no. 940 3900501) and C227 (10nF, part no. 950 1035621). While I was putting the screws in, I had a phone call from Wosname up Church Street.

"Gorranaarreff mod fur an MSS100?" he enquired.

I explained, as gently as I could, that the MSS100 does not have a

separate RF modulator module, but he insisted.

"Course it 'as. Where d'you think you stick the aerial plug, you great oaf?"

At this point I gave up and suggested that he phone CPC or HRS. Let them deal with it! I just hoped that the owner of the MSS100 wouldn't bring it to me after Wosname had "looked at" it.

No Signal

An MSS100 that arrived a few weeks ago had me stumped for a while. "No signal" it announced, on a blue background. Now the cause of this is often a dry-joint at D18 or, occasionally, a broken soldered joint at the tuner unit's input pin. It was neither of these in this case however. In addition the LNB supply was present, so it wasn't a question of going into the menu to see whether some idiot had selected 'LNB power OFF'!

To see what was happening, I turned off the blue screen – by pressing 'F' then store – and found that there was a marked difference between the noise on the screen with the LNB connected and with it disconnected. This suggested that the tuner was probably all right but was stuck on an out-of-band frequency.

The board's design is such that a tuner with serial data control could be used. At present however the receiver still uses analogue voltage control via a divided-down frequency feedback loop. This process is handled by the frequency-synthesiser chip U100, which is an LM7001 as in SS9000 series receivers. The actual tuning voltage is produced by an integrating circuit based on the MOSFET Q100.

A quick voltage check showed that the 30V supply to this circuit was present. But Q100 was permanently off. Before jumping in and replacing Q100, I used the scope to check around U100. This showed that the 5.625MHz crystal X100 was not oscillating. A new crystal restored normal operation.

Pace PRD800

In the heat of the summer a jovial gentleman skipped into the workshop with a Pace PRD800 tucked under his arm.

"Doesn't like the heat, ha, ha, ha" he chuckled. "Keeps scrambling the

pictures, ha, ha."

He passed the offending receiver to me, and I almost dropped it as I was so distracted by his attire. He sported nothing more than a pair of shorts, a baseball cap and a beer belly. A horrible sight, made worse by the fact that he was as red as a beetroot.

He chuckled his way through the ticket-completion procedure, then took himself off – to his sun lounger presumably.

I went through the motions of soak testing the receiver but, after six hours, the fault had not shown up and the day was becoming cooler. So I finished off my tenth repair of the day and then phoned the jovial one.

"Ha, ha, ha" he explained. "Does it mostly on QVC. Her indoors doesn't get out much nowadays, so she likes to watch that."

I left the receiver tuned to QVC overnight. Sure enough, next day the picture was scrambled. I disconnected the receiver and let it cool down for an hour before repowering it.

There was a picture, but I noticed tiny speckles – not sparklies, which are the tadpole-shaped spots you get with a poor signal, but tiny dots on bright colours. They were present in only the centre two-thirds of the screen. As the receiver warmed up the speckles became worse. Finally, the picture scrambled. The other Sky channels remained perfect for several hours before they, too, became scrambled – one by one!

I won't bore you with the details of how many ICs I swapped and how many curses I uttered. The cause of the problem was eventually traced to link wires J1-J4. These are factory set by cutting certain combinations – a sort of fine tuning for the decoding 'cut and rotate' points. One link had apparently been cut by mistake, and the scrambling was the result.

I phoned the jovial gentleman to tell him the news. He didn't chuckle when I told him the price.

The BT SVS250

This receiver was made by The Orient Power Video Manufacturing Co., which made the Oritron/Aegir/Dixi/Lenco D2-MAC decoder. I had three of them in for repair on the same day.

The complaint with the first one

was "decoder messages disappear after warm up". Replacing the 1µF electrolytic C45, next to the PTV111 chip U6, often cures this fault. On this occasion however the cause was C38, a 33nF polyester capacitor. It measured correctly but must have been leaky.

The second one had had a fault which the dealer described as "pat-teming". He'd cured it by replacing D15, L6 and C29 at the rear, right-hand corner of the decoder board, using a hairdryer and freezer to find the cause. He then discovered that at switch on the display showed "LNBS", followed by "off". LNBS is actually LNBS, which means LNB short-circuit. I told him to post it to me, which was why it was now on the bench.

In fact there was no LNB short-circuit, and the LNB voltage was 14V DC under load. I traced the cause of the fault to transistors Q407 (2SC1815) and Q406 (a medium-power pnp type) next to a heatsink. Fortunately I have a poor photocopy of a photocopy of what is laughingly described as "the circuit diagrams" – barely readable, but at least I was able to figure out the LNB supply circuitry (though the cause of the fault was actually in the 12V regulat-

ed supply!).

The third SVS250 exhibited symptoms I'd not come across before. When I changed channels I could see only a blank screen for the first couple of seconds, then the picture appeared. With channel 18 (possibly others as well) the screen remained blank (this is the Cartoon Channel). After replacing every electrolytic capacitor on the main board I found that the cause of the fault was C173, a green-coloured 47nF capacitor which is in the middle of a cluster of electrolytics just to the right of the tuner.

As a precaution I also replaced C460 (100µF) next to the heatsink. When faulty it causes a herringbone pattern that customers often describe as "loses colour when warm".

These BT receivers are now dropping like flies. They should be good little earners for a few months.

Pace Receivers

Several people have asked why my articles contain so many references to faults with Pace receivers. "They must be very unreliable" one reader commented. Not so. There are several reasons why I do so much work on Pace receivers. First, far more of them were sold in this area than any

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

jack@netcentral.co.uk

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

other. Secondly, my customers like them so much that they prefer to have them repaired rather than scrap them. Thirdly, parts are readily available for even eight-year old receivers. And fourthly service information is willingly provided by the Pace Technical Department. These factors, together with Pace's openness about any problems, mean that dealer and customer loyalty remain high.

With truly unreliable receivers you'd be reading about the same faults month after month. No one wants to read about replacing start-up resistors time after time after time – which is why I write about Pace receivers instead!

Test Case 417

High summer is a relatively slack time in the workshop. It's also the favourite time for taking holidays however – how service managers would love to abolish holidays! So it was that our occasional stand-in, Roger, came to be installed at a repair bench in the peace of the almost deserted service department. The first few repairs he handled gave him no trouble – a Sony VCR with dirty heads, a Tatung telly with a dodgy mains switch, and a blown-up Pace satellite box for which we had a repair kit in the stores. Roger was in fact rather rusty with regard to diagnosis and repairs, and was relieved to be doing so well. Then the Mitsubishi VCR came along.

It was an HSB12, a straightforward and reasonably trouble-free machine that was about seven years old. The reported symptom was a simple one: the deck would shut down a couple of seconds after any mode (play, record, fast transport) was requested via the front panel or the remote control unit. A belt problem perhaps, or maybe hardened grease on the deck surface. Roger removed the top cover, inserted a cassette and asked the machine to play. It laced up the tape smartly, everything started to move, then the deck went into the stop mode. Roger noticed that before the shut down the drum rotated, the capstan drove the tape and the reels turned.

Maybe, thought Roger, the cause of the problem lay with the reel rotation sensor. This can usually be proved by using the pause key just after the commencement of play. But there was barely time to do so before the deck stopped. An oscilloscope check on the reel-sensor pulses at pin 29 of the main microcontroller chip showed, briefly, that they were present. What was the next most likely culprit? The mode switch of course. There was a good likelihood that during the seven

years or so it had become tarnished or worn. It's usually quicker to fit a replacement than try to monitor and interpret the outputs of the original mode switch, especially in a situation like this where mechanical operation continued for only a short period. As there was a new mode switch of the right type in the stores, in it went. But the machine still insisted on shutting down after a couple of seconds, whatever the mode.

Why, Roger wondered, was the microcontroller chip not happy when everything seemed to be up and running? Perhaps it didn't know that the capstan was rotating, even though it was being told that the spools were turning. Another scope check showed that the capstan FG feedback was present at pin 13 of the microcontroller chip. After more headscratching Roger decided to check all relevant voltages from the power supply – they were OK, or at least within tolerance. He then checked the off-tape control-track pulses, which were also fine though hardly relevant to the problem.

As in most VCRs, there's another microcontroller chip on the front panel. Its duties relate to control-key input decoding and fluorescent display-panel drive. The two microcontroller chips talk to each other via serial data lines. Could the one at the front be telling its colleague in the engine room to stop, and if so why? You cannot read, analyse or interpret the whizzing data carried by a serial control/data line, or at least we can't – with or without the help of Roger! Resisting the temptation to order a microcontroller chip – which would have arrived after his stint of duty – Roger finally found the cause of the trouble. It was nowhere near the front panel or the syscon microcontroller chip. What was it? For the solution, turn to page 832.



Servicing in the Digital Age

Eugene Trundle reports from the recent RETRA service conference, which was mainly concerned with the problems that await us when digital TV/video equipment will need repair

The first service conference organised by dealer association RETRA was held early last month in Birmingham. Its main purpose was to consider the future of the consumer electronics servicing and repair industry in the imminent age of digital TV and video equipment.

Key Presentation

RETRA'S president, dealer Chris Keeble, outlined the problems that face engineers and technicians in the beckoning digital era. He portrayed several species: Nigel, 17 years old, with moderately good exam results; Modem Singh, 23 years old, who's passed all his exams and loves computers; Harry (100 Watts) Homer, who earns more at evening pop-music gigs than he does during the day at his repair bench; John, 39 years old, who passed his exams long ago and is getting rusty in spite of his long experience; Jody Fixall, who can fix anything electrical or electronic; and Rodney Radar, 63 years old, who was an RAF apprentice in 1950. Most readers of *Television* will see themselves somewhere in this list of characters.

All, with the exception of Rodney who is cruising towards his retirement and pension, desperately need practical, hands-on retraining and updating to enable them to deal with the new technology. Some are seeking to leave the trade at the first chance, while some are expecting their P45s at any time. A bleak outlook, it seems, typified by John. He declares himself to be in the dark about new technology, demoralised, underpaid,

underequipped, lowly in status and having difficulty right now coping with 1,000 new products from 31 manufacturers without a digital receiver as yet amongst them!

Chris Keeble then enacted, with colleagues, a typical scenario. This involved a hilarious exchange of views between a field engineer (puffed out and parked on double yellow lines), a boss (being chased by a customer for a refund unless his repair is completed within twenty minutes), and a bench engineer who had no service manual for the digital widescreen TV in question and no training on it – he didn't know where to start, and guessed that maybe the power supply or the timebase sections might ring some bells, based on previous experience.

The scene was thus set by people who were clearly in there at the sharp end of the industry. The rest of the day was spent exploring possible solutions to the problems – with 'snapshots' presented by representatives of the broadcasters, the setmakers, technical colleges and retailers.

Training and Test Equipment

BBC training manager Andy Woodhouse conceded that the Corporation has more money at its disposal than Midshire TV Repairs Ltd. It nevertheless faces similar problems. He mentioned four pieces of expensive test gear that each provided different answers, then went on to describe digital broadcasting modulation and delivery systems and the way in which the BBC proposes to arrange its own digital terrestrial TV multiplex, with promises of widescreen pictures and, hopefully, a return to the days of on-screen service aids and information for repair and installation technicians.

Setmakers Sony, Pace, Thomson and Panasonic outlined their plans and hopes for service support in the digital age. On the subject of test equipment, Sony admitted that it is impractical for the company to repair digital video products in the UK at present – the test

equipment required is simply too expensive! Products that need repair are returned to a service facility in Belgium.

Sony's UK training budget is probably greater than that of any other UK brown goods manufacturer, reflecting the company's success in the market place. So long as its dealers and service centres are prepared to invest in training and equipment, Sony says that they will be given full back-up, including subsidies for test gear and plant and comprehensive product training.

Questioned as to whether the manufacturers were trying to "squeeze out" the smaller servicing businesses, Sony's Howard Marsh stressed the need for competent service staff and adequate equipment. He added that without the minimum requirements of an on-bench PC and good surface-mount rework stations, service centres will be struck off Sony's approved list for some product types.

Panasonic UK's Simon Nash described the evolutionary nature of consumer goods servicing over the last forty years, and drew contrasting pictures of the service departments of the past, the present (very similar in most cases!) and the future. He foresaw a future with DVD, solid-state memories replacing video tape, service software on floppy discs, CD-ROM service manuals and ICs with ball-grid arrays over their faces for surface contacts.

Panasonic's plans for the future include an Internet site for technical support, the Lucy system to interface with a PC for diagnosis and setting up purposes, and liaison with technical colleges – the company already has Modern Apprenticeship schemes going with Bracknell and Wokingham colleges.

Optimism from Pace

Pace Micro Technology has had most experience to date of manufacturing and servicing digital TV gear. Though currently going through a difficult period, the company presented an optimistic picture. It already had a test program for use with a PC, and expects to have diagnostic software ready for the UK launch of satellite DTV. The company's message to technicians is not to be afraid of the new technology, and to "have a go".

The current Pace DTV receivers incorporate operating software for MPEG signal decoding in two flash memories that can be reprogrammed over the air or via an RS232 PC interface, a 16Mbyte RAM for frame storage and a combined video/audio decoder all on a four-layer PCB. A fast modem is built in to provide a return channel via a telephone line.

Internet Ordering

Cromwell Business Systems described the increasing use of the Web and other advanced communications systems for spares ordering, component search and selection, and technical databases. Manufacturers and service providers are turning to the Internet, generally with the use of confidential passwords. It was envisaged that engineers would have access to this information on the road and on site at customers' homes using a laptop computer. Indeed information is becoming so dense and widespread that search services (datamining) are already being offered by several companies. It's expected that there will be 225 million Internet users by the year 2000, with 200 million of them using e-mail.

Education

Representatives of colleges and examining bodies described the difficulties they face in the further education sector – with accusations of apathy from several

quarters hardly helping. Central and local government funding is low and at present has two objectives, maximum class occupancy and helping the unemployed. Courses for the TV/video servicing trade have to be largely self-supporting. They have had poor take up, and are expensive and complex to run. Their cancellation is for these reasons easy to justify – in the relatively few places where they are still run. The equipment and know-how in colleges are out-of-date.

Despite this grim situation Jim Potts, of the Greater Notts Technical College, found reasons for hope. He described partnerships with manufacturers and dealers, and funding from EU sources and from the government, as possibilities. Everyone agreed that no single sector could afford to bear the cost of retraining alone, and that the burden would therefore have to be shared.

Setmakers pledged help with training lecturers and designing relevant courses and syllabuses, also (in some cases) subsidisation or donation of equipment. Thomson Multimedia's representative Mike Geaves however made it clear that the perilously slim profit margins in the industry meant that little of this sort could be afforded.

General Discussion

The day finished with a general discussion of possible sources of training and the all-important funds to finance it. Training could be provided by setmakers, technical colleges, specialist technical training companies, distance-learning courses and the Internet. Work on developing the latter is already being undertaken in various quarters. Possibilities for finance include central and local government, EU funds and (suggested from the audience) a 'levy' imposed by manufacturers; also a 'compulsory' donation of 0.25 per cent of turnover to a common kitty for training and 'upskilling'.

Pointing to the healthier state of the servicing industry on the European mainland, one delegate suggested that certification and a licence to practice, as in France, Germany and also Australasia, would help: this might come to the UK eventually as a result of European law. It was also suggested that broadcasters who subsidise receiver costs (e.g. BSkyB) will offer free servicing or equipment replacement in order to maintain their subscriber base.

A point made was that with sixty million TV receivers currently in use in the UK, and the relatively poor DTV takeup elsewhere in the world, the changes are not going to happen overnight.

It was an interesting conference that provided much food for thought. At its conclusion, there was a strong sense of recognition and awareness of the problems that lie ahead. RETRA hopes to arrange further service conferences and seminars in the future.

RETRA president Chris Keeble talks to delegates.



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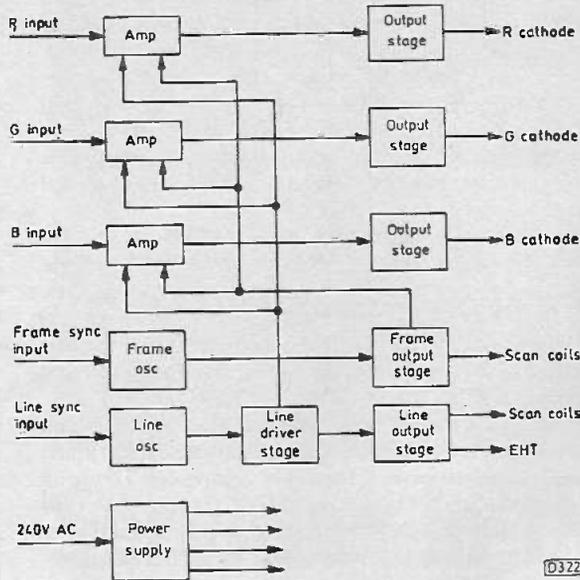


Fig. 1: Basic block diagram of a colour monitor.

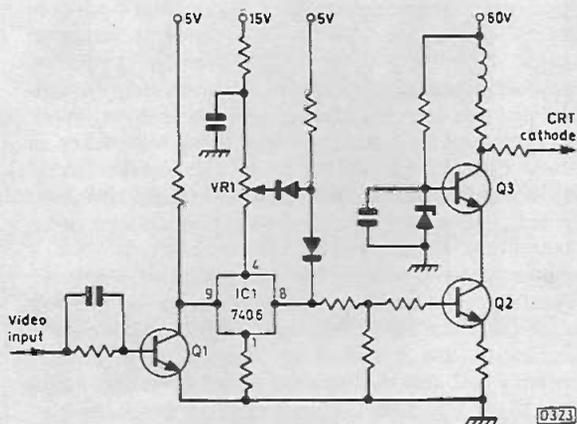


Fig. 2: A typical digital (TTL) video driver circuit.

SVGA monitors, the most common types encountered these days.

Power Supplies

Fig. 1 shows a block diagram of a typical colour monitor. It will look very familiar to anyone reading this article. Most monitors have a chopper power supply that provides outputs at around 6.3V, 12V, 20V, 87V (HT) and 135V. I've come across a few older monitors that have a series-regulator power supply, but these tend to be early types and you probably won't encounter one in normal servicing.

The power supply is normally conventional in design, but mention should be made of power-saving systems. The idea is similar to a TV set that switches itself to standby if the tuner doesn't receive a signal for a given length of time. Unlike a screen saver, which is a piece of software designed to avoid phosphor burn, the power-saving system is built into the monitor, switching it to the standby mode in which it consumes less power. The monitor needs some sort of signal from the PC to let it know when to go into standby. Two systems are in relatively common use.

DPMS

The first is the Display Power Management System (DPMS), which was developed by the Video Electronic Standards Association (VESA). This system has four

states: on, standby, suspend and off. DPMS controls the monitor by disabling the sync signals. With line sync missing and frame sync present the monitor goes to standby and remains in this state until it is returned to on (for example if a key on the PC's keyboard is pressed) or it is asked to change to the suspend mode. This is done by restoring the line sync pulses while disabling the frame sync pulses. The monitor uses less power in the suspend than in the standby state.

Nutek System

The second system in relatively common use is the Swedish Nutek system. This has the advantage that it's not necessary to manipulate the signals from the video board in the PC. It is activated by a lack of blue video input, which can be accomplished by using a screen saver that blanks the screen. If there's no blue signal for a given period of time, a Nutek monitor will switch to its first power-saving state, in which it consumes about 80 per cent of its normal power consumption. If the lack of blue continues, the monitor switches to its second power-saving state, which usually means shutting off everything except the CRT's heaters and the microcontroller chip. This second state generally lowers the power consumption to about ten per cent of normal. When the monitor detects a blue signal it returns to its normal operating state (if a screen saver is used to remove the blue signal, this will happen when the mouse is moved or a key is pressed).

Video Drive Circuitry

The video drive circuits used in most analogue colour monitors are basically the same as those used in colour TV sets, so no more need be said about them. Monochrome and digital (TTL) colour monitors are slightly different. They use a digitally-coded signal at each input, sometimes with an additional intensity signal, rather than the analogue input signal used in TV sets and the more modern (analogue) colour monitors. This means that the electron gun is either switched on (when a digital one is present) or off (when a digital zero is present), with no provision for turning the gun on partially. As a result, the number of colours that can be displayed is extremely limited.

Fig. 2 shows a typical digital (TTL) video driver circuit. Q1 at the input amplifies the signal received via the video cable to a level that's suitable to drive IC1. This is a simple logic chip that's used to clean up the incoming signal. VR1 acts as a contrast control, by varying the amplitude of the output from IC1 and thus the difference between light and dark. The output from IC1 is fed to the video output stage, which is based on transistors Q2 and Q3. This amplifies the signal to a level suitable to drive the CRT.

Frame Timebase

An important difference between the frame oscillator used in a TV set and a monitor is that the former is free-running, synchronised by the frame sync pulses. In many monitors however the oscillator generates a single sawtooth waveform each time a frame sync pulse arrives.

Fig. 3 shows a circuit of this type, with an SCS (silicon controlled switch) as the oscillator. When a negative-going frame sync pulse arrives at the gate of the SCS it switches off and the two 0.22µF capacitors charge from the 53V supply to produce a positive-going sawtooth. When this reaches a certain amplitude the SCS switches on again, shorting out the charging capacitors. Feedback from Q1 linearises the sawtooth, with VR1 and VR2

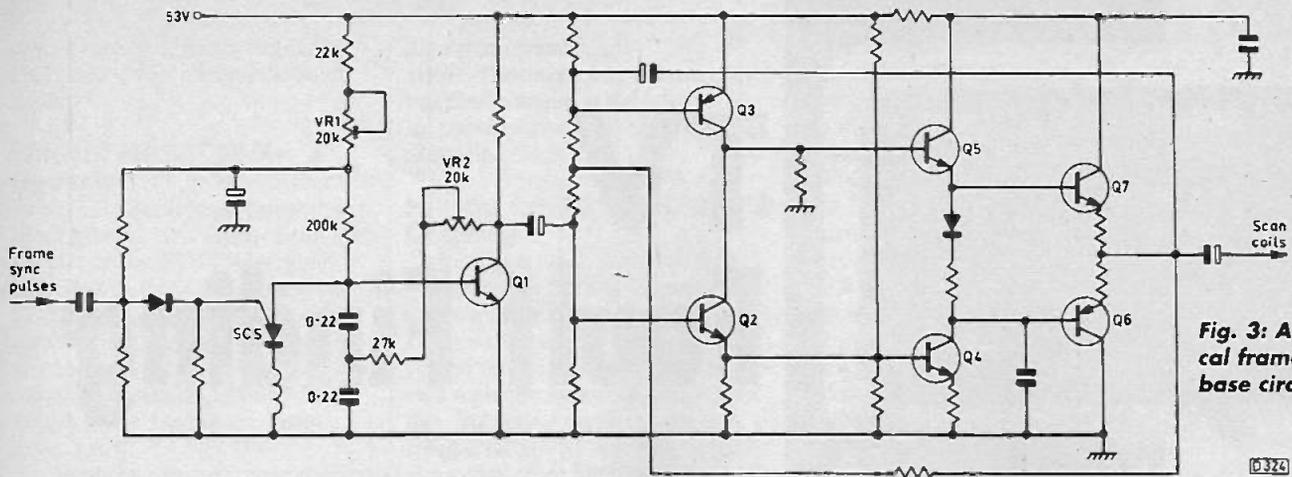


Fig. 3: A typical frame timebase circuit.

providing height and linearity adjustment. The following transistor pairs (Q2/3, Q4/5 and Q6/7) amplify the sawtooth waveform and drive the scan coils. Note that the use of discrete transistors, rather than a power chip, is far more common in monitors than in TV sets.

Line Timebase

As with the frame timebase, the line oscillator in a monitor may run only when line sync pulses are present. With many monitors an internal break in the video lead is a common cause of no line output stage operation and thus no picture.

Apart from the need for sync pulses to be present to fire the oscillator, the line timebase circuitry used in most monitors operates in the same way as that in a colour TV set. It is worth mentioning however that the

EHT is frequently higher in a monitor than in a TV set with the same CRT size.

In Conclusion

If you decide to have a go at repairing computer monitors, this article will hopefully help you to avoid some of the traps that can befall anyone who thinks, as I did, that a monitor is simply a TV set with bits missing. While this is largely true, many hours can be wasted with an apparently dead monitor that suddenly springs into life when it's connected to a PC! Nothing can replace a good service manual of course. But a knowledge of what goes on in a monitor and the differences between monitors and TV sets should enable many of the more basic repairs to be carried out despite not having service information to hand. Good luck!

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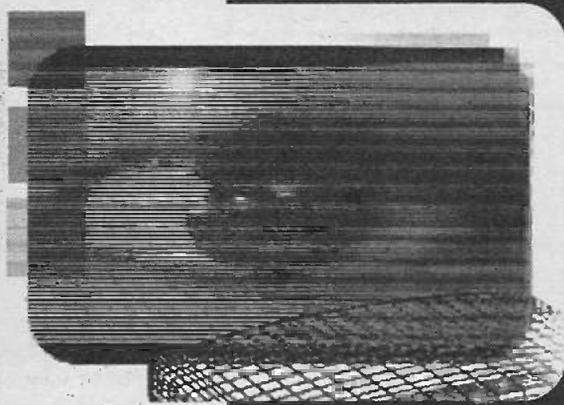
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Sony KVM1620U

The customer said that there was sometimes a blank screen with no sound. Sony TV sets in particular produce a blanked screen when there is loss of the signal or sync pulses etc. So when the fault finally appeared I selected the tuning mode via the remote control unit. Sure enough tuning drift could be seen.

Where to start? The 33V tuning voltage supply stabiliser was checked and found to be OK. A replacement tuner was then fitted but the fault, which could take a few hours to return, was still present. Eventually the cause was narrowed to the 2SC2712G surface-mounted transistor Q104 (equivalent to the BC846) and the 0.047 μ F capacitor C148. These components are in the variable tuning voltage supply. M.J.C.

Hitachi G8Q Chassis

"No sound or vision" the customer had said. When the setting of the first anode preset was turned up a blank raster appeared. So I jumped to the incorrect conclusion that there was a programming error. I fitted a switch to the remote control chip's pins, but no programming sequence came up on the display. On closer inspection the cause of

TV Fault Finding

the fault was found to be a dry-jointed connection to the sleeved wire that links the 8V supply to the text board and the 5V regulator IC001 (supply to the tuner). M.J.C.

Alba CTV842

This 14in. portable produced a snowy screen with no sound or picture. Retuning made no difference, and checks at the tuner then revealed that the variable tuning voltage was missing. This led me to transistor Q107, which integrates the tuning voltage. Its 10k Ω collector load resistor R108 was open-circuit.

This set is fitted with the Nikkai TLG144R chassis. M.J.C.

Sharp DV5105

One of these sets was stuck in standby with the red/green LED flickering. The cause of this was the main microcontroller's reset chip IC1004, which was oscillating. My circuit diagram shows D1005 in the associated circuitry replaced with a link and R1053 as 1k Ω . But the set had D1005 in place and R1053 as a link. Changing these components to correspond with the circuit diagram cured the fault.

While the set was on soak test the 15V supply at C754 drifted. So zener diode D754 (6.2V) was also replaced. R.P.

ITT Monoprint BNN Chassis

One of these sets was slow in producing a channel display, sound or a picture from a cold start. It worked normally after the third attempt. The raster, HT etc. all came up quickly when the fault was present.

I decided to check the memory and microcontroller reset circuit (transistors T1405/6 and associated components) carefully. As T1406 had only 0.65V between its base and emitter, it didn't switch on. A

replacement transistor made no difference, and the associated resistors were all within tolerance though T1406's emitter resistor R1420 read 85 Ω instead of 82 Ω .

A few calculations showed that T1406's drive was marginal at best. So the value of its base drive resistor R1427 was reduced from 2.2k Ω to 1.5k Ω . This cured the fault. R1420 had possibly started life at much closer to 82 Ω , which would have given T1406 an extra 20mV of drive.

Non-teletext models are likely to be immune from this problem, as the current that flows via R1420 is lower. R.P.

Tatung 160 Chassis

The symptom with this 20in. set was line collapse accompanied with smoke. The line scan coupling capacitor C406 (0.39 μ F, 250V) had split in half. Its value is 0.33 μ F with 16in. sets. J.E.

Mitsubishi CT21MITX

This set had no audio output. The cause was found on the power supply board, where Q952 (2SA950) was leaky collector-to-emitter. It's the regulator for the 22V supply to the audio output stage. J.E.

Sony KV2256 (PE3 Chassis)

Each time it was switched on this set was slightly off tune. Gradually, over a minute or two, it produced a good picture. When the 33V supply at D005 was checked I found that the voltage rose gradually from 26V to 32V. The supply comes from a rectifier circuit that consists of D652, R651 and the 33 μ F reservoir capacitor C652. Replacing this capacitor cleared the fault. J.S.R.

Mitsubishi CT2555

Despite dealing with all the dry-joints on the IF panel there was

still severe patterning. Replacing C920 and C925 cleared the fault. J.S.R.

Hitachi NP84CQ Mk 2 Chassis

The R2M overvoltage protection diode ZD953 was short-circuit. So I replaced the STR4211 regulator chip IC901, the 2.7V zener diode ZD910 and ZD953. The set then came to life, but the HT was high at 126V instead of 111V. This was cured by replacing C908 (4.7µF, 160V) in the feedback control loop. J.S.R.

Philips 2A Chassis

The problem with one of these sets was that the contrast couldn't be turned down. Although the contrast control voltage at pin 2 of plug M1 (the output from the CITAC module) varied, there was no variation at pin 7 of the TDA3561A colour decoder chip. When diode D6492 (OF449) was lifted to isolate the beam limiter circuit from the contrast control normal operation was restored. D6492 was leaky. P.B.

Philips G110 Chassis

If there is a line output stage short that's not caused by a faulty line output transistor or transformer, check the scan coupling/correction capacitor C2550 (390nF) by replacement. I have known this capacitor to go both short- and open-circuit. P.B.

Grundig CUC740 Chassis

For intermittent loss of sound, check whether the +G supply goes missing when the fault is present. If so, the cause of the trouble is usually faulty relay contacts. The fault can clear temporarily when the chassis is moved or the relay is tapped. P.B.

Philips G90 Chassis

If the set is dead, check for cracks in the print by the line output transistor's heatsink. The track most likely to break is the one that provides the line output stage's 95V supply. To prevent the PCB being strained any more, make sure that the lower back retaining screws are fitted. Otherwise the cabinet can flex when the set is on its stand. P.B.

NEI 204ITXS etc

The customer complained about pulling at the top of the picture when he used one of these sets for playback with a GoldStar VCR. The fault can be cured by changing

the value of R560 from 220Ω to 100Ω. This resistor is not marked, but can be found at the rear of the set between link K100 and a green delay line. M.K.

Hitachi CPT2026 (NP83CQ Chassis)

There was a blank screen with the sound OK. When the setting of the first anode preset was upped a raster with flyback lines appeared. As the setting was then reduced, first a picture appeared then it was lost. We found that someone had fitted a BU508AF line output transistor instead of a BU508DF.

With a BU508AF fitted, line flyback pulses were being fed back to IC701. This upset the field blanking. M.K.

GoldStar CF25C22F (PC33J Chassis)

There was excessive width with bowing at the sides. As C413 (10µF, 250V) had obviously been subjected to stress I fitted a replacement. This restored correct width, but the new capacitor very soon overheated and bulged like the original. So I switched off and looked at the circuit diagram again. As a result I removed the scan-correction capacitor C405 and checked it out of circuit. The reading was low at 0.128µF instead of 0.22µF. This was obviously why C413 had failed. With two new capacitors fitted the width and EW correction could be set up correctly, and cramping at the left-hand side of the screen also disappeared. These two capacitors are in the line scan coupling circuit. M.K.

Toshiba 1450TB

There was field collapse and the line was short by 1.5in. at each side. I checked the 8V supply at the output of IC480 (MC7809BT) and found it low at 3.9V. This supply feeds the multi-purpose chip IC501, which amongst other things provides the field and line drives. The set worked normally when a new MC7809BT IC had been fitted. M.K.

Sharp DV3760H

There was no output from the power supply because the 1N4997 HT rectifier diode D601 was leaky. The part no. is DX0515BM. G.P.

Hitachi C2564TN (G10Q Chassis)

The standby LED was pulsing and a check on the standby supply showed that it varied with each flash. The

cause of the trouble was the CNX82 optocoupler OPTO1, part no. T548009, which relays the power on/off command to the isolated side of the power supply. The LED in OPTO1 was open-circuit. G.P.

Panasonic Euro 1 Chassis

This set worked happily enough in the AV mode, but when an attempt was made to select an off-air channel it would shut down then come back on again with a display of snow. The MSP2410-08 multi-sound processor chip IC1401 turned out to be the culprit, although the voltages around it and the data lines all seemed to be OK. G.P.

Sony KV2705UB (QE1 Chassis)

The 135V HT supply was found to be low at only 80V, and a scope check showed that there was considerable ripple across the HT reservoir capacitor C652 (33µF, 250V). A new capacitor cleared the fault. G.P.

Panasonic Euro 1 Chassis

This set continually started up then shut down because the line drive was being switched on and off by the microcontroller chip. Voltage checks at the various digital ICs showed that the reset line to some of them was low at around 3.8V instead of 5V. The MSP2410-08 multi-sound processor chip IC1401 was pulling its reset input (pin 10) low. Replacing IC1401 cured the fault. G.P.

Ferguson ICC6 Chassis

The picture was being blanked out intermittently because the fast-blanking pin of IV01 was going high. The cause of the fault was traced to the BC858B surface-mounted transistor TV92. G.P.

Matsui 1436

There were no signs of life with this set. I found that the standby transformer T650 had an open-circuit winding. Its part no. is 558400601. G.P.

Hitachi C2118T

These sets were originally covered in my article in the June 1994 issue of *Television*. Here are two further faults that are worth putting on record. If the HT rises after the set has been on for a few minutes, the set then reverting to standby, it's worth replacing C906 (4.7µF, 250V). The 39kΩ resistor previously mentioned (R909) is the usual culprit, but this capacitor has start-

ed to produce similar symptoms.

If intermittent field bounce is causing a bit of a headache and the MC7809 9V regulator (IC703) has been checked for dry-joints, replace it. This device does get rather hot and suffers as the months go by. M.L.

Hitachi C2864TNZ

Slow or no start-up from cold can be caused by C909 in the power supply. It's a 470 μ F capacitor rated at 25V, and is mounted very close to R902 and R902A. These two parallel-connected, 33k Ω resistors get quite hot, damaging C909. Its replacement will usually cure a no start-up problem. M.L.

Ferguson ICC8 Chassis

The set was stuck on ch. 02 with a snowy raster. A new microcontroller chip and 8MHz crystal were tried but this made no difference. As checks in the microcontroller circuit suggested that everything was OK, attention was turned to the text board. After unloading IV02's SCL and SDA lines a picture came up. A new SDA5243 chip restored normal operation. M.C.

Akai CT2585 (Nokia 2BF 110NN Chassis)

One of these sets caused us some concern. It first came in dead with a faulty line output transistor and loads of dry-joints which we assumed were the cause of the transistor's failure. We fitted a new transistor, dealt with the dry-joints, gave the set a short test then returned it. Next day it was back again with the same fault.

After fitting another transistor we ran the set for a while. It then started to produce an arcing noise with interference on the picture. It seemed likely that the line output transformer was arcing internally. Wrong! A lot of time was wasted, then our luck changed – an identical set came in because of a width problem (more dry-joints).

We were now able to swap components to see if the fault could be transferred from the first set to the second one. This eventually proved that the BC337-25 line driver transistor T507 was the cause of the trouble. M.Dr.

Grundig CUC70 Chassis

The power supply in one of these sets had failed, with a short-circuit BU208A chopper transistor. As a precaution, in addition to fitting a new transistor we replaced R646 (270k Ω), the TDA4600 chopper

control chip. C631 (100 μ F), C633 (220 μ F) and C647 (1 μ F).

At switch-on the power supply blew up. Extensive checks failed to reveal any problem on the primary side of the power supply, but we found that R661 (0.15 Ω safety) on the secondary side was open-circuit. There are only two outputs on the secondary side, 18V and 152V. With R661 open-circuit there's no 18V supply and relay 651 cannot operate. As a result there is no HT supply to the line output stage, leaving the power supply with no load whatsoever. Switch-mode circuits don't like this situation: the result is instant destruction at switch-on. M.Dr.

Panasonic TC1631 (U4 Chassis)

The customer's complaint was "no sound". On testing the set we found that there was another fault. When the search button was pressed the sweep would search up the band, but when a station was found the search failed to stop. The two faults were quickly linked: Q1212 on the tuning panel was turned fully on, muting the sound – this is the interstation mute transistor. It receives its bias from Q1217, which turned out to be OK.

There's no circuit description in the manual, but we figured that when the voltage at pin 12 of connector M6 goes high the sweep should stop and the sound mute should be released. This voltage did rise when a station was found, but the sweep didn't stop. The stop signal is generated by Q502/3/4 on the main PCB. When the base of Q504 was shorted to chassis the fault cleared. The three transistors were OK, the cause of the trouble being the associated 10 μ F, 16V capacitor C513 which had gone very low in value.

A new capacitor restored the sound and the tuning, but we then found that the sound was at maximum and couldn't be turned down. When the up/down keys were used, the analogue output at pin 14 of the SN76730N sound up/down decoder chip IC1203 failed to vary. So it seemed that this IC was faulty. Quite by accident we found that pin 15 could be used to control the volume, the only difference being that volume control worked in reverse – the down key increased the volume while the up key decreased it.

As the SN76730N seems to be obsolete we put it to the customer that we could repair his set but the volume controls would work in

reverse. When he agreed to this we swapped over the connections to pins 14 and 15. It was also necessary to add a 100 Ω resistor across R1261 to centralise the volume control range. M.Dr.

Ferguson TX85 Chassis

If the TIPL791A chopper transistor TR6 is short-circuit, check R101 (1.2k Ω , 5W) in the snubber network. You will usually find that it has gone open-circuit. Replace these items and also R102 (1.2 Ω WW), R88 (1.8 Ω WW) and IC4 (TEA2018A). Check D8, D10 and D23 (all type 1N4001) and R95 (100 Ω).

One nasty point with this chassis is the use of live heatsinks for the chopper and line output transistors. M.Dr.

Sanyo CBP2180 (A5 Chassis)

This set suffered from field foldover at the top of the screen. The cause was a dry-jointed chassis connection at the 12V regulator IC552. M.M.

Mitsubishi CT2532TX (Euro 4 Chassis)

One of these sets wouldn't store the tuning. A check on the M58630P memory chip IC702 showed that its -31V supply was missing at pin 2. This comes from the sub power supply, where pin 4 of the chopper transformer was open-circuit. Fortunately the break was at the connecting pin and could be repaired. M.M.

Ferguson TX100 Chassis

"Gone off with a bang, and a smell of burning" said the voice on the phone. A visual inspection revealed that the HT smoothing capacitor C129 (100 μ F) had exploded. A replacement restored normal operation. M.M.

Mitsubishi CT25A25TX

One of these sets suffered from intermittent loss of the luminance signal. At first it seemed that a dry-joint was likely to be the cause, but the culprit was actually Q202 (J501). M.M.

Sony KVA2512U (AE1C Chassis)

Intermittent loss of colour was the problem with one of these sets. We are familiar with the fault on earlier models, but this chassis uses a digital comb filter on a highly complex board. Fortunately the decoder section is in analogue form. There are

two crystals, two trimmers and a surface-mounted J-legged TDA4650 chip here. Replacing these five items and setting up provided a complete cure. M.M.

Ferguson ICC7 Chassis

This set came to me from another dealer. It had two faults. He had replaced the mains switch, but said that the set still wouldn't start every time. The replacement switch was faulty: another one put this right.

The second fault was also intermittent. The picture and sound would both go, leaving odd black and white dots and lines on the screen. When the fault was present, I found that flexing the PCB in the area of the tuner made the fault come and go. As there were no dry-joints on the main board the tuner and IF modules were removed and dismantled. The tuner seemed to be OK, but the IF module had a single coil with two of its pins dry-jointed. M.M.

NEI 2131TX (Indiana 100 Chassis)

The customer complained of a flash, a puff of smoke and a dead

set. On inspection I found that the line output transistor Q600 was short-circuit while the line scan coupling/correction capacitor C604 was dry-jointed at one end.

Because of the dry-joint, C609 (1 μ F, 160V) had exploded, D604 (BA157) had gone short-circuit and R609 (10k Ω) had burnt up. These components form a network in parallel with C604. Replacing all these items restored normal operation. M.M.

Samsung C1212R

This set was a catalogue return and had done the rounds before it arrived on my bench. The problem was failure to start, because there was no start-up output at pin 8 of the TMP47C433AN3842 micro-controller chip IC105. As its 5V supply was spot on and there was a normal waveform across the 4MHz crystal I obtained and fitted a replacement chip.

Result – nothing! The start-up signal now reached the power supply, but it still refused to start. While I was checking around the power supply and the line output stage I noticed that the line output transformer's internal windings and

connections differed from those in the circuit diagram. The transformer was a perfect fit, and the soldering looked to be original. As I could find no other reason for the failure to start I obtained a new transformer. When I checked its connections they agreed with the diagram. Everything worked when it was fitted. D.A.C.

Philips G110 Chassis

There was sound but no picture, just a blank raster. The 200V supply smoothing resistor R3375 (180 Ω) on the tube base panel was open-circuit because the TEA5101A/P RGB output chip IC7465 was faulty. D.A.C.

Ferguson TX85 Chassis

As the setting of the contrast control was turned up towards the normal level it produced the effect of progressive picture overloading. At the maximum setting the picture was overlaid with black horizontal bars and there was also an audio buzz. After some time I found that there was a break in an earthing print track, where it leaves the customer controls adjacent to the colour control. D.A.C.

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What a Life!

Don sees a man cry for the first time and recalls some lighter moments since his last column

I was talking to John Stacey, who is about my vintage, the other day. He has been self-employed down Devon way for more years than he cares to recall. Like me, he came into the trade when the only TV was BBC in monochrome. He had some interesting tales to tell.

John recalled going out to demonstrate an electric shaver to a farmer. The farmer took his time trying it, then said "I've a good mind to buy it but, tell me, will it do my toenails without any trouble?"

On another occasion he showed

up at a caravan to repair a set, with a mate. They had to wait outside the door while its owner, a young lady, got dressed. When she finally let them in she apologised and added that she often watched TV while undressed.

"I hope they can't see me at the BBC" she said. "they *can't*, can they?"

"Well, it's not something we put about" his mate replied. "because it's a trade secret. But, yes, they can."

Things can go wrong for all of us of course. I recall an occasion when, towards the end of an evening spent making deliveries, my mate Algey and I decided to pop into the Magpie for a drink. There was just one set left to deliver, a 14in. ITT portable. Its plastic cabinet had a moulded handle.

The house we took it to was fronted by a lawn. This had a path with a row of fenceposts and an ornamental chain leading to the front door. Algey, refreshed by his pint, found a burst of energy. He jumped out of the van with the set, ran up the path, and jabbed his thumb on the bellpush. As he did so, he brought the set up ready to hand it over. It hit the nearest post of course, and when the customer opened the door he found Algey holding a neatly severed plastic handle. The rest of the set was on his front step.

The man's face produced a show I shall never forget. It displayed a sequence of just about every conceivable expression from a smile of greeting to one of sheer disbelief. Algey's plight was also something to behold.

Cash and Carry

In later years I discouraged house calls in favour of providing a cash and carry service. This led to the discovery that about two thirds of

my customers had bad backs. Those who didn't had no idea how to carry a set – with the tube's face towards your chest – and because I grew tired of their antics I usually took the set from our rack and carried it to the waiting car.

One day a young pap called in, paid for his repaired set then started to prance around it, wondering where to start.

"Don't worry" I said. "I'll carry it out for you – I've done it often enough." I hoisted the set, lifted it up against my chest and sped off towards the door. As I reached it, the set's mains lead caught on the door handle, yanking the set from my hold. It landed with quite a crunch.

I've never seen a man cry before, and felt about an inch high.

There was a fortunate end to this story. The damage was confined to the cabinet, and another of my customers was a professional french-polisher. He made it look like new, for just £3, all in a day. But it cost me a lot in extra work. I had to strip everything out of the cabinet, including the tube, then fit it all back again.

The customer, who scrutinised the set in vain for signs of damage, made a complete recovery!

Miss Drudge – 2

One of our customers is a formidable old woman who lives in a chair in front of her TV set. This is permanently on, so that she can resume her viewing whenever she wakes from her doze. The other day we had another call from her ageing daughter Miss Drudge.

"Mother's set is playing up again, Mr Bullock" she said flatly. "Can you come as quickly as possible?"

Because I felt sorry for her, I called round right away. The old woman, now well into her eighties, was sitting as usual with her shawl



Algey delivers an ITT portable's handle . . .

over her legs, looking at the screen.

The set, a Ferguson 22D1 (TX100 chassis), had a picture. But its geometry was awful. There was too much width, EW distortion and a band of line frilling. When either the width control RV72 or the pinch-control RV71 was moved the band of frilling would shift up and down the screen – in addition to affecting the width and EW correction slightly.

"Tell him I can't watch that" the old woman said.

"Mr Bullock knows you can't watch it, Mother" the daughter replied. "That's why he's here." She looked utterly worn out.

I had to take the set back to the workshop where son Paul, who now works with Steven, tackled it. He found that he could remove the frilling completely. But the set's line linearity then became terrible. After a good deal of checking he found the cause of the trouble. R143, the 6-8Ω safety resistor in the feed to the line driver stage, had risen in value to some 330Ω. A new resistor plus setting up produced a good picture.

When I took the set back and connected it up the scowl left the old woman's face.

"Tell Mr Bullock I'm very pleased" she told her daughter.

"Mother is very pleased, Mr Bullock" Miss Drudge said flatly. "Now I must pay you."

As I left I reflected on the hopeless life Miss Drudge led.

Mitsubishis

Esse Phipps drew up outside in a huge Mitsubishi car. She got us to collect her TV set from it. This wasn't easy – it was a 25in. Mitsubishi colour set, Model CT2534 (Euro 4 chassis).

"Dratted thing won't go" she said in her cut-glass voice. "Too bad, what?"

The set was stuck in standby. After some routine checks we found that the cause of the trouble was in the line output stage. The 2SD1877 line output transistor Q552 tested perfectly, which led us to the transformer (T553). When we took it out we found that pins 1, 2, 6 and 7 were all shorted together, linking the HT supply to chassis.

We ordered a new transformer from SEME, at a very reasonable price. It arrived by return. But when we fitted it the fault was still present.

We spent a good deal of time searching for a further short. Even-

tually, as there was nothing else left to check, we tested the line output transistor again. It was dead short! A replacement restored normal operation.

When Esse returned to collect it she said that she would be bringing her Mitsubishi VCR in for service. "I'd have everything Mitsubishi if I could" she trilled. "I'm going to buy a speedboat soon. Is there a Mitsubishi one?"

"Sure to be" I said.

"I've been thinking" Steven said afterwards. "I've had that fault sequence before with this chassis. The transistor tests OK then, after replacing a faulty transformer, the transistor is found to be dead short. We'd better replace both items together next time."

Fidelity ZX3000 Chassis

"Time we saw the back of this one" said Steven, hauling a Fidelity CTM2000T (ZX3000 chassis) on to the bench. No vision, sound or channel display was the complaint.

Some quick checks showed that the 12V supply was missing. We discovered a bad dry-joint at the MC7812 regulator, which is mounted on a heatsink close to the line output transformer. This wasn't clear initially, because the regulator is hidden by the infuriating plastic cradle in which the panel sits.

A NordMende Portable

Hazel Nutt is one of those modern girls – big, tall, fit looking and outgoing.

"It's this telly" she announced. "It's got a permanent wave. Ha ha ha!" She shuffled and leant over on her long legs, like a demented wick-keeper.

The set was horrible too. An old NordMende colour portable, Model 1534 (F10 chassis). We gave the HT circuitry the once-over and found a dry-joint at the negative side of the HT bridge rectifier's 470μF, 160V reservoir capacitor CP11. Resoldering this joint clear-ed the fault.

When Hazel returned to collect the set she was dressed for hockey and was carrying a stick thing.

"Do you play hockey much, Mr Bullock?" she asked.

"Never seem to get the time, unfortunately" I replied, stepping back a bit. "But I think Steven and Paul do, er, don't you lads?"

But they had disappeared.

The Pop Hopeful

Our final visitor that day was Seth

Mutt, who aims to be a pop singer as soon as his IQ rockets to 25. He carries a guitar everywhere, but has yet to discover how to play it. He humped in a huge, 26in. Loewe Contour S124 colour receiver (C8500 chassis).

"When I swishes 'im on, like, the lickol light 'd come on, then 'e'd go out" he said. "Har, har, har. Auhhh."

Steven backed off. Being of sterner stuff, I booked the set in and waved him out.

"We'd better look at this set together" I said to Steven when he finally poked his face around the workshop door. "Help me on to the bench with it, will you. We'll put it on your side, shall we?"

I handed him a screwdriver to get the back off. "I could do with a cup of tea" I said, "couldn't you?" When he nodded I skipped off to make it.

When I returned with the tea Steven was working around the TDA4600 chopper control chip. "Its supply at pin 9 is varying" he said.

"Find out why" I suggested, ever helpful. Before long he took out the relevant reservoir capacitor, C626 (100μF, 25), and gave it to me to test.

"Varies as you watch the meter" I said. Between 15-30μF. Guess it's faulty.

He shot me a sideways look and fitted the replacement I handed him. When he switched the set on there was EHT but no brightness or sound. "I'll up the first anode voltage" he said, "without bothering to mark the preset's position." I saw the look of perversity in his face. Bit like Green-eyes, I thought. As expected, there was field collapse.

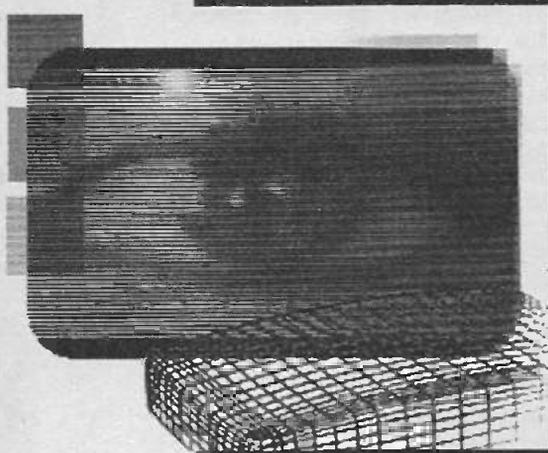
"No sound, no field scanning" I said, mainly to display my powers of observation. "Must be a common cause."

He carried out some checks around the TDA1872A field time-base chip I561 and soon found that the 12V supply was missing. When he traced the source of this he came to the LM7812 regulator chip I553. There was an input here but no output.

I handed him a replacement. When he'd fitted this there was sound and field scanning. After adjusting the first anode supply preset, which I'd hoped would give him trouble, there was a good picture.

"That was an intensive bit of work, wasn't it?" I commented. "I'd like another cup of tea. How about you?"

He looked at my empty mug, then at his own. "Haven't touched mine yet. Don't seem to have had time."



Reports from
I. Field
Owen Green
John Edwards
Chris Watton and
Adrian Spriddell

VAN E1428NC

There were ragged verticals and a sort of whingeing noise came from the power supply. As the UC3842 control chip in the chopper circuit receives its supply, also feedback for regulation purposes, from the transformer it seemed logical to suspect the electrolytic capacitors used in this circuitry. These are C509 (47 μ F, 50V) and C512 (100 μ F, 25V). C509 looked OK visually, but when given a whiff of freezer its capacitance vanished. C512 was fine but we replaced it anyway. They are both 105°C types. When we powered up however the fault was little changed. A replacement mains rectifier reservoir capacitor completed the repair. It's C506 (150 μ F, 400V).

I suspect that had we replaced C506 only we would have ended up with a power supply rebuild. **I.F.**

Philips 1565D

No contrast was the complaint. In fact the contrast control worked all right but the brightness was flat out, with flyback lines and the control having no effect. R737 (150k Ω) at the lower end of the brightness control network was open-circuit. **I.F.**

Tatung TM4401

The cause of no display was a faulty EW pincushion correction circuit. We found that TR416 (2SB1375/2SB1015), TR415 (2SC2229) and TR412 (2SD2125/2SC2893A) had all

Monitors

failed. Should you get this fault, make sure that you replace coil L401 or the same thing will probably happen again. **O.G.**

Mitac 1766PD

When this monitor was switched on with no signal input from the PC it remained in the standby mode, as normal, with the amber standby LED glowing. When signals were applied via the 15-pin D connector the monitor ticked quietly, like a clock, instead of coming to life. A check in the line output stage showed that the BU2025DF transistor was short-circuit.

It is easiest to replace the transistor by unsoldering its legs from the PCB then removing the two screws that secure its heatsink to the chassis and the transformer. The heatsink can then be lifted out with the transistor still attached to it. In this case the transistor's heatsink securing bolt was loose. It thus provided poor thermal conductivity.

As we couldn't find any other problems we fitted a new transistor – with a generous amount of heatsink compound. After doing this and applying an input signal the monitor worked correctly: the amber standby LED went out and the green OK LED switched on. **J.E.**

Model 72G9140

I have repaired a number of these monitors but still don't know who made them – only the model number is printed on the back.

This one was dead. Its power supply refused to get going because one of the two 32k Ω start-up resistors was open-circuit. They are easy to recognise, being the large stand-off resistors mounted near the chopper transformer. Renew them both. **J.E.**

Tatung TM3401

This monitor was brought in because it was thought to be dead. It worked all right with our test computer, and went off when the

signal input cable was disconnected. This is standard practice – these monitors have shutdown control from the PC. It works by switching off the supply to the line driver transistor.

The switching circuit is mounted on a small PCB near the line output transformer. In this case the cause of the fault was incorrect settings in the computer's BIOS (Basic Input/Output System). **C.W.**

Dell VC2E

The customer's complaint was "low height in Windows, OK in DOS". On checking we found that the reduced height was caused by the refresh rate being used for Windows. One of the height skeleton presets along the back of the motherboard had disintegrated. We replaced VR400, VR401 and VR404 with more substantial presets. **A.S.**

Tatung TM3401

The cause of lack of width and EW correction was traced to a high-resistance 33 μ H RF choke in the line timebase. It had apparently been added to the circuit as an afterthought, as there was no component reference number. **A.S.**

Peacock 17PRO

If the power supply is smoking, replace the burnt out filter capacitor X2 and connector M603 which goes with it. While you are about it, check and resolder the Molex pins at M608. New connectors are available from Farnell or RS. **A.S.**

Dell VC2E

When this monitor had warmed up its picture wobbled. It also made a vibrating noise. We traced the cause to one or possibly two inductors in the power supply and line timebase circuits. So all suspicious-looking wound components were 'locked' with Resin-W adhesive, our favourite compound for this purpose – it's non-flammable, and might even meet the CE mark criteria. **A.S.**

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BC108	8p	BD435	31p	BU128	125p	BUV48C	250p	MJ10012	300p	AN210	150p	AN6341	200p	BA338	80p	BA7007	200p
BC109	8p	BD436	30p	BU133	125p	BUV50	425p	MJ11015	250p	AN211	150p	AN6342	32p	BA340	75p	BA7021	180p
BC109C	10p	BD437	28p	BU137	150p	BUV51	1000p	MJ11016	300p	AN212	150p	AN6344	440p	BA343	60p	BA7022	350p
BC140	20p	BD438	36p	BU130	100p	BUV70	200p	MJ11032	800p	AN214Q	170p	AN6345	400p	BA336	175p	BA7025L	100p
BC143	20p	BD439	40p	BU154	100p	BUV80	175p	MJ11033	800p	AN217P	95p	AN6346	350p	BA401	90p	BA7102A	475p
BC147	8p	BD441	40p	BU205	70p	BUW11A	200p	MJ15004	300p	AN228	280p	AN6350	610p	BA402	50p	BA7212S	200p
BC149	8p	BD533	50p	BU206	100p	BUW11AF	225p	MJ15015	200p	AN252	150p	AN6352	450p	BA511	145p	BA7252S	150p
BC159	8p	BD534	38p	BU207	150p	BUW12A	150p	MJ15016	350p	AN259	250p	AN6356	300p	BA514	180p	BA7604N	400p
BC160	30p	BD535	38p	BU208	70p	BUW12F	250p	MJ15022	250p	AN262	140p	AN6359	500p	BA515	150p	BA7751LS	150p
BC171	10p	BD536	38p	BU208A	100p	BUW13A	200p	MJ15023	400p	AN271	230p	AN6360	320p	BA518	150p	BA7752S	250p
BC172	10p	BD537	40p	BU208AT	200p	BUW32A	600p	MJ15024	400p	AN272	250p	AN6363	375p	BA521	100p	BA7755	150p
BC177	14p	BD543	40p	BU208B	130p	BUW48	550p	MJ15025	700p	AN273	400p	AN6367NK	400p	BA522	240p	BA7767AS	155p
BC178	14p	BD543	50p	BU208D	200p	BUW49	550p	MJE340	25p	AN301	330p	AN6370	275p	BA526	180p	BA8504	350p
BC179	14p	BD545	50p	BU209	90p	BUW50	550p	MJE350	80p	AN302	650p	AN6374	400p	BA527	95p	BA1521B	60p
BC182	7p	BD547	50p	BU225	170p	BUW81A	150p	MJE360	30p	AN303	250p	AN6377	100p	BA532	100p	CAS140E	38p
BC182L	7p	BD549	50p	BU226	120p	BUW81A	150p	MJE295ST	65p	AN304	360p	AN6380	480p	BA534	220p	CXN82A	80p
BC183	7p	BD575	40p	BU312	90p	BUW84	75p	MJE305ST	65p	AN315	210p	AN6387	480p	BA536	180p	CXN82A	80p
BC183L	7p	BD576	40p	BU325	55p	BUW85	85p	MJE13004	100p	AN316	350p	AN6390	100p	BA546	60p	CXN83A	80p
BC184	7p	BD577	38p	BU326A	75p	BUX10	150p	MJE15016	350p	AN317	250p	AN6392	45p	BA612	120p	CX136	600p
BC184L	7p	BD578	40p	BU326B	75p	BUX11	200p	MJE15022	250p	AN318	250p	AN6393	100p	BA614	100p	CX139A	750p
BC212	7p	BD579	40p	BU326C	75p	BUX12	150p	MJE15007	100p	AN319	300p	AN6395	50p	BA618	55p	CX141	75p
BC212L	7p	BD580	40p	BU326D	75p	BUX13	220p	MJE15009	100p	AN320	300p	AN6396	50p	BA631	280p	CX145	725p
BC213	7p	BD581	45p	BU326E	75p	BUX14	210p	MJE15028	200p	AN321	300p	AN6397	50p	BA656	110p	CX150B	325p
BC214	7p	BD582	45p	BU326F	75p	BUX15	210p	MJE15029	200p	AN322	300p	AN6398	50p	BA658	150p	CX157	325p
BC214L	7p	BD583	45p	BU326G	75p	BUX16	210p	MJE15030	250p	AN323	300p	AN6399	50p	BA659	150p	CX157	325p
BC237	7p	BD709	50p	BU412	175p	BUX17	210p	MJE18004	125p	AN324	300p	AN6400	50p	BA682A	300p	CX804A	775p
BC238	7p	BD711	50p	BU413	175p	BUX18	210p	MJF18004	175p	AN325	300p	AN6401	50p	BA683A	300p	CX867	575p
BC239	7p	BD738	50p	BU414B	250p	BUX19	210p	MJF18204	350p	AN326	300p	AN6402	50p	BA684	400p	CX868	525p
BC240	20p	BD825	50p	BU414C	250p	BUX20	210p	OC28	350p	AN327	300p	AN6403	50p	BA685	400p	CX877	300p
BC301	20p	BD828	50p	BU426A	70p	BUX21	210p	OC28	350p	AN328	300p	AN6404	50p	BA686	400p	CX925B	450p
BC302	20p	BD839	55p	BU433	120p	BUX22	210p	OC35	350p	AN329	300p	AN6405	50p	BA718	45p	CX20015A	60p
BC303	20p	BD857	50p	BU500	100p	BUX23	210p	OC36	250p	AN330	300p	AN6406	50p	BA728	55p	CX20106A	75p
BC304	25p	BD899	60p	BU500D	225p	BUX24	210p	S2000A3	175p	AN331	300p	AN6407	50p	BA806	220p	CX20109	140p
BC327	7p	BD978	40p	BU505	90p	BUX25	210p	S2000AF	130p	AN332	300p	AN6408	50p	BA843	130p	CX20187	700p
BC328	7p	BDX33	100p	BU505D	90p	BUX26	210p	S2055AF	175p	AN333	300p	AN6409	50p	BA844	100p	CX2019F	1600p
BC337	7p	BDX37	100p	BU505DF	90p	BUX27	210p	S2530A	100p	AN334	300p	AN6410	50p	BA845	100p	CX2019F	1600p
BC338	7p	BDX44	100p	BU506	100p	BUX28	210p	TIP29	15p	AN335	300p	AN6411	50p	BA846	100p	CX2019F	1600p
BC421	28p	BDX47	60p	BU506D	70p	BUX29	210p	TIP29A	22p	AN336	300p	AN6412	50p	BA847	100p	CX2019F	1600p
BC446	28p	BDX54C	75p	BU506DF	70p	BUX30	210p	TIP29B	22p	AN337	300p	AN6413	50p	BA848	100p	CX2019F	1600p
BC477	18p	BDX62C	150p	BU508A	70p	BUX31	210p	TIP29C	22p	AN338	300p	AN6414	50p	BA849	100p	CX2019F	1600p
BC516	22p	BDX63C	175p	BU508AF	95p	BUX32	210p	TIP30	25p	AN339	300p	AN6415	50p	BA850	100p	CX2019F	1600p
BC537	22p	BDX64C	175p	BU508APH	80p	BUX33	210p	TIP30C	25p	AN340	300p	AN6416	50p	BA851	100p	CX2019F	1600p
BC546	8p	BDX65	80p	BU508B	75p	BUX34	210p	TIP31	22p	AN341	300p	AN6417	50p	BA852	100p	CX2019F	1600p
BC547	8p	BDX66	80p	BU508C	75p	BUX35	210p	TIP31C	22p	AN342	300p	AN6418	50p	BA853	100p	CX2019F	1600p
BC548	8p	BDX67C	275p	BU508D	130p	BUX36	210p	TIP32	24p	AN343	300p	AN6419	50p	BA854	100p	CX2019F	1600p
BC549	8p	BDX71	70p	BU508E	110p	BUX37	210p	TIP32A	21p	AN344	300p	AN6420	50p	BA855	100p	CX2019F	1600p
BC550	8p	BDX77	175p	BU508F	100p	BUX38	210p	TIP32B	21p	AN345	300p	AN6421	50p	BA856	100p	CX2019F	1600p
BC556	8p	BDX87C	175p	BU526	75p	BUX39	210p	TIP33	20p	AN346	300p	AN6422	50p	BA857	100p	CX2019F	1600p
BC557	8p	BDX88C	150p	BU526B	130p	BUX40	210p	TIP33C	20p	AN347	300p	AN6423	50p	BA858	100p	CX2019F	1600p
BC558	8p	BDW74	55p	BU546	125p	BUX41	210p	TIP34	60p	AN348	300p	AN6424	50p	BA859	100p	CX2019F	1600p
BC559	8p	BDW93	50p	BU603	125p	BUX42	210p	TIP34C	60p	AN349	300p	AN6425	50p	BA860	100p	CX2019F	1600p
BC560	8p	BDW94	50p	BU606D	225p	BUX43	210p	TIP35C	60p	AN350	300p	AN6426	50p	BA861	100p	CX2019F	1600p
BC637	20p	BDY29	225p	BU608D	120p	BUX44	210p	TIP36	60p	AN351	300p	AN6427	50p	BA862	100p	CX2019F	1600p
BC638	20p	BDY56	225p	BU626	120p	BUX45	210p	TIP37	60p	AN352	300p	AN6428	50p	BA863	100p	CX2019F	1600p
BC640	20p	BDY95	225p	BU705	130p	BUX46	210p	TIP38	60p	AN353	300p	AN6429	50p	BA864	100p	CX2019F	1600p
BCY33	200p	BDY90	125p	BU706DF	175p	BUX47	210p	TIP39	60p	AN354	300p	AN6430	50p	BA865	100p	CX2019F	1600p
BCY34	200p	BDY92	100p	BU706F	150p	BUX48	210p	TIP40	60p	AN355	300p	AN6431	50p	BA866	100p	CX2019F	1600p
BCY70	18p	BF137	35p	BU724A	100p	BUX49	210p	TIP41	60p	AN356	300p	AN6432	50p	BA867	100p	CX2019F	1600p
BCY71	18p	BF167	35p	BU724B	100p	BUX50	210p	TIP42	60p	AN357	300p	AN6433	50p	BA868	100p	CX2019F	1600p
BCY72	18p	BF181	35p	BU724C	100p	BUX51	210p	TIP43	60p	AN358	300p	AN6434	50p	BA869	100p	CX2019F	1600p
BD115	30p	BF183	20p	BU807	60p	BUX52	210p	TIP44	60p	AN359	300p	AN6435	50p	BA870	100p	CX2019F	1600p
BD124P	60p	BF195	7p	BU807F	75p	BUX53	210p	TIP45	60p	AN360	300p	AN6436	50p	BA871	100p	CX2019F	1600p
BD131	25p	BF199	8p	BU808DF	210p	BUX54	210p	TIP46	60p	AN361	300p	AN6437	50p	BA872	100p	CX2019F	1600p
BD132	25p	BF200	15p	BU810	110p	BUX55	210p	TIP47									

PLEASE PHONE US FOR TYPES NOT LISTED AS WE
 HAVE OVER 50,000 ITEMS IN STOCK.
 QUOTATIONS GIVEN FOR LARGE QUANTITIES

LINEAR ICs

Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price		
HA13001	110p	LA2800	350p	LA7096	200p	LF353	48p	MC3302	52p	SAB3029	275p	STK3102 II	530p	STK5478	380p	STR16006	500p	TA7281	170p
HA13002	200p	LA3120	200p	LA7113	275p	LF355	60p	MC3401	45p	SAB3035	250p	STK3106	2500p	STK5479	300p	STR17006	500p	TA7282	160p
HA13006	400p	LA3150	200p	LA7116	125p	LF357	70p	MC3423P	100p	SAB3036	725p	STK3122 III	725p	STK5481	470p	STR20005	450p	TA7210	200p
HA13007	300p	LA3160	120p	LA7123	1300p	LF358	300p	MC3488AP	250p	SAB3037	700p	STK3152 II	900p	STK5482	285p	STR20012	450p	TA7283	200p
HA13108	280p	LA3161	40p	LA7210	60p	LH2426S	600p	MC34063AP	300p	SAB3042	825p	STK3155	500p	STK5483	440p	STR20015	450p	TA7284	400p
HA13117	175p	LA3210	65p	LA7212	150p	LM301	26p	MC34220T	600p	SAB3064	130p	STK4017	400p	STK5484	450p	STR20018	350p	TA7288	220p
HA13118	140p	LA3225	60p	LA7214	110p	LM311	35p	MC34226	450p	SAB3069	225p	STK4019	430p	STK5485	520p	STR20019	450p	TA7289	200p
HA13127	350p	LA3300	140p	LA7220	125p	LM319	165p	MC34228	600p	SAB3210	250p	STK4021	380p	STK5488	480p	STR20120	400p	TA7291P	200p
HA13128	400p	LA3301	110p	LA7222	110p	LM324	30p	MC34230	600p	SAB3212	125p	STK4024 II	550p	STK5490	450p	STR20123	450p	TA7292P	325p
HA13130	450p	LA3381	100p	LA7224	150p	LM335Z	120p	MC34232	600p	SAB8048	225p	STK4025	530p	STK5632	450p	STR20125	550p	TA7294P	450p
HA13135	500p	LA3365	70p	LA7225	250p	LM339	35p	MC34233	600p	SAB8051AP	700p	STK4026	480p	STK5720	400p	STR20130	250p	TA7295	200p
HA13139	600p	LA3370	70p	LA7292	275p	LM348	60p	MC34234	600p	SDA2003	450p	STK4028	500p	STR20133	350p	STR40060	350p	TA7302P	250p
HA13150A	1150p	LA3370	70p	LA7294	200p	LM358	45p	MC34235	600p	SDA2004	325p	STK4032 II	510p	STR40115	600p	STR41030	300p	TA7303	70p
HA13151	875p	LA3375	300p	LA7297	120p	LM381	150p	MC34236	600p	SDA2005	700p	STK4034 X	925p	STR41030	300p	STR41030	300p	TA7307	100p
HA13403	400p	LA3376	80p	LA7305A	350p	LM382	130p	MC34237	600p	SDA2008	400p	STK4036	470p	STR41115	950p	STR41115	950p	TA7310	100p
HA13406V	400p	LA3380	70p	LA7308	70p	LM386	60p	MC34238	600p	SDA2112	450p	STK4040 II	650p	STR41115	950p	STR41115	950p	TA7312	120p
HA13408	350p	LA3390	200p	LA7311	200p	LM387	100p	MC34239	600p	SDA2120	200p	STK4042 II	800p	STR41115	950p	STR41115	950p	TA7313	70p
HA13412	600p	LA3400	250p	LA7320	120p	LM389N	105p	MC34240	600p	SDA2122	228p	STK4044	850p	STR41115	950p	STR41115	950p	TA7314	175p
HA13426	300p	LA3410	90p	LA7325	160p	LM390	105p	MC34241	600p	SDA2208	450p	STK4046	950p	STR41115	950p	STR41115	950p	TA7315	200p
HA13432	400p	LA3420	150p	LA7330	350p	LM431	60p	MC34242	600p	SDA2212	775p	STK4048	1280p	STR41115	950p	STR41115	950p	TA7317P	120p
HA13441	450p	LA3430	135p	LA7331	200p	LM710	45p	MC34243	600p	SDA2214	725p	STK4050 II	1600p	STR41115	950p	STR41115	950p	TA7320P	200p
HA17524	250p	LA3500	60p	LA7332	225p	LM723	40p	MC34244	600p	SDA243-2	450p	STK4060	510p	STR41115	950p	STR41115	950p	TA7322	130p
KA2102	100p	LA3605	100p	LA7340	300p	LM741DIL	18p	MC34245	600p	SDA25343	1450p	STK4065	650p	STR41115	950p	STR41115	950p	TA7323	80p
KA2120	150p	LA3607	125p	LA7376	150p	LM741MET	55p	MC34246	600p	SDA25641	200p	STK4101	500p	STR41115	950p	STR41115	950p	TA7324	80p
KA2131	110p	LA4030	100p	LA7381	550p	LM751	55p	MC34247	600p	SDA25642	450p	STK4111	500p	STR41115	950p	STR41115	950p	TA7325	75p
KA2206	150p	LA4031	140p	LA7520	200p	LM1017	200p	MC34248	600p	SGS444	500p	STK4112	500p	STR41115	950p	STR41115	950p	TA7326	200p
KA2209	125p	LA4032	140p	LA7530	200p	LM1035N	350p	MC34249	600p	SGS465	500p	STK4121	480p	STR41115	950p	STR41115	950p	TA7328	110p
KA2210	230p	LA4051	160p	LA7535	175p	LM1040N	650p	MC34250	600p	SAA1000	350p	STK4122	560p	STR41115	950p	STR41115	950p	TA7330	80p
KA2212	65p	LA4100	85p	LA7546	160p	LM1203	225p	MC34251	600p	SAA1004	650p	STK4131	480p	STR41115	950p	STR41115	950p	TA7331P	80p
KA2213	130p	LA4101	80p	LA7550	275p	LM1203AN	225p	MC34252	600p	SAA1005	325p	STK4132	400p	STR41115	950p	STR41115	950p	TA7332	80p
KA2214	100p	LA4102	100p	LA7555	150p	LM1876T	330p	MC34253	600p	SAA1006	300p	STK4133 II	600p	STR41115	950p	STR41115	950p	TA7333	100p
KA2224	50p	LA4110	120p	LA7620	500p	LM1881N	375p	MC34254	600p	SAA1008	450p	STK4141 II	420p	STR41115	950p	STR41115	950p	TA7335	85p
KA2244	75p	LA4120	270p	LA7680	675p	LM1886	250p	MC34255	600p	SAA1010	400p	STK4142	530p	STR41115	950p	STR41115	950p	TA7336	180p
KA2261	100p	LA4138	105p	LA7681	660p	LM1889	300p	MC34256	600p	SAA1024	250p	STK4147 II	1450p	STR41115	950p	STR41115	950p	TA7337P	175p
KA2263	100p	LA4140	60p	LA7710	250p	LM1894N	200p	MC34257	600p	SAA1025	250p	STK4151	880p	STR41115	950p	STR41115	950p	TA7338	175p
KA2264	100p	LA4142	65p	LA7800	90p	LM1895N	275p	MC34258	600p	SAA1026	400p	STK4152	650p	STR41115	950p	STR41115	950p	TA7341	250p
KA2284	75p	LA4146	65p	LA7801	100p	LM2901N	330p	MC34259	600p	SAA1027	450p	STK4161	650p	STR41115	950p	STR41115	950p	TA7342P	70p
KA2309	175p	LA4165	100p	LA7802	300p	LM2902N	40p	MC34260	600p	SAA1029	150p	STK4162	550p	STR41115	950p	STR41115	950p	TA7343	120p
KA2401	150p	LA4162	110p	LA7806	260p	LM2903N	40p	MC34261	600p	SAA1042	325p	STK4164 II	1175p	STR41115	950p	STR41115	950p	TA7347P	120p
KA2412	225p	LA4178	150p	LA7808	250p	LM2900	40p	MC34262	600p	SAA1043P	675p	STK4171	900p	STR41115	950p	STR41115	950p	TA7348P	125p
KA2912	125p	LA4180	150p	LA7820	100p	LM3909	100p	MC34263	600p	SAA1044	400p	STK4172 II	680p	STR41115	950p	STR41115	950p	TA7349P	175p
KA2913A	175p	LA4182	180p	LA7823	200p	LM3911N	200p	MC34264	600p	SAA1056	300p	STK4177 II	210p	STR41115	950p	STR41115	950p	TA7354P	65p
KA2914A	200p	LA4190	300p	LA7824	130p	LM3914	180p	MC34265	600p	SAA1057	275p	STK4181	680p	STR41115	950p	STR41115	950p	TA7357	340p
KA2247	100p	LA4192	140p	LA7830	200p	LM3915	160p	MC34266	600p	SAA1058	225p	STK4182 II	75p	STR41115	950p	STR41115	950p	TA7358	80p
KA2248	100p	LA4200	130p	LA7831	85p	LM3916	270p	MC34267	600p	SAA1060	375p	STK4192	700p	STR41115	950p	STR41115	950p	TA7359	96p
KA2249	100p	LA4201	120p	LA7832	130p	LM39363	320p	MC34268	600p	SAA1061	250p	STK4211 II	1000p	STR41115	950p	STR41115	950p	TA7361	125p
KA2250	100p	LA4202	130p	LA7833	150p	LM3936	175p	MC34269	600p	SAA1062	250p	STK4221 II	800p	STR41115	950p	STR41115	950p	TA7362	150p
KA2251	100p	LA4203	140p	LA7834	150p	LM3950	150p	MC34270	600p	SAA1063	250p	STK4221 II	1200p	STR41115	950p	STR41115	950p	TA7363P	65p
KA2252	100p	LA4204	140p	LA7835	150p	LM3950	150p	MC34271	600p	SAA1064	250p	STK4221 II	1200p	STR41115	950p	STR41115	950p	TA7364P	65p
KA2253	100p	LA4205	140p	LA7836	150p	LM3950	150p	MC34272	600p	SAA1065	250p	STK4221 II	1200p	STR41115	950p	STR41115	950p	TA7365P	65p
KA2254	100p	LA4206	140p	LA7837	150p	LM3950	150p	MC34273	600p	SAA1066	250p	STK4221 II	1200p	STR41115	950p	STR41115	950p	TA7366P	65p
KA2255	100p	LA4207	140p	LA7838	150p	LM3950	150p	MC34274	600p	SAA1067	250p	STK4221 II	1200p	STR41115	950p	STR41115	950p	TA7367P	65p
KA2256	100p	LA4208	140p	LA7839	150p	LM3950	150p	MC34275	600p	SAA1068	250p	STK4221 II	1200p	STR41115	950p	STR41115	950p	TA7368P	65p
KA2257	100p	LA4209	140p	LA7840	150p	LM3950	150p	MC34276	600p	SAA1069	250p	STK4221 II	1200p	STR41115	950p	STR41115	950p	TA7369P	65p
KA2258	100p	LA4210	140p	LA7841	150p	LM3950	150p	MC34277	600p	SAA1070	250p	STK4221 II	1200p	STR41115	950p	STR41115	950p	TA7370P	65p
KA2259	100p	LA4211	140p	LA7842	150p	LM3950	150p	MC34278	600p	SAA1071	250p	STK4221 II	1200p	STR41115	950p	STR41115	950p	TA7371P	65p
KA2260	100p	LA4212	140p	LA7843	150p	LM3950	150p	MC34279	600p	SAA1072	250p	STK4221 II	1200p	STR41115	950p	STR41115	950p	TA7372P	65p
KA2261	100p	LA4213	140p	LA7844	150p	LM3950	150p	MC34280	600p	SAA1073	250p	STK4221 II	1200p	STR41115	950p	STR41115	950p	TA7373P	65p
KA2262	100p	LA4214	140p	LA7845	150p	LM3950	150p	MC34281	600p	SAA1074	250p	STK4221 II	1200p	STR41115	950p	STR41115	950p	TA7374P	65p
KA2263	100p	LA4215	140p	LA7846	150p	LM3950	150p	MC34282	600p	SAA1075	250p	STK4221 II	1200p	STR41115	950p	STR41115	950p	TA7375P	65p
KA2264	100p	LA4216	140p	LA7847	150p	LM3950	150p	MC34283	600p	SAA1076	250p</								

LINEAR ICs/JAPANESE TRANSISTORS

Part	Price	Part	Price	Part	Price	Part	Price								
TA8164P	100p	TA1180	120p	TA24760	400p	TA44661	225p	TA48391	675p	UPC1004C	130p	2SA771	90p	2SA1177	25p
TA8164P	350p	TA1185A	190p	TA24780	600p	TA44670	475p	TA48395	450p	UPC1009	950p	2SA773	50p	2SA1179	20p
TA8189P	130p	TA1190	80p	TA24791	275p	TA44680	475p	TA48405	550p	UPC1018	170p	2SA777	35p	2SA1182	20p
TA8200AH	325p	TA1200B	80p	TA24795	200p	TA44685	475p	TA48415	550p	UPC1020	200p	2SA778	100p	2SA1184	120p
TA8201AK	200p	TA1205	80p	TA24822M	50p	TA44700A	750p	TA48425	625p	UPC1023	60p	2SA781	150p	2SA1186	50p
TA8207K	175p	TA1235	200p	TA24824	85p	TA44714C	350p	TA48417	550p	UPC1024H	2	2SA785	25p	2SA1195	500p
TA8210	260p	TA1236	240p	TA24840	200p	TA44716C	450p	TA48421	500p	UPC1025	230p	2SA794	50p	2SA1198	40p
TA8211AH	200p	TA1251	150p	TA24847	100p	TA44718A	500p	TA48425	500p	UPC1026	95p	2SA798	30p	2SA1201	40p
TA8214K	200p	TA1270	160p	TA24848	130p	TA44725	760p	TA48432	660p	UPC1028	90p	2SA812	15p	2SA1202	25p
TA8215	300p	TA1327	200p	TA24850	200p	TA44800	200p	TA48433	300p	UPC1031	150p	2SA814	65p	2SA1204	22p
TA8216H	300p	TA1328	80p	TA24853	200p	TA44810	250p	TA48440	300p	UPC1032	60p	2SA816	70p	2SA1205	20p
TA8217G	120p	TA1410	220p	TA24859	100p	TA44814A	300p	TA48442	200p	UPC1035C	11p	2SA817	20p	2SA1207	25p
TA8220AH	600p	TA1412	35p	TA24860	400p	TA44850	475p	TA48443	350p	UPC1043C	12p	2SA825	70p	2SA1208	70p
TA8221AH	500p	TA1506	275p	TA24870	120p	TA44851	400p	TA48444	200p	UPC1058H	70p	2SA836	20p	2SA1209	100p
TA8225H	475p	TA1508	175p	TA24875	150p	TA44852	400p	TA48451	400p	UPC1161	110p	2SA837	200p	2SA1210	120p
TA8225L	475p	TA1510	170p	TA24880	200p	TA44860	200p	TA48452	200p	2SA838	110p	2SA1215	600p	2SA849	35p
TA8227	250p	TA1512	180p	TA24881	400p	TA44865	325p	TA48453	350p	UPC1170	150p	2SA841	20p	2SA1216	550p
TA8229K	200p	TA1514A	450p	TA24882	450p	TA44868	25p	TA48461	950p	UPC1173	200p	2SA844	20p	2SA1217	100p
TA84000	200p	TA1515A	300p	TA24883	300p	TA44935	300p	TA48490	350p	UPC1176C	120p	2SA847	25p	2SA1220	75p
TA8410K	200p	TA1516Q	200p	TA24890	275p	TA44940	325p	TA48540	250p	UPC1178H	25p	2SA854	30p	2SA1221	70p
TA8430P	200p	TA1517	250p	TA24892	260p	TA44942	325p	TA48570	275p	UPC1180C	200p	2SA861	45p	2SA1222	50p
TA8432	200p	TA1519	200p	TA24894	450p	TA44944	250p	TA48573	500p	UPC1181H	400p	2SA872	25p	2SA1226	25p
TA8805N	350p	TA1519A	200p	TA24895	350p	TA44950	120p	TA48578	900p	UPC1186	80p	2SA872A	50p	2SA1227	25p
TA8806N	350p	TA1520	275p	TA24896	650p	TA45030A	150p	TA48579	225p	UPC1187	150p	2SA879	30p	2SA1232	180p
TA8807P	320p	TA1521	250p	TA24897	350p	TA45100A	250p	TA48582	400p	UPC1188H	35p	2SA884	100p	2SA1237	25p
TA8811AH	400p	TA1522	110p	TA24900	200p	TA45300T	300p	TA48575	175p	UPC1191	300p	2SA885	35p	2SA1238	30p
TA8815N	480p	TA1526	225p	TA24901	175p	TA45321	150p	TA48576	175p	UPC1192	300p	2SA886	45p	2SA1239	30p
TA8828N	350p	TA1528	225p	TA24902	175p	TA45322	150p	TA48577	175p	UPC1198H	200p	2SA887	25p	2SA1240	45p
TA8831	500p	TA1534	2000p	TA24903	300p	TA45500	400p	TA48808T	325p	UPC1210	150p	2SA893	15p	2SA1242	80p
TA8832N	550p	TA1540	420p	TA24904	300p	TA45500	450p	TA48809T	350p	UPC1215	125p	2SA896	25p	2SA1244	120p
TA8844N	425p	TA1541	750p	TA24905	250p	TA45600P	250p	TA49045	400p	UPC1222	130p	2SA899	40p	2SA1245	55p
TA8845N	425p	TA1542	250p	TA24906	200p	TA45626T	300p	TA49080	550p	UPC1225H	220p	2SA900	45p	2SA1246	80p
TA8853N	1500p	TA1543	200p	TA24907	200p	TA45627	300p	TA49082	550p	UPC1227	240p	2SA904	45p	2SA1247	100p
TA8853AN	1500p	TA1552Q	350p	TA24908	325p	TA45708	400p	TA49083	180p	UPC1228HA	45p	2SA907	650p	2SA1249	100p
TA8860N	700p	TA1553AQ	375p	TA24909	220p	TA45709	450p	TA49090	500p	UPC1230	200p	2SA909	500p	2SA1252	20p
TA8861N	400p	TA1555Q	375p	TA24910	280p	TA45800	600p	TA49503	150p	UPC1237HA	70p	2SA912	70p	2SA1253	30p
TA8870AN	275p	TA1557Q	350p	TA24911	350p	TA45820	370p	TA49513	300p	UPC1238	120p	2SA913	100p	2SA1256	30p
TA8871AN	275p	TA1560	300p	TA24912	300p	TA45832	200p	TA49800	300p	UPC1241H	150p	2SA914	90p	2SA1257	30p
TA8872AN	450p	TA1561	300p	TA24913	300p	TA45833	200p	TA49801	300p	UPC1242H	150p	2SA915	70p	2SA1258	70p
TA8873AN	450p	TA1562	300p	TA24914	300p	TA45834	200p	TA49802	300p	UPC1245V	130p	2SA916	30p	2SA1261	150p
TA8873AP	450p	TA1572	175p	TA24915	300p	TA45835	200p	TA49803	300p	UPC1247H	250p	2SA921	40p	2SA1262	110p
TA8873AN	450p	TA1574	125p	TA24916	300p	TA45836	200p	TA49804	300p	UPC1270H	250p	2SA922	40p	2SA1263	280p
TA8874AN	450p	TA1575	170p	TA24917	300p	TA45837	200p	TA49805	300p	UPC1272V	250p	2SA923	40p	2SA1264	280p
TA8875AN	450p	TA1576	170p	TA24918	300p	TA45838	200p	TA49806	300p	UPC1274V	250p	2SA924	40p	2SA1265	280p
TA8876AN	450p	TA1577	170p	TA24919	300p	TA45839	200p	TA49807	300p	UPC1276V	250p	2SA925	40p	2SA1266	280p
TA8877AN	450p	TA1578	170p	TA24920	300p	TA45840	200p	TA49808	300p	UPC1278V	250p	2SA926	40p	2SA1267	280p
TA8878AN	450p	TA1579	170p	TA24921	300p	TA45841	200p	TA49809	300p	UPC1280V	250p	2SA927	40p	2SA1268	280p
TA8879AN	450p	TA1580	170p	TA24922	300p	TA45842	200p	TA49810	300p	UPC1282V	250p	2SA928	40p	2SA1269	280p
TA8880AN	450p	TA1581	170p	TA24923	300p	TA45843	200p	TA49811	300p	UPC1284V	250p	2SA929	40p	2SA1270	280p
TA8881AN	450p	TA1582	170p	TA24924	300p	TA45844	200p	TA49812	300p	UPC1286V	250p	2SA930	40p	2SA1271	280p
TA8882AN	450p	TA1583	170p	TA24925	300p	TA45845	200p	TA49813	300p	UPC1288V	250p	2SA931	40p	2SA1272	280p
TA8883AN	450p	TA1584	170p	TA24926	300p	TA45846	200p	TA49814	300p	UPC1290V	250p	2SA932	40p	2SA1273	280p
TA8884AN	450p	TA1585	170p	TA24927	300p	TA45847	200p	TA49815	300p	UPC1292V	250p	2SA933	40p	2SA1274	280p
TA8885AN	450p	TA1586	170p	TA24928	300p	TA45848	200p	TA49816	300p	UPC1294V	250p	2SA934	40p	2SA1275	280p
TA8886AN	450p	TA1587	170p	TA24929	300p	TA45849	200p	TA49817	300p	UPC1296V	250p	2SA935	40p	2SA1276	280p
TA8887AN	450p	TA1588	170p	TA24930	300p	TA45850	200p	TA49818	300p	UPC1298V	250p	2SA936	40p	2SA1277	280p
TA8888AN	450p	TA1589	170p	TA24931	300p	TA45851	200p	TA49819	300p	UPC1300V	250p	2SA937	40p	2SA1278	280p
TA8889AN	450p	TA1590	170p	TA24932	300p	TA45852	200p	TA49820	300p	UPC1302V	250p	2SA938	40p	2SA1279	280p
TA8890AN	450p	TA1591	170p	TA24933	300p	TA45853	200p	TA49821	300p	UPC1304V	250p	2SA939	40p	2SA1280	280p
TA8891AN	450p	TA1592	170p	TA24934	300p	TA45854	200p	TA49822	300p	UPC1306V	250p	2SA940	40p	2SA1281	280p
TA8892AN	450p	TA1593	170p	TA24935	300p	TA45855	200p	TA49823	300p	UPC1308V	250p	2SA941	40p	2SA1282	280p
TA8893AN	450p	TA1594	170p	TA24936	300p	TA45856	200p	TA49824	300p	UPC1310V	250p	2SA942	40p	2SA1283	280p
TA8894AN	450p	TA1595	170p	TA24937	300p	TA45857	200p	TA49825	300p	UPC1312V	250p	2SA943	40p	2SA1284	280p
TA8895AN	450p	TA1596	170p	TA24938	300p	TA45858	200p	TA49826	300p	UPC1314V	250p	2SA944	40p	2SA1285	280p
TA8896AN	450p	TA1597	170p	TA24939	300p	TA45859	200p	TA49827	300p	UPC1316V	250p	2SA945	40p	2SA1286	280p
TA8897AN	450p	TA1598	170p	TA24940	300p	TA45860	200p	TA49828	300p	UPC1318V	250p	2SA946	40p	2SA1287	280p
TA8898AN	450p	TA1599	170p	TA24941	300p	TA45861	200p	TA49829	300p	UPC1320V	250p	2SA947	40p	2SA1288	280p
TA8899AN	450p	TA1600	170p	TA24942	300p	TA45862	200p	TA49830	300p	UPC1322V	250p	2SA948	40p	2SA1289	280p
TA8900AN	450p	TA1601	170p	TA24943	300p	TA45863	200p	TA49831	300p	UPC1324V	250p	2SA949	40p	2SA1290	280p
TA8901AN	450p	TA1602	170p	TA24944	300p	TA45864	200p	TA49832	300p	UPC1326V	250p	2SA950	40p	2SA1291	280p
TA8902AN	450p	TA1603	170p	TA24945	300p	TA45865	200p	TA49833	300p	UPC1328V	250p	2SA951	40p	2SA1292	280p
TA8903AN	450p	TA1604	170p	TA24946	300p	TA45866	200p	TA49834	300p	UPC1330V	250p	2SA952	40p	2SA1293	280p
TA8904AN	450p	TA1605	170p	TA24947	300p	TA45867	200p	TA49835	300p	UPC1332V	250p	2SA953	40p	2SA1294	280p
TA8905AN	450p	TA1606	170p	TA24948	300p	TA45868	200p	TA49836	300p	UPC1334V	250p	2SA954	40p	2SA1295	280p
TA8906AN	450p	TA1607	170p	TA24949	300p	TA45869	200p	TA49837	300p	UPC1336V	250p	2SA955	40p	2SA1296	280p

JAPANESE TRANSISTORS

Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price
2SC1875	90p	2SC2258	30p	2SC2710	60p	2SC3244	45p	2SC3781	160p	2SD287	250p	2SD879	60p	2SD1311	65p	2SD1786	275p	2SK240	140p
2SC1878	80p	2SC2259	60p	2SC2712	20p	2SC3246	80p	2SC3782	75p	2SD291	250p	2SD880	40p	2SD1313	1000p	2SD1758	75p	2SK241	30p
2SC1883	100p	2SC2261	700p	2SC2714	20p	2SC3259	350p	2SC3783	300p	2SD313	25p	2SD882	25p	2SD1326	200p	2SD1760	80p	2SK246	30p
2SC1884	30p	2SC2267	90p	2SC2716	50p	2SC3260	220p	2SC3787	100p	2SD315	75p	2SD889	35p	2SD1327	150p	2SD1761	60p	2SK240	25p
2SC1885	30p	2SC2270	60p	2SC2719	25p	2SC3261	230p	2SC3788	80p	2SD320	30p	2SD892A	75p	2SD1328	60p	2SD1762	50p	2SK301	40p
2SC1729	900p	2SC2271	25p	2SC2721	120p	2SC3262	280p	2SC3789	75p	2SD330	65p	2SD894	35p	2SD1330	50p	2SD1763A	60p	2SK303	40p
2SC1730	10p	2SC2274	15p	2SC2724	15p	2SC3263	280p	2SC3790	120p	2SD348	300p	2SD895	100p	2SD1347	70p	2SD1764	70p	2SK304	25p
2SC1740	10p	2SC2275	50p	2SC2738	200p	2SC3264	390p	2SC3795	140p	2SD350	320p	2SD896	200p	2SD1348	65p	2SD1765	70p	2SK312	75p
2SC1741	10p	2SC2278	70p	2SC2749	350p	2SC3269	50p	2SC3798	220p	2SD357	40p	2SD898B	225p	2SD1350	150p	2SD1769	110p	2SK315	70p
2SC1755	90p	2SC2283	700p	2SC2750	300p	2SC3270	50p	2SC3807	120p	2SD358	40p	2SD900	400p	2SD1376	60p	2SD1773	160p	2SK320	120p
2SC1756	35p	2SC2291	1800p	2SC2751	270p	2SC3271	75p	2SC3808	70p	2SD359	50p	2SD905	450p	2SD1378	60p	2SD1776	70p	2SK323	130p
2SC1758	35p	2SC2292	40p	2SC2752	75p	2SC3272	75p	2SC3811	80p	2SD361	100p	2SD916	130p	2SD1379	100p	2SD1783	100p	2SK332	175p
2SC1758	30p	2SC2298	35p	2SC2767	300p	2SC3279	30p	2SC3831	250p	2SD362	100p	2SD917	300p	2SD1380	100p	2SD1785	160p	2SK359	40p
2SC1760	70p	2SC2307	300p	2SC2769	400p	2SC3280	200p	2SC3832	135p	2SD371	240p	2SD921	320p	2SD1382	60p	2SD1789	210p	2SK363	50p
2SC1775	10p	2SC2308	10p	2SC2774	700p	2SC3281	200p	2SC3833	250p	2SD380	650p	2SD923	360p	2SD1384	50p	2SD1796	180p	2SK364	40p
2SC1781	20p	2SC2312	300p	2SC2775	500p	2SC3284	600p	2SC3851	100p	2SD381	50p	2SD946	120p	2SD1390	350p	2SD1802	75p	2SK367	40p
2SC1789	100p	2SC2314	70p	2SC2785	40p	2SC3293	85p	2SC3852	80p	2SD382	75p	2SD947	100p	2SD1391	25p	2SD1806	75p	2SK369	30p
2SC1809	40p	2SC2316	150p	2SC2786	40p	2SC3298	80p	2SC3853	220p	2SD386	70p	2SD950	300p	2SD1392	85p	2SD1812	60p	2SK373	40p
2SC1810	20p	2SC2320	100p	2SC2787	10p	2SC3298	120p	2SC3855	200p	2SD388	150p	2SD951	200p	2SD1395	80p	2SD1815	100p	2SK374	45p
2SC1815	10p	2SC2324	120p	2SC2791	500p	2SC3300	400p	2SC3857	500p	2SD389	60p	2SD957A	520p	2SD1398	120p	2SD1825	60p	2SK386	60p
2SC1819	70p	2SC2328A	500p	2SC2792	220p	2SC3303	100p	2SC3858	550p	2SD390	14p	2SD968	60p	2SD1398	120p	2SD1827	120p	2SK389	115p
2SC1826	60p	2SC2310	25p	2SC2793	700p	2SC3306	130p	2SC3866	275p	2SD401	50p	2SD975	35p	2SD1398	120p	2SD1843	100p	2SK400	700p
2SC1827	60p	2SC2315	175p	2SC2808	40p	2SC3307	600p	2SC3868	100p	2SD402	120p	2SD978	60p	2SD1399	300p	2SD1847	350p	2SK405	450p
2SC1829	500p	2SC2329	480p	2SC2810	360p	2SC3309	150p	2SC3870	200p	2SD414	45p	2SD978	60p	2SD1400	280p	2SD1847	350p	2SK405	450p
2SC1833	27p	2SC2330	300p	2SC2812	40p	2SC3310	125p	2SC3883	210p	2SD415	55p	2SD978	60p	2SD1402	120p	2SD1848	280p	2SK414	550p
2SC1834	60p	2SC2331	50p	2SC2814	40p	2SC3316	280p	2SC3884A	200p	2SD424	350p	2SD982A	70p	2SD1403	120p	2SD1850	325p	2SK415	500p
2SC1841	12p	2SC2333	200p	2SC2824	75p	2SC3317	350p	2SC3885	250p	2SD426	150p	2SD983	90p	2SD1405	80p	2SD1853	40p	2SK423	75p
2SC1844	50p	2SC2334	80p	2SC2825	900p	2SC3326	50p	2SC3885A	290p	2SD427	350p	2SD985	120p	2SD1406	50p	2SD1854	40p	2SK427	50p
2SC1845	15p	2SC2335	55p	2SC2826	200p	2SC3327	60p	2SC3886A	330p	2SD438	35p	2SD986	120p	2SD1407	60p	2SD1857	75p	2SK430	200p
2SC1848	35p	2SC2336A	125p	2SC2827	130p	2SC3328	50p	2SC3890	150p	2SD467	15p	2SD989	70p	2SD1408	125p	2SD1858	40p	2SK411	450p
2SC1847	45p	2SC2344	150p	2SC2832	300p	2SC3330	20p	2SC3892A	400p	2SD468	15p	2SD1010	40p	2SD1409	175p	2SD1863	35p	2SK413	320p
2SC1855	85p	2SC2347	35p	2SC2834	280p	2SC3331	25p	2SC3893	225p	2SD471	20p	2SD1012	40p	2SD1411	85p	2SD1864	85p	2SK426	160p
2SC1856	25p	2SC2353	120p	2SC2837	350p	2SC3333	120p	2SC3895	400p	2SD476	100p	2SD1020	40p	2SD1412	75p	2SD1877	175p	2SK531	350p
2SC1865	700p	2SC2360	120p	2SC2839	40p	2SC3345	100p	2SC3896	400p	2SD525	50p	2SD1021	120p	2SD1413	60p	2SD1878	160p	2SK534	700p
2SC1870	70p	2SC2361	150p	2SC2853	70p	2SC3346	130p	2SC3897	400p	2SD526	70p	2SD1022	250p	2SD1415	190p	2SD1879	275p	2SK537	900p
2SC1871	425p	2SC2362	50p	2SC2873	60p	2SC3352	200p	2SC3907	250p	2SD545	18p	2SD1024	850p	2SD1417	125p	2SD1880	360p	2SK538	350p
2SC1875	220p	2SC2365	280p	2SC2877	120p	2SC3353	280p	2SC3927	280p	2SD549	120p	2SD1027	850p	2SD1425	250p	2SD1881	350p	2SK539	1100p
2SC1881	70p	2SC2369	100p	2SC2878	20p	2SC3355	50p	2SC3940	40p	2SD551	300p	2SD1030	75p	2SD1426	135p	2SD1884	300p	2SK544	30p
2SC1890	15p	2SC2371	25p	2SC2879	3200p	2SC3356	120p	2SC3943	75p	2SD554	225p	2SD1031	70p	2SD1427	160p	2SD1886	450p	2SK552	220p
2SC1895	500p	2SC2373	210p	2SC2882	60p	2SC3358	50p	2SC3944	80p	2SD555	500p	2SD1036	600p	2SD1428	180p	2SD1887	300p	2SK553	250p
2SC1904	125p	2SC2383	50p	2SC2883	60p	2SC3376	300p	2SC3950	120p	2SD556	225p	2SD1046	200p	2SD1430	280p	2SD1894	300p	2SK555	320p
2SC1906	15p	2SC2389	45p	2SC2898	200p	2SC3377	50p	2SC3953	60p	2SD558	200p	2SD1047	180p	2SD1431	200p	2SD1895	225p	2SK556	500p
2SC1907	20p	2SC2407	110p	2SC2899	50p	2SC3378	120p	2SC3955	70p	2SD560	60p	2SD1051	130p	2SD1432	400p	2SD1910	280p	2SK557	400p
2SC1909	250p	2SC2408	120p	2SC2909	60p	2SC3379	1200p	2SC3964	100p	2SD571	20p	2SD1055	60p	2SD1433	400p	2SD1911	300p	2SK559	600p
2SC1913	90p	2SC2412K	50p	2SC2910	25p	2SC3381	130p	2SC3972	150p	2SD575	530p	2SD1060	130p	2SD1438	100p	2SD1913	50p	2SK560	580p
2SC1914	30p	2SC2440	200p	2SC2911	80p	2SC3383	80p	2SC3973	210p	2SD582	25p	2SD1062	150p	2SD1439	165p	2SD1920	50p	2SK566	475p
2SC1921	15p	2SC2458	10p	2SC2912	120p	2SC3393	80p	2SC3975	210p	2SD586	25p	2SD1063	200p	2SD1441	200p	2SD1930	60p	2SK606	70p
2SC1922	175p	2SC2459	50p	2SC2921	650p	2SC3397	20p	2SC3987	220p	2SD589	30p	2SD1064	260p	2SD1442	80p	2SD1933	75p	2SK612	80p
2SC1923	10p	2SC2466	55p	2SC2922	480p	2SC3399	50p	2SC3996	600p	2SD591	40p	2SD1065	160p	2SD1445	200p	2SD1939	75p	2SK684	950p
2SC1929	180p	2SC2486	275p	2SC2923	75p	2SC3400	35p	2SC3997	1400p	2SD592	60p	2SD1069	150p	2SD1446	30p	2SD1941	500p	2SK685	1150p
2SC1940	110p	2SC2492	50p	2SC2928	550p	2SC3401	50p	2SC3998	1000p	2SD596	50p	2SD1073	350p	2SD1450	60p	2SD1944	50p	2SK699	100p
2SC1941	27p	2SC2470	85p	2SC2929	280p	2SC3402	40p	2SC4006	100p	2SD597	70p	2SD1088	150p	2SD1451	20p	2SD1958	80p	2SK719	300p
2SC1942	350p	2SC2481	120p	2SC2934	75p	2SC3405	130p	2SC4020	280p	2SD601	300p	2SD1094	375p	2SD1452	275p	2SD1959	210p	2SK724	500p
2SC1944	350p	2SC2482	20p	2SC2937	250p	2SC3409	40p	2SC4023	325p	2SD603	70p	2SD1110	225p	2SD1453	140p	2SD1978	50p	2SK725	550p
2SC1945	350p	2SC2483	120p	2SC2939	400p	2SC3416	30p	2SC4029	350p	2SD606	10p	2SD1111	20p	2SD1455	250p	2SD1984	450p	2SK726	425p
2SC1946	1500p	2SC2484	185p	2SC2944	300p	2SC3417	90p	2SC4043	45p	2SD607	15p	2SD1113	225p	2SD1457	185p	2SD1991	50p	2SK727	475p
2SC1947	450p	2SC2485	400p	2SC2958	50p	2SC3419	120p	2SC4046	40p	2SD638	15p	2SD1128	200p	2SD1458	50p	2SD1994	300p	2SK739	400p
2SC1953	45p	2SC2491	200p	2SC2962	800p	2SC3420	80p	2SC4056	350p	2SD639	20p	2SD1133	65p	2SD1459	80p	2SD2006	75p	2SK758	300p
2SC1957	70p	2SC2498	50p	2SC2979	160p	2SC3421	45p	2SC4059	550p	2SD640	350p	2SD1135	75p	2SD1468	40p	2SD2010	250p	2SK769	500p
2SC1959	10p	2SC2500	25p	2SC2987	250p	2SC3422	75p	2SC4064	140p	2SD645	18p	2SD1138	40p	2SD1487	225p	2SD2011	60p	2SK786	200p
2SC1962	175p	2SC2502	140p	2SC2988	150p	2SC3423	60p	2SC4106	200p	2SD661	60p	2SD1140	40p	2SD1494	200p	2SD2012	50p	2SK787	800p
2SC1967	1300p	2SC2503	600p	2SC2995	60p	2SC3													

REPLACEMENT VIDEO HEADS

Model	Price	Model	Price	Model	Price	Model	Price	Model	Price
AKAI		VHSAN3	800p	HRD750, HRD830, HRD860	3300p	NVFS 100	5000p	TLS1100	3100p
VS105, 112, 115, 116, 120, 125, 126, 201, 202, 205, 220, 240, 244, 245, 247, 248, 250, 301, 303, 304, VSP8,		VHSAY3	1200p	HRD250, HRD257	2200p	NVFS 151	4850p	VHR120, 130, 14, 141, 143G, 145P, 151, 15, 15, 171, 220, 23, 244, 274, VHR310, 330, 4100, 4105, 4200, 430, 4300, 4400, 4500, 5080, 5100,	
VSP82	1000p	VHSB11, VHSCH1	2100p	3V32, BR42, HR7655	2200p	N.E.C.		VHR5200, 5600, 6850, 7100, 7200, 7250, 7300, 8070, 8100, 8101, 8200, VHR7800, 7810, 8000SP, 8700SP, VHRD4400, 4410, 4500, 4600,	
VP7100, VS8300, VS9500	650p	VHSB17	850p	HRD180, 190, 230, 610, 3V59, FV12L	2050p	N9011, 9012, 9013E, 9014E, 9014G, 9015, 9016, 901A, 902A, 9032, N9034, 9040, 9053, 9054, 9055, 9056, 9063, 9065, 9066, 9069, 9077,		VHRD4510, 8800, 4800, 4900	
VP7200, VS9700, VS9800	1200p	VHSB37	2600p	FV208, 260, 30, 32, 33, VCI411	2050p	N9096, DX1000, 1600, PX1200, 1150P		SL2000	4250p
VS1	1250p	VHSD52	1600p	HRD370, HRD430, HRD470, 3V58, FV13H	2130p	N911A, 914C, 915A, 916A, 917, 9110, 9120	2400p	VHR5300, VHR6500, VHR7400	4500p
VS2	1200p	VHSEH2, VHSDH2	1600p	HRD530, HRD700, HRD840, HRD870	3100p	PVC200, 740, 744, 754, 753E, 764, PV200, 2400, 760, 794, 770, 774	1650p	VHR160E, 235, 335E, 4150, 4160, 4350, 7250, 7260, 8250	1950p
VS3	1350p	VHSEY1, VHSFY2	1300p	HRD130, HRD147, FV57H	2800p	82611AH1 (FOR MODEL DX3000), DX2000, N9610, NS7000	3000p	VCA461	1600p
VS10	1350p	VHSP11, VHSF2	1300p	GRC1, GRC2, 3 V41	2800p	N9052, N9530, DX200	3000p	VC488	4200p
VS33.35, 37, 38, 38E0G MKII, 53, 55, 66, 765, 766, 767, 768, 865, 867, VSF30, 33, 4, 400, 410, 420, 430, 440, 441, 450, 455, 480, 490, 497, VSC51, 54, 55, VXS450, VXS470	2250p	VHSTJ1, VHSJ2	1300p	HR182LV, VR202LV	3800p	VCP1	1700p	VC779	1800p
VSS12, VSS15, VSS16	2250p	VHSTJ1, VHSJ3, VHSWJ3, VHSYJ2	700p	FV67HV, FV68TV, FV77	4500p	PVC2300, 2400, 740, 744, 760, 764	1400p	VC789, VC790	2000p
VSA62, 465, 467, 467E0G2, VSF12, 15EK, 15E0H, 300, 301, 310	2300p	VHSTJ1, VHSJ3, VHSWJ3, VHSYJ2	700p	R2006-SERIES	4500p	764	1700p	VC800, VC830, 381, 383, 384, 385, 386, 387, 388, 471, 477, 481, 482, VC483, 486, 3300, 8381, 9100, 9300, 9400, 9500, 9600, 9700	1100p
VSF230, 330, 340, 350, VSG30, 33, 34, 35	2300p	VHSTJ1, VHSJ3, VHSWJ3, VHSYJ2	700p	FV61LV, FV62LV, FV67HV	4000p	D5600	3500p	VC910	2800p
VS11, VS12	1200p	SE2100, 5110	1400p	FV42L	1950p	VH3, VH555, VH600, VH700, VH844, HRJ200, HRJ205	3300p	VH815	2800p
V56, V58, V59	2400p	MADRID, SE5140, VS540, VS5480	3000p	VR160L, VR172L	1950p	VH1000 (ALL MODELS)	1100p	VH815	2800p
VX9	2250p	MV5540, 620, VS550, 620, 630, 640, 790, 930, 940	2400p	HRJ200, HRJ205	3300p	VH1, VH2A	700p	VH815	2800p
VXA1100, 1110, 650, VSF500, 510, 550, 560, 580, 590, 600, 650, VSG60, 64, 65, VSG70, 73, 74, 75, VSG80, 580	3600p	MV5550, 620, VS550, 620, 630, 640, 790, 930, 940	2400p	HRJ600EG, HRJ600EK, HRJ605EG, HRJ605UK, HRJ610EK	7100p	D1000, D1100	1600p	VH815	2800p
VS155, VS165	2300p	VS120	2300p	HRJ300, HRJ305, HRJ315, HRJ316G, HRJ318E	3750p	D1500X, D1500X, D4500, VPCD100, D1200, D2000X, D5000	1600p	VH815	2800p
VS20, 22, 23, 24, 25, 26, 27, 422, 425, 426, 427, 485, VSF10, 11, 180, 190, VSF200, 210, 220, 221, 222, 230, 240, 260, 261, 262, 265, 270, 275, 280, VSG290, 510, 550, VSG20, 204, 205, 206, VSG21, 211, 212, 216, VSG217E0G, 23, 24, 25, 405, 411, 415, 417, VSP100, 100EM, 110, VSP88, 88KC, 8111, VSP9, VSR100, 100EDG, 100EM, 110, VXA400	1250p	VS160, VS280	4600p	HRJ400, HRJ405, HRJ407MS, HRJ41, OEK, HRJ415, HRJ416	5850p	VR640, VR6520, 64VR60, VR6711 4 HEAD	2800p	VCA111, 113, 116, 131, 140, 202, 203, 211, 234, 244, 254, 255, 30, 35, VCA40, VCB311N, 320, VCD501, 802, VCM73, VCT212, 310, 410, VCT510, 72, VCT1314, VCT5313	1100p
VSR9	1300p	VS170	4600p	MITSUBISHI		VR6440, VR6541, VR6640, VR6642	1300p	VC6000, 6200, 6300, 7300, 7700, 7750, 8000, 8300	1800p
VSR109, VS603, VS606, VS607	2500p	VS180	4600p	HS303, HS304, HS320, HS700	1400p	VR6820	2750p	VC793	3000p
VS75	2500p	VS190	4600p	HS306, HS318, HS710	1400p	41DV2, 4S811BVR412, 415, 6485, 6490, 6880	1600p	VC793	3000p
VSR85, VC967	3450p	VS200	4600p	HS307	2300p	BR948	1600p	VC793	3000p
VSF400, 410, 420, 430, 440, 441, 450, 455, 480, 490, 497, VXA450, 470	2850p	VS210	4600p	HS307	2300p	20DV1, 20DV2, 20RW7, 21DV1, 21DV2, 21DV3, 25B01, 02, 11, 12, 30D, 31D, 31DV2, 31DV3, 35B02, 03, 05, 11, 12, 13, 6885A, 715B4, 865B1, 915B2, 925B2, DV186, 190, 291, 292, 468, 471, VR201, 202, 203, 2115, 212, 213, 223, 231, 232, 302, 303, 305, 311, 312, VR313, 3210, 3219, 322, 323, 323, 501, 6180, 6182, 6185, 6290, 6291, VR6293, 6362, 6367, 6467, 6468, 6470	4600p	VC809, VCA601, VCA602	2000p
VSG20, 204, 204, 205, 208, 20, 21, 211, 212, 215, 217, 225, 23, 24, 25, VSP100, 110, 88, VSR100, 110, VXA400	1950p	VS220	4600p	HS307	2300p	VR3260, 6349, 6442, 663, 6448, 6449, 6542, 6643	1250p	VC809, VCA601, VCA602	2000p
VSG415, VSG415EA, VSG425	2800p	VS230	4600p	HS308	2300p	VR601	1750p	VC809, VCA601, VCA602	2000p
V575, V5A77	3500p	VS240	4600p	HS309	2300p	V8586, VR6548, VR6648, VR6820	2800p	VC90E1	3900p
VSF1000, VSF1010, VSF1030	5800p	VS250	4600p	HS310	2300p	SAISHO		VH815	2800p
ALBA		VS260	4600p	HS310	2300p	VR100, 605, 705, 805, 905, 1000, 1100, 1200, 1600	1200p	VH815	2800p
VDR3000, VCR4000, VCR5000, VCR6000	1850p	VS270	4600p	HS310	2300p	VR3300X, VR3600X, VR3650X, VR3800	1400p	VH815	2800p
VCR7000, 7800, 8000, 8800	1100p	VS280	4600p	HS310	2300p	VR3200, VR3500	1400p	VH815	2800p
AMSTRAD		VS290	4600p	HS310	2300p	VR2000, VR3300, VR3600	1400p	VH815	2800p
VCR4500, VCR5200, VCR9000	900p	VS300	4600p	HS310	2300p	VRS5000X, VXR6000A, VXL12X	1500p	VH815	2800p
TVR1	900p	VS310	4600p	HS310	2300p	SALORA		VH815	2800p
VCR7000	1000p	VS320	4600p	HS310	2300p	6500, 6600	1600p	VH815	2800p
VCR1000, 2000, 6000, 61000, 62000, 8600, 8602, 8700, 9005, DD8900, DD8904, TVR4	1100p	VS330	4600p	HS310	2300p	SV730, SV8200, SV8300, SV9200	1500p	VH815	2800p
TVR2, TVR3, VCR4600, VCR4600 MKII	1100p	VS340	4600p	HS310	2300p	SV7400, SV8400	1600p	VH815	2800p
VCR400	1100p	VS350	4600p	HS310	2300p	SV8100	1600p	VH815	2800p
VCR8800, VCR8804, VCR9340	2100p	VS360	4600p	HS310	2300p	SV800, SV810	1500p	VH815	2800p
VCR8603, VCR8604, VCR8704, VCR8714	1350p	VS370	4600p	HS310	2300p	SV6700, SV8710, SV8750	1500p	VH815	2800p
VCR9140, VCR9142	3650p	VS380	4600p	HS310	2300p	623N, SV6800, SV6900, SV8850, SV8870, SV8870	1750p	VH815	2800p
VCR9340	3650p	VS390	4600p	HS310	2300p	SV8910, SV8910	2650p	VH815	2800p
VCR9244	3450p	VS400	4600p	HS310	2300p	323N, SV8920	323N	VH815	2800p
UF020, 22, VCR3000, 3002, 9500	1750p	VS410	4600p	HS310	2300p	SV8700, SV8700	4500p	VH815	2800p
FISHER		VS420	4600p	HS310	2300p	SV8600, SV8600	2400p	VH815	2800p
FVHP420, 510, 520, 530, 615, 618, 620, 622, 710, 711, 715, 716, 720, FVHP721, 722, 730, 830, 905, 906, 907, 908, 910, 911, 915, 916, 918, FVHP5000, 8001, 9005, 9050, 9050, 9075	1100p	VS430	4600p	HS310	2300p	SV8600, SV8600	2400p	VH815	2800p
VBS32500, 7100, 7500, 7600, 9900, VBR330	1800p	VS440	4600p	HS310	2300p	SV8600, SV8600	2400p	VH815	2800p
VBS7000, VBS7100, VBS9000	2000p	VS450	4600p	HS310	2300p	SV8600, SV8600	2400p	VH815	2800p
VFP5000, 711, 715, 721, 722, 730, 710, 710, FVHD720	1100p	VS460	4600p	HS310	2300p	SV8600, SV8600	2400p	VH815	2800p
FVHP725, FVHP830, FVHP980	2500p	VS470	4600p	HS310	2300p	SV8600, SV8600	2400p	VH815	2800p
FVHP990	2700p	VS480	4600p	HS310	2300p	SV8600, SV8600	2400p	VH815	2800p
FVHP975	2400p	VS490	4600p	HS310	2300p	SV8600, SV8600	2400p	VH815	2800p
FVHD407, FVHD140, FVHP11, FVHP10, FVHP20	1850p	VS500	4600p	HS310	2300p	SV8600, SV8600	2400p	VH815	2800p
FVHD230, FVHP1100, 1200, 130, 1340, 1410, 2000, 200, 210, 300, FVHP310, 410, 420	1800p	VS510	4600p	HS310	2300p	SV8600, SV8600	2400p	VH815	2800p
FVHD250, 270, 370, FVHP1500, FVHP250	2700p	VS520	4600p	HS310	2300p	SV8600, SV8600	2400p	VH815	2800p
FVHP132, 1400, 1440, 320, 440, 445	3550p	VS530	4600p	HS310	2300p	SV8600, SV8600	2400p	VH815	2800p
FVHP470S, FVHP475HV	4800p	VS540	4600p	HS310	2300p	SV8600, SV8600	2400p	VH815	2800p
FVHP1250, FVHP4305	1900p	VS550	4600p	HS310	2300p	SV8600, SV8600	2400p	VH815	2800p
GOLDSTAR		VS560	4600p	HS310	2300p	SV8600, SV8600	2400p	VH815	2800p
8000 JHS5D, VHR121, RQ2011, 2031, 2051	1900p	VS570	4600p	HS310	2300p	SV8600, SV8600	2400p	VH815	2800p
GVH51, GVH122, VCP4000, VCP4100, VCP4200	1100p	VS580	4600p	HS310	2300p	SV8600, SV8600	2400p	VH815	2800p
GHV1232, 1238, 1241, 1242, 1243, 1244, 1245, 1246, 1266, 1290, 1291	1100p	VS590	4600p	HS310	2300p	SV8600, SV8600	2400p	VH815	2800p
GHV1295, 1296, 1891, 8210, 8215, 1221, 1240, 1241, 1247, 12									

PINCH ROLLERS

Model	Price	Model	Price	Model	Price	Model	Price
AKAI VS10, VS9300, VS9500, VS9700, VS9800, VP1700, VP177 VS1, VS2, VS3, VS4, VS5, VS6, VS8, VS9, VS12, VS15 VS105, 112, 115, 116, 120, 125, 126, 155, 165, 205, 220, 240, 244, 246, VS247, 248, 250, 512, VS515, 516, VSX9 VS201, 301, 303, 304, 603, 606, 607, VS28 VSP82, VP38, VP82 VS125, VS155, VS165, VS220, VS240, VS250, VS512 VS22, 23, 25, 35, 37, 38, 53, 66, 75, 422, 425, 426, 427, 462, 465, 467 VS485, 765, 766, 767, 768, 865, 867, 955, 967, VSAT77, VS4650 VSF10, 11, 12, 15, 180, 190, 200, 210, 220, 221, 222, 230, 240, 30, 33 VSF330, 4, 500, 550, VSP88, VSR100, VSF400, 450, 470 VSF260, 261, 262, 265, 270, 274, 275, 280, 290, 340, 550, VCR400, 420, 43C VSF441, 440, 450, 455, 480, 490, 497, 510, 560, 580, 590, 599, 800 VSG20, 21, 23, 24, 25, 30, 33, 34, 35, 51, 54, 55, 60, 64, 66, 70, 73, 74, 75 VSP110, VSX560, VSX580 VS17, 20, 22, 23, 24, 25, 26, 27, 35, 37, 38, 53, 55, VS477 PINCH ROLLER ASSEMBLY VS422, 425, 426, 427, 462, 465, 467, 495, 498, 765, 766, 767, 768, 865, 867, 955, 967, VSAT77, VS4650, VSF10, 11, 12, 14, 15, 180, 190, 200, 210, 220, 221, 222, 230, 240, 30, 300, 301, 310, 320, 33, 330, 4, 500, 510, 600, VS9110, VSX100, 400, 450, 470 PINCH ROLLER ASSEMBLY VSS99 ALBA VCR3000X, VCR4000 VCR5000, VCR6000 VCR161, VCR222 VCR7000, VCR7300, VCR8000, VCR8800 VTV10 AMSTRAD VCR1000, 2000, 4500, 4600, 4700, 5200, 6000, 6100, 6200, 8600 VCR8602, 8603, 8604, 8700, 8704, 8714, 8800, 8804, 9000, 9005 VCR9244, 9340, DD8900, 8904 TVR1, 2, 3, 4 VCR7000 DD8900, DD8904, VCR6000, 6100, 6200, 8600, 8604, 8803, 8604 VCR8700, 8800, 9000-9, 9140, 9244, 9340 PINCH ROLLER ASSEMBLY PART NO: SL1348 TX3650, UF20, VCR3000, VCR3002, VCR4000, VCR8500 PINCH ROLLER ASSEMBLY PART NO: 2545966 DD9900, 9904, TX3650, UF20, 22, 24, VCR3000, 3002, 9500 VS1004 VS1104 FERGUSON 3V00, 3V01, 3V16, 3V22, 3V23, 3V24, 3292, 8900, 8901, 8902, 8903, 8904, 8905, 8909, 8912, 8922, 8923, 8924, 8925, 8929 3V29, 3V30, 3V31, 3V32, 3V52, 8930, 8931, 8933, 8940, 8941, 8942 3V35, 3V58, 3V58, 3V59, 3V42, 3V43, 3V44, 3V45, 3V46, 3V49, 3V53, 3V54, 3V55, 3V56, 3V57, 3V58, 3V59, 3V65, FV10, FV11, FV12, FV14, 8943, 8944, 8945, 8947, 8948 3V52 8950, 8951, FV108, 11R, 13H, 14T, 205, 21R, ZL2, 26E, 31R, 32L, FV33H, 395, 41R, 42L, 50B, 51L, 52L, VC141L FV37H, FV44L, FV46T, FV43H, FV57H 3V35, 3V36, 3V38, 3V39, 3V49, 8943, 8944 PINCH ROLLER ASSEMBLY 3V42, 3V43, 3V44, 3V45, 3V48, 3V53, 3V54, 3V55, 3V56, 3V57, 8945, 8947, 8948 PINCH ROLLER ASSEMBLY FV37, FV57, FV58 PINCH ROLLER ASSEMBLY FV31R FV41L, FV42L PINCH ROLLER ASSEMBLY 3V58, 3V59, 3V64, 3V65, FV10, 11, 12, 15, 20, 21, 22, 25, 30, 32, 33 FV39, VC141L PINCH ROLLER ASSEMBLY FV43H, FV44L, FV45X, FV46T PINCH ROLLER ASSEMBLY FV61, FV62, FV67, FV68, FV70, FV71, FV72, FV74, FV77 PINCH ROLLER ASSEMBLY FISHER FVHP420, 520, 530 BRISBANK 605, 747, 777, 920, 925 HR510 BPS500, HRD110, 111, 120, 220, 225, 455 PINCH ROLLER ASSEMBLY HRD140, 141, 142, 143, 150, 152, 157, 158, 160, 565, 566, 725, 755, HRP50 9000, 9900 FVHD230, 250, 270, 370, 20080, FVHP3, 210, 250, 300, 310, 1100, FVHP120, 1250, 130, 132, 1340, 1340, 1400, 1410, 1440, 1500, 200, FVHP200, 420, 430, 440, 445, 470, 475, FVSP290S, 495, 290S FVHD140, FVHD40, FVHD55, FVHP1, FVHP10, FVHP20, 40, 55, FVHP11, 10, 25, 30, 40, 400, FVHS10, 30 PINCH ROLLER ASSEMBLY GOLDSTAR GHV51, 1221, 1222, 1233, 1240, 1241, 1242, 1243, 1244, 1245, 1246, 1265 GHV1247, 1248, 1250, 1266, 1290, 1291, 1295, 1296, 1392, 1393 GHV1891, 1900, 2145, 3000, 3010, 4400, 4410, 51, 8000, 8200, GHV210, 8215, 8430 GHVP1240, 1241, 1247, 1248, 1290, 1291, GHVP1295, 1296, VCF4000, 4100, 4130, 4200, 4300, 4301, 4305, VCF4306, 4310, 4311, 4315, 4316, 4320, 4321, 4325, 4326, 4350, GSE1290, 1291, 1295, 1296, 1297, 1891, 1910, 2000S, 2000 HITACHI HTS1, 14, 16, 17, 18, 19, 33, 34, 35, 350, 38, 39, 88, 300, 680, 4200 VTS000, 5030, 5500, 6500, 6800, 7000, 8000, 8300, 8500, 8700, 930, VT9500, 9700, 9900, VM600 VTR, 52, 57, 61, 62, 63, 64, 65, 85, 86, 88, 100, 110, 111, 113, 115, 116, VT120, 122, 125, 128, 130, 135, 138, 145, 150, 168, 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VXL3 VXL4, VXL10, VXL35 VTV100, VXL10, VXL11, VXL9, VXL90 PINCH ROLLER ASSEMBLY VJ2H, VXL5, VXL6 MOD KIT JVC HR2200, 3300, 3330, 3360, 3660, 4100, 7700 HR2650, 7200, 7300, 7350, 7600, 7610, 7650, 7655 HRD110, 111, 120, 121, 140, 141, 142, 143, 150, 152, 156, 157, 158, HRD160, 220, 225, 250, 257, 445, 455, 565, 566, 725, 755, HRP50, BP5000, BR7000, BRSE11, 811 HRD520, 540, 550, 560, 580, 600, 610, 620, 637, 640, 841, 650, 660, HRD670, 720, 730, 740, 770, 820, 830, 840, 860, 870, 880, 910, 950 HRD980, HRD920, 22, 25, HRJ200, 205, 210, 215, 300, 315, 316, 318 HRJ400, 405, 407, 410, 411, 415, 416, 507, 600, 605, 610, 615, 715, 815 HRJ97, HRJ4700, 5800, 5900, 6800, 5900, SR3200, 300, 368 HRD170, 171, 180, 210, 211, 217, 230, 300, 320, 321, 330, 337, 350, HRD370, 400, 430, 440, 441, 470, 500, 530, 700, 750, 950 HR5900, 5500, 8000, 9000, BR7030, 7040, 9060, NS7000 ORION VH1, VH2 VC150, 180, VH3, 33, 200, 201, 205, 212, 250, 254, 288, 300, 303, 312, VH404, 555, 700, 704, 712, 770, 780, 844, 900, 1000, 2948, 300, 3312 VHF2A, VP2948 COMB 15000, 16000, HV03, LVH50, NEVH, NEVHM, NEVHML TFP230PC, VCF, VH04, 30, 103, 300, 358, 360, 361, 400, 416, 512 VH530, 532, 535, 536, 600, 630, 635, 640, 662, 730, 735, 744, 774, 790 VH800, 620, 850, 888, 893, 900, 930, 940, 944, 974, 1012, 1040, 1050, VH1060, 1070, VH1100, 1120, 1204, 1440, 1500, 1650, 1800, 2004, VH2151, 2308, 22042400, 2500, 2600, 2700, VHV2960, 2970, 3050, VHV3050, 4000, 4008, 4010, 4012, 4015, 4015, 4020, 4300, 5020, VP 10, 200, 220, 225, 245, VR821, 925, 1032, 2949, 2959, 2957, 2966, 2979, 2980, VTV300, VXL20, 25, 30 PHILIPS VR6460 VR6920 VR2020, VR2021, VR2022, VR2023, VR2024 VR6711 VR6545, 385, VR702, 703, 6485, 6585, 6586, 6755, 6880, 6848 VR445, VR6442, VR6542, VR6643, VR6843, VR6943, 44589 DV464, 662, VR2220, 2300, 2324, 2330, 2334, 2340, 2350, 2414, VR2480, 2485, 2486, 2489, 2490, 2498, 2840, 6462, 6463, 6464, 6560, VR6660, 6860, 6861, 6862, 6863 N-7100, VR2870 VR2025, VR6580, VR6581 4958B, VR3260, 6349, 6448, 6449, 6548, 6648 PRESSURE ROLLER ASSEMBLY PS303-40205 DV186, 190, VR211, 2115, 212, 213, 223, 286, 291, 292, 311, 312, 313, VR3210, 3219, 322, 3229, 323, 535B0, 486, 471, 562, 562, 571, 761, VR201, 202, VR203, 302, 303, 305, 6180, 6182, 6185, 6295, 6296 VR6291, 6293, 6362, 6367, 6390, 6391, 6393, 6467, 6468, 5470, 6561 VR6570, 6581, VR6670, 6676, 6710, 6760, 6761, 6762, 6870, 6970, VR6975, 8681, 63597, 68584, 71584, 71585, 72588, 72589, 525831, 20D1V, 20D2V, 20R7W, 21D1V, 21D2V, 25B01, 25B02, 25B11, 25B12, 30D1V, 31D1V, 31D2V, 31O1V335B02, 35B03, 35B05, 35B11, 35B12, 35B13 VR321, 322, 332, 422, 4229, 512, 5229, 722, 7229, 723 VR2591 SANYO VHR1100, 1110, 1150, 1200, 1300, 1500, 2100, 2300, 2370, 2500 VHR2700, 3300, MVR220 VTC5200, 5150, 5300, 5350, 5400, 5500, 8900, 8910, 6500, 9100 VTC3000, VTCM10, 20, 11, 21, 30, 31, 40, 50, VHR3150 VHR3100, 3300, 3310, 3400, 3500, 3700, 3800, VHRD500, 700 VTC3000 VHR120, 130, 14, 141, 143, 14, 150, 151, 153, 154, 15, 16, 171, 194, 22, 0VR23, 235, 240, 244, 250, 251, 274, 27, 297, 0VHR7810, 8000, 8070, 8100, 8200, 8250, 8500, 8500, VHRD4400, 4410, 4500, 4600, 4610, 4710, 4890, 6700, VHR5700 VCR100 VHR120, 135, 150, 190, 4150, 4160, 4350, 5200, 5440, 5350, 7200, 7250, 7260, 7700, VHRD4410, 4610, 4710, 4890, 5450, VHR5700 PINCH ROLLER ASSEMBLY VHR3100, 3200, 3300, 3310, 3400, 3700, 3800, VHRD500, 700 PINCH ROLLER ASSEMBLY SHARP VC200, 381, 383, 384, 385, 386, 388, 390, 393, 800, 2300, 3300, 6000, VC6200, 6300, 7300, 7700, 7750, 7800, 8300, 8380, 9100, 9300, 9400, VC9500, 9600, 9700, 9800 VC3000, 387, 402, 471, 473, 477, 481, 482, 483, 483, 488, 486, 500, 571, VCS1200, VCA1031 VC108, 208, 405, 408, 550, 600, 651, 671, 674, 681, 682, 684, 685, 693, VCG99, 700, 772, 750, 779, 780, 781, 7810, 782, 782MK2, 7822, 783, VCT785, 786, 787, 793, 800, 7810, 7822, VCT772, VCG675, VCG575, VCA 100, 102, 104, 101, 131, 140, 170, 202, 203, 211, 234, 303, 501, 512, VCA602, 5011, VCD801, 802, 851, 852, 881, 882, VCM73, VCT73, VCT72, VCB351 VCC20 VCA10, 30G, 60, 103, 105, 106, 111, 113, 131, 211, 244, 254, 33, 35, 36, VCA37, 39, 40, 42, 454, 46, 47, 48, 50, 505, 51, 52, 53, 54, 55, 57, 58, 505, VCA60, 605, 615, 62, 63, 67, 68, 1031, 11613, VCB311, 320, VCB597, VCD805, 806, 810, V15, VCB80, 81, 865, 910, VCS 1000, VCT310, VCT410, 610, VCT 1314, 5313, VCT90 165P VCA790, VCA101, 103, 1031, 105, 106, 211, 244, 254, 30, 35, VCA340, 43, 47, 50, 60, 605, 615, VCD805, 815, VCB380, 81, 83, 85, VCH665, 87, 910, VCS 1000, VCT12, 310, 410, 510, 610, VCT1314 VCT5313 PINCH ROLLER ASSEMBLY SAISHO VHL3, VR1000, 2000, 2500, 3200, 3300, 3500, 3600, 3650, 3800, VRS4400, VRS5000 VRS400 SAMSUNG SV716, 717, VB510, 520, 610, 616, 617, 619, 620, 626, 627, 629, 900 V910, V9150, 520, 611, 616, 621, 626, 900, 910, VX510, 520, 616, VV617, 619, 626, 627, 629 SVX301, 303, 305, 307, 319, 322, VB710, 713, 750, 770, 971, 8220, VB8225, V1710, 730, 750, 770, 790, 8220, 8225, 970, VX710, 712, VX720, 730, 750, 770, 790, 825, 8225, 970, 971, 972, 8220, PX860, 981, 982, SE9000, 9001, SX7120, 7121, 7220, 7221, 7230, SX7301, VK8220 VPX31 VX9800 PX31R, 32R, PXR30, SV80, SX3230, 3231, 3260, 3261, VSR900, VX30, 31, 32, 3560, 3561, 370, 375, 380, VXX300, 301, 306, 307, 320, VXX321, 326, 330, 331, 336, 337, 350, 351, 356 VX990, 991, 992, S11230, 1240, SVX4000, 503, 504, 500, SX1261, SX1262, SX1263, SX1264, SX1265, 1566, V11560, VPK43, VX1230, 1260, 1261, VX1560, 1561, 1850 SONY SLC5, 6, 7, SL3000, 8000, 8080, 8200, SLJ, 10, SLT84E, SLT40E SLC9, 20, 24, 33, 44, SLHF100, SLF1, 11, 20, 25, 30, 35, 60, 100, SLK88, 95, SLT20ME, SLT30ME, SLT50ME BMC 100, BMC203, BMC500 SLV201, 202, 301, 302, 401, 402, 801, 802 SLV210, 270, 273, 275, 300, 353, 373, 410, 415, 474, 656, 715, SLV75, 777 SLV255 SLV275, 282, 315, 325, 353, 363, 373, 410, 415, 416, 474, 625, 656, SLV715, 725, 727, 757, 777, 815, 825, SLV250, 50, 55 SLV125, 213, 225, 252, 255, 262, SLVX1, 20, 3 SLV215, 216E, 275, 282, 315, 325, 353, 363E, 373, 393, 410, 415, SLV416E, 474, 434A, 555UC, 559, 575UC, 579, 585HF, 595HF, SLV600, 615, 625, 656, 676C, 686HF, 696HF, 715, 725, 727, 757, SLV767, 817, 815, 825, SLV67, 8, 8SLVX300AS, SLVX35AF, SLVX50AS, SLVX55DH, SLVX65BR, SV01A0, 160 PINCH ROLLER ASSEMBLY PART NO: X3777701 SLV210, 212, 270, 273, 275, 285, 300, 310, 335, 425, 427 PINCH ROLLER ASSEMBLY SV6700, 8750, 9700, VHR3100, 3200, 3300, 3310, 3400, 3700, 3800, VHRD500, 700, 1350P PINCH ROLLER ASSEMBLY SL100, 20, SL120, 30, 33, 34, 40, 44, 80, 83, 9, SLF1, 20, 25, 30, 35, 45, SLF60, 65, 79, 90, SLHF100, 150, 850, SLK85, 95, SL10700, SL550, SLT0, 30, 50 PINCH ROLLER ASSEMBLY							

VIDEO LAMPS

Models & Description	Order Code	Price	Models & Description	Order Code	Price	Models & Description	Order Code	Price
UNIVERSAL VIDEO LAMP 9V 80mV (310mm WIRES)	VL01	25p	AINA, AKAI, ALBA, AMSTRAD, BLAUPUNKT, FERGUSON, FIDELITY, FISHER, FUJITSU, FUNAI, G.E.C., GOLDSTAR, GRANADA, GRUNDIG, HINARI, HITACHI, IIT, JVC (HRD SERIES), MATSUI, MITSUBISHI, NEC, ORION, NATIONAL, PHILIPS, SAISHO, SALORA, SAMSUNG, SANYO, SHARP, SIEMEN, SONY, TELEFUNKEN, THOMSON, TOSHIBA	VL05	100p	AKAI, GRANADA (VHSTJ2), HITACHI (VTR3000), IIT (VTR3912, VTR3933), JVC (HR2200, 3300, 3360), MITSUBISHI (HS200), TELEFUNKEN (VR510, 519, 610), THOMSON (VK300, 305, 306, 3301), FERGUSON (3V00, 16, 22, 24, 3292, 8900, 8901, 8902, 8903, 8909, 8912, 8922, 8923, 8924, 8925, 8929)	VL01	25p
PANASONIC VIDEO LAMPS	VL02	30p	GRANADA (VHSAY3), SHARP (VC200, 381, 384, 385, 386, 388, 390, 393, 9300, 9500, 9700)	VL08	45p	BLAUPUNKT, ORION (VH1, 2A), NATIONAL (NV200, 2010, 3000, 8000, 8150, 8200, 8400, 8600, 8610, 8620), SHARP (VC2300, 6000, 6200, 7300, 7700, 8300)	VL02	30p
SHARP VIDEO LAMPS	VL03	30p						
HITACHI 5381682 (VT63, VT64) VIDEO LAMPS	VL04	135p						

VIDEO SERVICE KITS

<p>AMSTRAD VCR700 <i>Contents</i> BELT SET, PINCH ROLLER, REEL IDLER, VIDEO LAMP Order Code: SK41</p> <p style="text-align: right;">£3.50</p>	<p>HITACHI VT11/VT33 <i>Contents</i> BELT SET, PINCH ROLLER, TENSION BAND, IDLER TYRES Order Code: SK06</p> <p style="text-align: right;">£5.00</p>	<p>NV600/NV688 <i>Contents</i> BELT SET, PINCH ROLLER, PLAY IDLER, FF/REW IDLER, TENSION BAND Order Code: SK25</p> <p style="text-align: right;">£12.00</p> <p><i>Economy Kit Contents</i> BELT SET, PINCH ROLLER, PLAY IDLER TYRE, FF/REW IDLER TYRE Order Code: SK26</p> <p style="text-align: right;">£6.00</p>
<p>FERGUSON & JVC 3V42/43 HRD455/HRD725 <i>Contents</i> BELT SET, PINCH ROLLER, CLUTCH MECHANISM, TENSION BAND Order Code: SK37</p> <p style="text-align: right;">£16.00</p> <p><i>Economy Kit Contents</i> BELT SET, PINCH ROLLER, SUPPLY CLUTCH, TAKE UP CLUTCH Order Code: SK38</p> <p style="text-align: right;">£9.00</p>	<p>VT11/VT33 <i>Contents</i> BELT SET, T/UP REEL TABLE TYRE, SUPPLY REEL TABLE TYRE, PINCH ROLLER, FF/REW IDLER, CLUTCH PLATE, TENSION BAND Order Code: SK45</p> <p style="text-align: right;">£13.00</p> <p><i>Economy Kit Contents</i> BELT SET, PINCH ROLLER, FF/REW IDLER TYRE, T/UP REEL TABLE TYRE, SUPPLY REEL TABLE TYRE Order Code: SK46</p> <p style="text-align: right;">£3.75</p>	<p>NV730/NV770 <i>Contents</i> SLOT IN BELT, LOADING BELT, PINCH ROLLER, IDLER UNIT, TENSION BAND Order Code: SK19</p> <p style="text-align: right;">£5.00</p> <p><i>Economy Kit Contents</i> SLOT IN BELT, LOADING BELT, PINCH ROLLER, IDLER TYRE Order Code: SK20</p> <p style="text-align: right;">£3.00</p>
<p>3V58/59/64/65 HRD170/180/210/230/300/320/370/400/430/530/700/750 HRS5000 <i>Contents</i> BELT SET, PINCH ROLLER, IDLER ARM, TENSION BAND Order Code: SK44</p> <p style="text-align: right;">£7.00</p>	<p>VT52/61/62/63/64/65/85/86/640 <i>Contents</i> BELT SET, PINCH ROLLER, FF/REW ARM, CLUTCH PLATE, TENSION BAND Order Code: SK49</p> <p style="text-align: right;">£14.00</p> <p><i>Economy Kit Contents</i> BELT SET, PINCH ROLLER, FF/REW IDLER Order Code: SK50</p> <p style="text-align: right;">£3.00</p>	<p>NV370/NV380/480/630/780/830/850/AG2100PK/AG2200PK <i>Contents</i> BELT SET, PINCH ROLLER, IDLER, TENSION BAND Order Code: SK21</p> <p style="text-align: right;">£5.00</p> <p><i>Economy Kit Contents</i> BELT SET, PINCH ROLLER, IDLER TYRE Order Code: SK22</p> <p style="text-align: right;">£2.75</p>
<p>3V29/3V30 HR7200/7300/7350 <i>Contents</i> BELT SET, PINCH ROLLER, TENSION BAND, IDLER TYRES Order Code: SK05</p> <p style="text-align: right;">£5.00</p>	<p>VT400/405/410/131/141/15/18/420/25/26/28/430/31/35/48/450/490/510/520/25/26/30/35/36/540/545/46/48/510/75/578/580/585/88 <i>Contents</i> TIMING BELT, PINCH ROLLER, FF/REW ARM, CLUTCH BASE, TENSION BAND Order Code: SK52</p> <p style="text-align: right;">£9.75</p>	<p>NV777/NV788 <i>Contents</i> BELT SET, PINCH ROLLER, IDLER UNIT, TENSION BAND Order Code: SK17</p> <p style="text-align: right;">£6.00</p> <p><i>Economy Kit Contents</i> BELT SET, PINCH ROLLER, IDLER TYRE Order Code: SK18</p> <p style="text-align: right;">£4.00</p>
<p>3V35/36, 38/39/49 HRD110/111/120/225 <i>Contents</i> BELT SET, PINCH ROLLER, TENSION BAND, IDLER TYRES Order Code: SK04</p> <p style="text-align: right;">£5.00</p>	<p>VT100/110/111/113/115/118/120/125/128/130/135/138/145/150/175/220/225/250/255/258/260/271/30 <i>Contents</i> BELT SET, PINCH ROLLER, FF/REW ARM, CLUTCH PLATE, TENSION BAND Order Code: SK51</p> <p style="text-align: right;">£14.00</p>	<p>SHARP VC381 <i>Contents</i> BELT SET, PINCH ROLLER, REEL IDLER, TENSION BAND, VIDEO LAMP Order Code: SK47</p> <p style="text-align: right;">£8.00</p> <p><i>Economy Kit Contents</i> BELT SET, PINCH ROLLER, REEL IDLER TYRE Order Code: SK48</p> <p style="text-align: right;">£3.25</p>
<p>3V31/3V42 HR7600/7610/7650/7655 <i>Contents</i> BELT SET, T/UP REEL TABLE TYRE, PINCH ROLLER, REEL IDLER, T/UP CLUTCH, T/UP IDLER TYRE, TENSION BAND, VIDEO LAMP Order Code: SK33</p> <p style="text-align: right;">£11.00</p> <p><i>Economy Kit Contents</i> BELT SET, T/UP REEL TABLE TYRE, PINCH ROLLER, REEL IDLER TYRE, T/UP IDLER TYRE, T/UP CLUTCH Order Code: SK34</p> <p style="text-align: right;">£5.00</p>	<p>PANASONIC NV2000/NV2010/NV7000/NV7200/NV7800 <i>Contents</i> BELT SET, PINCH ROLLER, TENSION BAND, IDLER TYRES Order Code: SK03</p> <p style="text-align: right;">£5.00</p> <p><i>Economy Kit Contents</i> BELT SET, PINCH ROLLER, TENSION BAND, IDLER TYRES Order Code: SK02</p> <p style="text-align: right;">£5.00</p>	<p>VC500/VC571/VC581/VC582/VC583/VC584/VC5F3 <i>Contents</i> BELT SET, PINCH ROLLER, REEL IDLER, TENSION BAND Order Code: SK60</p> <p style="text-align: right;">£5.00</p> <p><i>Economy Kit Contents</i> BELT SET, PINCH ROLLER, REEL IDLER Order Code: SK61</p> <p style="text-align: right;">£5.00</p>
<p>3V35/36/38/39/49 HRD110/111/120/121/225 <i>Contents</i> BELT SET, T/UP REEL TABLE TYRE, SUPPLY REEL TABLE TYRE, PINCH ROLLER, T/UP CLUTCH, T/UP IDLER, REEL IDLER, TENSION BAND Order Code: SK25</p> <p style="text-align: right;">£10.00</p> <p><i>Economy Kit Contents</i> BELT SET, T/UP REEL TABLE TYRE, SUPPLY REEL TABLE TYRE, PINCH ROLLER, T/UP CLUTCH, T/UP IDLER TYRE, REEL IDLER TYRE Order Code: SK36</p> <p style="text-align: right;">£5.50</p>	<p>NV300/NV330/NV333/NV340/NV366 <i>Contents</i> BELT SET, PINCH ROLLER, TENSION BAND, IDLER TYRE Order Code: SK01</p> <p style="text-align: right;">£5.00</p> <p><i>Economy Kit Contents</i> BELT SET, PINCH ROLLER, TENSION BAND, IDLER TYRES Order Code: SK02</p> <p style="text-align: right;">£5.00</p>	<p>VC781/VC7810/VC7822/VC785/VC786/VC793/VC800/VC100/VC102/VC104/VC104A/VC202 <i>Contents</i> BELT SET, PINCH ROLLER, REEL DRIVE UNIT, TENSION BAND Order Code: SK64</p> <p style="text-align: right;">£13.50</p> <p><i>Economy Kit Contents</i> BELT SET, PINCH ROLLER, REEL DRIVE UNIT TYRE Order Code: SK65</p> <p style="text-align: right;">£3.75</p>
<p>3V44/45/48/53/54/55/57 HRP50/HRD140/150/158/160 HRD250/257/565/566/755 <i>Contents</i> BELT SET, PINCH ROLLER, CLUTCH MECHANISM, TENSION BAND Order Code: SK39</p> <p style="text-align: right;">£15.00</p> <p><i>Economy Kit Contents</i> BELT SET, PINCH ROLLER Order Code: SK40</p> <p style="text-align: right;">£9.50</p>	<p>NV7000/NV7200/NV7800 <i>Contents</i> BELT SET, PINCH ROLLER, IDLER UNIT, PLAY IDLER, TENSION BAND, VIDEO LAMP Order Code: SK13</p> <p style="text-align: right;">£6.00</p> <p><i>Economy Kit Contents</i> BELT SET, PINCH ROLLER, IDLER TYRE, PULLEY TYRE Order Code: SK14</p> <p style="text-align: right;">£3.50</p>	<p>VC681/VC682/VC684/VC685/VC683/VC689/VC683/VC700 <i>Contents</i> BELT SET, PINCH ROLLER, REEL DRIVE UNIT, TENSION BAND Order Code: SK62</p> <p style="text-align: right;">£13.50</p> <p><i>Economy Kit Contents</i> BELT SET, PINCH ROLLER, REEL DRIVE UNIT TYRE Order Code: SK63</p> <p style="text-align: right;">£5.00</p>
<p>FISHER FVHP905/906/907/908/910/911/916/918 <i>Contents</i> BELT SET, PINCH ROLLER, IDLER, GEAR IDLER UNIT, TENSION BAND Order Code: SK57</p> <p style="text-align: right;">£13.00</p> <p><i>Economy Kit Contents</i> BELT SET, PINCH ROLLER, IDLER TYRE Order Code: SK58</p> <p style="text-align: right;">£5.00</p>	<p>NV300/NV330/NV333/NV340/NV366 <i>Contents</i> BELT SET, PINCH ROLLER, IDLER UNIT, PLAY IDLER, TENSION BAND Order Code: SK15</p> <p style="text-align: right;">£7.00</p> <p><i>Economy Kit Contents</i> BELT SET, PINCH ROLLER, IDLER TYRE, PLAY IDLER Order Code: SK16</p> <p style="text-align: right;">£3.75</p>	<p>VC781/VC7810/VC7822/VC785/VC786/VC793/VC800/VC100/VC102/VC104/VC104A/VC202 <i>Contents</i> BELT SET, PINCH ROLLER, REEL DRIVE UNIT, TENSION BAND Order Code: SK64</p> <p style="text-align: right;">£13.50</p> <p><i>Economy Kit Contents</i> BELT SET, PINCH ROLLER, REEL DRIVE UNIT TYRE Order Code: SK65</p> <p style="text-align: right;">£3.75</p>
<p>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</p> <p style="text-align: right;">£11.00</p> <p><i>Economy Kit Contents</i> BELT SET, PINCH ROLLER, IDLER TYRE Order Code: SK69</p> <p style="text-align: right;">£3.00</p>	<p>NV67/NV69/NV610/NV611/NV612/NV614/NV615/NV616/NV618/NV630/NV6120/NV6130/NV6400/NV665 (P/A/C)/AG1810 (P/A) <i>Contents</i> LOADING BELT, CAPSTAN BELT, PINCH ROLLER, IDLER TENSION BAND Order Code: SK27</p> <p style="text-align: right;">£6.00</p> <p><i>Economy Kit Contents</i> LOADING BELT, CAPSTAN BELT, PINCH ROLLER, IDLER TYRE Order Code: SK28</p> <p style="text-align: right;">£3.00</p>	<p>NV332 <i>Contents</i> BELT SET, PINCH ROLLER, PLAY IDLER, FF/REW IDLER, TENSION BAND, FF/REW TYRE Order Code: SK29</p> <p style="text-align: right;">£12.00</p> <p><i>Economy Kit Contents</i> BELT SET, PINCH ROLLER, PLAY IDLER TYRE, FF/REW IDLER TYRE Order Code: SK30</p> <p style="text-align: right;">£5.10</p>
<p>NV230/250/260/280/430/450/460/470/650/810/890/AG1200P/KAG1500PK <i>Contents</i> BELT SET, PINCH ROLLER, IDLER, TENSION BAND Order Code: SK23</p> <p style="text-align: right;">£5.00</p> <p><i>Economy Kit Contents</i> BELT SET, PINCH ROLLER, IDLER TYRE Order Code: SK24</p> <p style="text-align: right;">£3.25</p>	<div style="border: 1px solid black; padding: 10px; text-align: center;"> <p>FOR MORE DETAILS OF OVER 500 TYPES OF SERVICE KITS . . . PLEASE RING US!</p> </div> <div style="border: 1px solid black; padding: 10px; text-align: center; margin-top: 10px;"> <p style="font-size: 2em; font-weight: bold; letter-spacing: 0.5em;">SPECIAL OFFERS!</p> <p style="font-size: 1.5em; font-weight: bold;">See Page 814</p> </div>	

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Name	Models	Code	Price	Name	Models	Code	Price	Name	Models	Code	Price
AKAI	V535, V553, V585, V556, V575	CH18	3200p	FV31R	HRD515, 520, 527, 540, 560, 580, 600, 610, 620, 660, 670, HRD830, 840, 850, 860, 4050, 6600, FV37H	CH20	2200p	VCA103, 103GV, 106, 106GV/M, 25AGV/M	CH23	2500p	
GRANADA	VHSDP1, VHSYJ2	CH05	1100p	HRD540, 580, 630, 860, 910, 960, HRD970, HRD20, FV57H	CH27	2400p	VCS211, 244, 5055, 605, VCB230, VCD8066, 8106, VCT212, 310, 4106, 610	CH24	2500p		
GOLDSTAR	GHW1280P, 1291P, 1295P, 9500, 73401, GSE1295P, GSE1891P, 20001Q, 20051Q, VCP4200, 4330, 4301, 4305, VCP4306, 4311, 4315, 4316, 4320, 4321, 4325	CH25	2000p	VR3916, 3926, 3946, 3948, 3976, 3986, 3996, 3997, 6948	CH02	2800p	V220, 321, 323, 326, 4200, 4300	CH01	2800p		
	GHW51, 1221, 1232, 1240, 1241, 1242, 1244, 1246, 1248, GHW8000, 8200	CH26	2800p	VR3916, 3926, 3946, 3948, 3976, 3986, 3996, 3997, 6948	CH02	2800p	V942, 343, 352, 353, 360, 364, 368, 4210, 4230, 4260, 4400, V5500, 6000, 8540	CH02	2800p		
FERGUSON & J.V.C.	3V38, 3V39, 8943, 8944, 8951, 3V35, 3V36, 3V49, HRD 110, 111, 120, 121, 225	CH01	2800p	NATIONAL PANASONIC	NV730	CH06	4300p	V55, V57, V65, V66	CH02	2800p	
	3V42, 3V43, 3V44, 3V45, 3V48, 3V53, 3V54, 3V55, 3V57, 8945, 8947, 8948, HRD 140, 141, 150, 157, 158, 160, 250, HRD257, 435, 565, 566, 725, 755	CH02	2800p	N.E.C.	N830EG, N831EG, N831EG, N832, N833EG, N895	CH01	2800p				
	8948, 8950, FV108, 12L, 13H, 14T, 20B, 21R, 22L, 26, 295, HRD230, 430, 530	CH03	2800p	PHILIPS	CASSETTE LIFT ASSEMBLY (68120366)	CH05	1100p				
	3V58, 3V59, 3V64, 3V65, FV11R, 8950, 8951, HRD170, HRD180, HRD370	CH04	2800p	DV186, 190, 286, 471, 562, 761, VR6180, 6182, 6185, 6285, VR6230, 6291, 6293, 6362, 6367, 6393, 6467, 6468, 6470, VR6561, 6670, 6760, 6761, 6870, 6970	CH05	1100p					
				VR6443, VR6448, 485BE	CH22	2900p					
				SHARP	VCA100, VCH851, VCH852	CH22	2900p				

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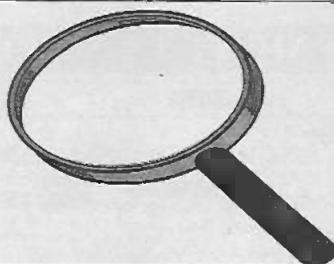
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HELP WANTED

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 about this feature.

Wanted: Circuit diagram/maintenance information for the Tandon Model TM4142 laptop computer. Ted Francis, 22 Glebe Drive, Rayleigh, Essex SS6 9HJ. 01268 780 029.

Wanted: Lead or D-plug pin connections for a cable link between a Philips ETS100 word processor and a Brother CE60 typewriter. F. Anderson, 25 Ewe Hill Terrace, Fenchouses, Houghton-le-Spring, Tyne and Wear DH4 6JX. 0191 385 4057.

Wanted: A 'Sprinter' processor chip unit for increasing the speed of my Amstrad PCW8512 word processor. Donald Bullock, Buzon 226, Ambolo 2, Costa Nova, Javea, Alicante, Spain. 00 346 647 1357 (from UK).

Wanted: Original remote control unit for the Hinari VXL8 VCR, or information on a possible source. Vines Parmar, 9 The Sheddings, Great Lever, Bolton, Lancs BL3 2JN. 01204 527 682.

Wanted/for disposal: Require circuit/manual for the Philips PM5506 pattern generator. Have for disposal 405-line TVs, valves, tubes etc. D.P. Bunker, 326 High Street, Berkhamstead, Herts HP4 1HT. 01442 864 334 (evenings).

Wanted: TV IF/demodulator PCB for the Panasonic NVG7 VCR; customer control cover for the Ferguson 3V43 VCR; line driver transformer (T801) for the Sony KV2752; take-up reel sensor unit for the Ferguson 3V59 VCR. Les Mawdsley, One-Way TV, 82 Sandhurst Road, Rainhill, Merseyside L35 8NQ. 0151 426 4152.

Wanted: Tube base with associated transistors and drive potentiometers for the Hitachi Model CPT1471 (NP82C-2 chassis). Roger C. Cleal, 2 Smythe Grove, Warwick CV34 5SE. 01926 498 868.

For disposal: Philips colour TV pattern generator. Price now £3-4,000. Will accept any reasonable offer. Clare comprehensive test station. Ramesh Lad, 16 Gurney Close, Bradford BD5 9QR. 01274 693 331.

Wanted: LOPT for the Matsui MB10 colour portable. Type no. is FCA030, and the word Sampo is present (manufacturer?). Or advice on a possible alternative. Ian Nurse, 43 Otmoor Way, Heyside, Royton, Oldham OL2 6SD. 01706 882 081.

Wanted: Video heads for the Philips Model VR2324 VCR (V2000 system). Part

no. is 4822 691 20195. Also bridge, part no. 4822 691 20168. T. Hughes, 41 Underhill, Moulsoford, Nr. Wallingford, Oxon OX10 9JH. 01491 651 576 (evenings/weekends).

Wanted: Data sheets with pin connections for the following ICs: Dallas DS80C320 microcontroller; 27C256 EPROM; 74HC573 logic chip. Does anyone know of a stockist of the DS80C320 or a supplier of 0.8mm thick photoresistive PCB (has to be thin enough to fit a smart card socket)? Also circuit diagram or schematic (photocopy OK) for the Two View Smart Card doubler, to assist repair of a damaged unit. William Moore, Meadow View, WhiteHouse Farm, Cabourne, Lincs LN7 6HU. 01472 852 436 (evenings).

Wanted: Azimuth test tapes for 7in. open-reel tape recorders, speeds 3-75 and 7-5 in./sec. They should be for head alignment and speed tests. L.H. Singleton, Upstairs Flat, 87a Bryngwyn Road, Llanelli SA14 8LH. 01554 741 562.

Wanted: Three-button ultrasonic handsets for the Ferguson TX9 chassis. A. Acheson, 48 Wessex Road, Horndean, Hants PO8 0HS. 01705 599 200.

Wanted: Pinch roller for the Wollensak cassette deck, Model 4766. Call Mark on 01764 664 813.

Wanted: Service/workshop manual and operator's manual for the Philips VHS camcorder type VKR6800/00, NR H5H 6001127, VQL2882. Photocopies OK. Thomas Lutton, Foymore Dungannon Road, Portadown, Co. Armagh, N. Ireland BT62 1QA.

Wanted: AC adaptor for the Panasonic NV100B VCR or details of the adaptor multipin connector. Also a NAB adaptor for a reel-to-reel tape machine. Rob Hannah, 21 Kilmaurs Road, Knockentiber, Kilmarnock, Ayrshire KA2 0DA. 01563 531 559.

Wanted: Chopper transformer for the Finlux 1000 chassis (Model 1412). J. Wallis, 907 Old Kent Road, London SE15 1NL. 0171 639 9903.

Wanted: Following back issues of *Television*: January, February, April, June, August, September and October 1988; November and December 1989; January, March, April and August 1990; November

1991. Brian Downs, Media Services Dept., University of Glasgow, 64 Southpark Avenue, Hillhead, Glasgow G12 8LB. 0141 330 3739/4993.

Wanted: LM8854-1912 syscon chip or a syscon/servo PCB for the Fisher FHV-P906 VCR - or information on a supply source. L. Costello, 3 Rowan Grove, Liverpool L36 5XU. 0151 489 3586.

Wanted: Operating instructions for the Sharp VCA5011 VCR, especially the index search part. Photocopy fine. Ray Palmer, 5 Hawkley Close, Leigh Park, Havant, Hants PO9 5EL. 01705 451 544.

Wanted: Remote control handset for the Saira XLE8901 satellite receiver. C. Rodwell, 42 Gosbeck Road, Helmingham, Stowmarket, Suffolk IP14 6ET. 01473 890 746.

Wanted: Vision and sound valve IF PCB for the dual-standard GEC/Sobell Models 2010/1010 or 2014/1014, dating from the mid Sixties. D. Longstaff, 100 Hawthorne Avenue, Anlaby Road, Hull, E. Yorks HU3 5QR. 01482 509 898 (evenings).

Wanted: Colour decoder/RGB panel for the Mitsubishi Model CT2555STX or CT2155STX. P. George, 113 Farebrother Street, Grimsby, N.E. Lincs DN32 0JT. 01472 354 665.

Wanted: £1 coin inserts or someone to modify 50p inserts to take £1 coins, for Smiths Switchmaster 4000 series TV meters (grey) or Coinmechs TV timer Mk. II (black). E. Longton, 47-49 Back Victoria Street, Fleetwood, Lancs FY7 6EJ. 01253 778 338.

Wanted: Circuit diagram/service manual for the EMI 101 oscilloscope. Photocopies or loan OK. David Irvine, Mealoughmore, Windgap, Co. Kilkenny, Ireland. 00 353 51 648 376.

Wanted: Service manual or circuit diagram for the Mitac NB6600C laptop computer. Geoff Davies (Radio), 13 Bowen Road, Rugby CV22 5LF. 01788 574 774.

Wanted: Combi choke part no. 525-462 for the Ferguson Model 3787/NordMende Model 8180. Circuit reference no. is VA01. Michael Dranfield, 6 Caledale Close, Buxton, Derbyshire SK17 9RH. 0129 873 492 (evenings), 0129 871 689 (daytime).

Servicing the

Salora M Chassis

Chris Watton deals with the digital processing sections of the receiver followed by fault finding and setting up

Last month we dealt with the power supply and time-base circuitry used in the Salora M chassis. A 40-pin microcontroller chip, ICB1, has overall charge of the operation of the chassis. It's responsible for driving the display, decoding the remote control commands, key scanning and the frequency synthesis tuning system. The type number varies with model. Two other chips work with ICB1, the X2404 memory chip ICB50 and an MEA2901 tuner interface chip ICB61. The latter selects the band and provides the tuning voltage, on information it receives from the microcontroller chip.

ICB1 must be powered and running in the standby mode. It receives the standby 5V supply at pin 27 while its clock oscillator is controlled by the 4MHz crystal XTB1 which is connected to pin 1. Pin 4 is the reset pin.

Tuner/IF Module

The tuner/IF module TU101 contains the tuners, the complete IF circuit with AFC, and video amplifiers for the scart 1 input. Important pins are as follows:

- Pin 1 chassis.
- Pin 2 tuner AGC input (from pin 16).
- Pin 3 12V input.
- Pin 7 UHF select.
- Pin 8 0-30V tuning input.
- Pin 9 5V A input.
- Pin 11 prescaler output ($\div 64$)
- Pin 12 chassis.
- Pin 16 AGC output to pin 2.
- Pin 20 sound IF output
- Pin 24 demodulated video output.

The AGC voltage at pins 2 and 16 is about 2V with no signal and up to 7V with a strong signal. We'll look at the sound and video channels next – the block diagram in last month's article (Fig. 1, page 717) shows the overall arrangement.

Sound Channel

The sound output from the tuner/IF module, whether the set is stereo or mono, goes to pin 13 of the Nicam/audio module (socket Q5). Demodulated outputs appear at pins 4 and 5. These go to pins 4 and 5 of the ADC2301E analogue-to-digital converter chip ICB101, which also receives L and R scart inputs at pins 21 and 24. After conversion to digital form, the sound signals exit this chip at pins 10 and 11. ICB101 has 5V inputs at pins 12

and 20 and a 12V input at pin 13.

The digital audio signals are passed to pins 16 and 17 of the APU2470S/APU2471S audio processor chip ICB102. This chip is responsible for input selection; volume, bass, treble and balance adjustment; and headphone volume and balance adjustment. It can generate a simulated stereo (wide sound) output for the speaker channels. These functions are all controlled via the IM bus. The outputs, which consist of pulse-width modulation, appear at pins 19 (phones left), 20 (phones right), 22 (speaker left) and 23 (speaker right). ICB102 receives a 5V supply at pins 7, 14 and 18, also a reset pulse at pin 11.

The audio signals now pass to the filter and headphone amplifier module (at pins 10 and 11 for headphones, pins 12 and 13 for the speaker inputs). The headphone outputs from this module are taken to sockets at the front of the set. The speaker outputs, at pins 4 (left) and 5 (right), are passed to two TDA2040 audio output chips, ICB130 and ICB140 respectively. There are three supplies to the filter and headphone amplifier module, -4.5V at pin 3, 17V at pin 7 and 12V at pin 8. The TDA2040 audio output chips receive their inputs at pin 2, provide outputs at pin 4 and receive +15V and -15V supplies at pins 5 and 3 respectively.

The Video Channel

The video signal at pin 24 of the tuner/IF module is fed to pin 35 of the VCU2133 video codec chip ICB201, at an amplitude of about 2V peak-to-peak. This may be either the demodulated off-air signal or the scart 1 video input signal. The scart 2 video input signal goes via emitter-follower TB201 to pin 37 of ICB201, at a lower level – 1V peak-to-peak. We'll consider the former signal.

After amplification and blanking, ICB201 converts this to seven lines of digital video data. These outputs appear at pins 2-8. Pin 36 receives a line blanking pulse, pin 39 combined line and field pulses. These should be checked in the event of a blank screen, because a field output fault will for example upset the blanking and shut off the digital outputs, cutting off the tube. The amplitude of the digital outputs is about 1V peak-to-peak, and they all look the same when checked with an oscilloscope. I find that a test picture from a VCR, consisting of one white stripe on a blank raster, is useful in showing the digital signals clearly. ICB201 should have a 17.7MHz clock signal at pin 22 and a reset pulse should

appear at pin 23. This pin also receives hold pulses from ICB240, see later. ICB201's supplies are 12V at pin 38 and 5V at pins 1, 9 and 25.

The digital video outputs from ICB201 enter the VPU2203 video processor chip ICB230 at pins 5-11. This IC separates the luminance and chrominance signals, adjusts the contrast, decodes the chroma signal, sets the saturation level, checks the beam current and measures the gain and cut-off levels for tube drive.

Luminance data outputs appear at pins 32-39, chroma signal outputs at pins 27-30. The 17.7MHz clock signal should be present at pin 22 and a reset pulse should appear at pin 20. A 5V supply is fed to pins 12, 24 and 31.

The digital video outputs from ICB201 are also fed to the TPU2734 teletext processor chip ICB250 and the DPU2543 deflection processor chip ICB501. ICB250 operates in conjunction with a 4164 RAM chip ICB260. Its jobs are to extract text information from the digital video signal, control its associated memory chip, and provide a loop-through for external RGB inputs. It's controlled by the IM bus, receives the 17.7MHz clock signal at pin 36, a reset pulse at pin 13, line pulses at pin 11 and combined field and line pulses at pin 12. The RGB outputs are at pins 6, 7 and 8 respectively, with a fast blanking output at pin 9. These outputs are returned to ICB201 for further processing. There's a 5V supply at pins 26 and 35.

The DPU2543 deflection processor chip ICB501 extracts the sync information from the digital video inputs. It also provides clamping voltages for the video signals in ICB201. Pins 8, 32, 35 and 40 receive a 5V supply. Clock pulses are fed to pin 2; pin 5 is for reset.

The digital luminance and chroma outputs from the video processor chip ICB230 go to the DTI2223 digital transient improvement chip ICB240. As the transmitted luminance signal has a bandwidth of 4MHz while the associated chroma signal has a bandwidth of only 1MHz, colour transients would occupy a wider portion of the screen than luminance transients unless steps were taken to correct this. ICB240 processes the digital chroma signal to provide rise and fall times that are the same as those of the luminance signal. It also generates hold pulses which stop the colour-difference signal DA converters in ICB201 during colour transients to provide coincidence with the luminance signal, adjusts the colour level, delays the luminance transients, and adjusts the chroma and luminance signal delay times.

The chroma outputs from ICB240 appear at pins 22-25. The luminance outputs are at pins 27-34. Pin 21 is the output for the hold pulses. ICB240 receives 17.7MHz clock pulses at pin 2, a reset pulse at pin 37, line pulses at pin 38 and combined line and field pulses at pin 39, with control via the IM bus. A 12V supply is fed to pin 26, with 5V fed to pins 1 and 14.

The luminance and chroma outputs return to the VCU chip IC201, luminance at pins 10-17 and chroma at pins 18-21, for DA conversion and matrixing. Analogue RGB outputs appear at pins 28, 27 and 26 respectively.

Picture in Picture

Some sets incorporate a picture-in-picture option, which is inserted between the digital Y/C outputs from ICB240 and the inputs to ICB201. It's mounted on a subpanel and can provide a small picture in the corner of the main picture. The input can be selected from either scart socket (1 for a satellite receiver, 2 for a VCR) so that the viewer can watch the terrestrial channel with a satellite or VCR picture insert.

Once the required input has been selected it's AD con-

verted then passed to additional VPU and DPU chips. These work in much the same way as the chips on the main PCB. Six lines of digital luminance signal and four lines of digital chroma are then taken to the PIP2250 PIP processor chip ICOM401, which takes 672 samples from 216 lines of the selected picture. After processing and compression, the digital information is stored in two 4416 16K x 4bit RAMs, from which it can be retrieved for display at the request of the user.

The PIP is a still-picture display which can be inserted at any of the four corners of the screen. The digital data for it is sent to ICB201 along with the data for the main picture.

Fault Finding

Rather than having a fault in the digital circuitry, the sets that come our way mainly suffer from the dead-set symptom. As suggested last month under the heading "No Go", to determine the section of the set at fault in this situation, force it into the standby mode. If the set will work in standby, the primary side of the power supply is probably OK and the cause of the trouble is likely to be in the line timebase.

A burn up in the line output stage is not uncommon, because the capacitors tend to become dry-jointed. As a result the line scan current makes a hole in the board. In this situation the S2000AF/2SD1577 line output transistor will probably have failed. We used to repair the print and fit a new transistor, but quite often the transistor would fail again. So we now replace a number of components, which seems to increase the set's reliability.

The items we replace are as follows: TB521 (BC237B), TB522 (BC307B), TB523 (BC368), TB524 (BC369), TB525 (S2000AF), CB622 (470µF), CB623 and CB624 (both 220µF). We uprate these three capacitors to 35V, 105°C. Before going further we resolder the Ipsalo transformer MB601 and the LF0070 chopper drive chip HB701, also capacitors CB525, CB526, CB527, CB528 (90° sets) and CB531. CB622/3/4 are often faulty. Any line output stage capacitor that has had a burn up at one of its connections should be replaced. All this might seem to be a bit extravagant, but the cost of these items comes to only a few pounds. If you end up with about half a dozen S2000s that are as much use as bits of wire you will wish that you had taken these preventive measures.

It is common to find that the BS208 FET EW modulator driver transistor TB526 has failed. This is often because of dry-joints at CB527, CB528 (90° sets), CB531, DB523 (BY448), DB524, DB525 (both BYV95C) and RB538 (10kΩ). In the M2 version of the chassis there are two BS208 FETs. The FET can be the cause of a few faults. Width faults, such as poor EW correction or no width adjustment, will be present if it is leaky. RB542 (18kΩ - 27kΩ in the M2 version) should also be replaced as it often fails, sometimes intermittently, causing width variations.

Back to the power supply section. If the set will come on in standby but the ±15V (typically ±11-13V) supplies are low/missing, CB617 (6-8µF) is open-circuit. If the base of the line output transistor TB525 is at 0.6V when the set is in standby, check this voltage when you switch to on. If the voltage remains at 0.6V, TB521 (BC237B) is probably leaky.

A squawk from the power section at switch on/off with a line tear on bright pictures can be caused by diode DB524 (BYV95C) or the LF0070 chopper drive chip HB701.

A bright, 2in. wide scan can be caused by TB526 (BS208) or RB542 (18kΩ or 27kΩ, see previous note).

OPTIONS CHART

Option 1

Bit 0	Bit 1	Make	Bit 2	8 mins sleep	Bit 3	AES control
0	0	Salora	0	Yes	0	Off
1	0	Granada	1	No	1	On
0	1	Luxor				
1	1	Other				

Bit 4	Bit 5	Tuner	Bit 6	Bit 7	IF (MHz)
0	0	Ch. 00-120	0	0	38.9
1	0	4-band + hyper	1	0	39.5
0	1	UHF chs. 21-69	0	1	38.0
1	1	3-band	1	1	37.0

Option 2

Bit 0 is used for mute when no sync signal is present. 0 = yes, 1 = no.

Bit 1 is used for remote control decoding. 0 = double check, 1 = normal.

Bit 2 is used for PAL/Secam identification. 0 = only in P mode (indicated by dot at top left in the display), 1 = always on.

Bit 3 is used for AFC tracking. 0 = no (VCR operation), 1 = AFC tracking with programme numbers 7 and 8.

Bit 4 is used for tuning protection. 0 = no protected programmes, 1 = programmes 1-6 are protected (need password to store).

Bit 5 is used for bleep control. 0 = text bleep on (normal), 1 = bleep for production computer.

Bit 6 is used for OSD bargraph control. 0 = bargraph only, 1 = bargraph with text.

Bit 7 is used for OSD (on-screen display) control. 0 = no, 1 = yes.

Option 3

Bit 0	DTI	Bit 1	NTSC	Bit 2	FM radio	Bit 3	S Video
0	No	0	No	0	No	0	No
1	Yes	1	Yes	1	Yes	1	Yes*

Bit 4 is not used.

Bit 5 is used for PIP change with programme keys. 0 = no, 1 = yes.

Bit 6 is not used.

Bit 7 is used for search of FLOFF start page. 0 = yes, 1 = no (selected page is retained during programme changes).

*VCY2136 and VPU2204 only.

A blank raster with no channel display can be mistaken for a power supply fault but is more often caused by a defective X2404 memory chip (ICB50). This is supplied as an empty memory, but will initialise itself if the set is switched on with the normal key depressed and this key is held for a short time.

A low buzz on the sound with probably a poor picture can be caused by HB701 (LF0070). If so the HT voltage will be low (it should be 150V at CB614). Replace HB701 if the HT voltage is low.

The most common cause of the no picture, sound OK symptom is the TDA8172 field output chip ICB570. To check, advance the setting of the first anode (G2) control: if there is illumination at the top of the screen, the TDA8172 chip is duff; if a raster appears, the cause of the fault lies elsewhere. In this event, check for the presence of an analogue video signal at pin 35 of the VCU chip ICB201. If there is no video here, go back to the tuner/IF module. If video is present, check for line/field pulses at pin 39 of ICB201. If the pulses are missing, check TB571 (BC557) which could be leaky.

Setting Up

The set-up procedure for these receivers can be tedious to say the least. Fortunately little adjustment is required. To enter the set-up mode you have to key in a password via the remote control unit, or service processor as it then becomes. The password is P * O # >M, the maximum time allowed between the last two key operations being 1.5secs. This password and time scale are intended to prevent customers entering the service mode accidentally. The password for storing tuning information is P O # >M.

Once the service mode has been entered, the numerical channel display will change to a two-digit number that indicates the microcontroller chip's mask version, typically 04, 07 or 12. The various setting-up stages can then be selected by pressing the # or * button to go forwards or backwards respectively through the procedure. You don't have to follow a set sequence, but the one listed below is the preferred order.

I strongly recommend that you obtain an M chassis service video cassette, which goes through the set-up procedure and provides various tips. A service manual is also essential.

The preferred adjustment order is as follows – the second column shows the segment indication as best we can:

1	XX	Mask indication
2	SP	Phase shift
3	bP	Line shift
4	dL	Luminance delay
5	dC	Chrominance delay
6	Y0	Width
7	r0	Trapezium 1
8	C0	Pincushion 1
9	t1	Summing point 1
10	r1	Trapezium 2
11	C1	Pincushion 2
12	t2	Summing point 2
13	H0	Height
14	A0	Vertical shift
15	ud	Lum/chroma delay
16	Sr	DTI start
17	S7	DTI stop
18	SA	Colour osc sync
19	62	A1/G2 voltage
20	cr	Red cut-off point
21	c6	Green cut-off point

- 22 cb Blue cut-off point
- 23 dr Red gain
- 24 d6 Green gain
- 25 db Blue gain
- 26 HA Text line shift
- 27 CA Text contrast
- 28 One bar Option byte 1
- 29 Two bars Option byte 2
- 30 Three bars Option byte 3

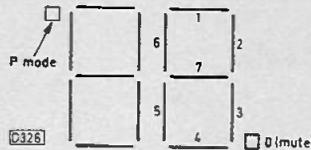


Fig. 4: The numerical channel indicator display. When setting the options in the service mode the left-hand digit shows the byte and the right-hand digit the bit (the mute dot is used for bit 0).

Make the vertical adjustments as follows. First adjust the height (H0) until the picture is correct at the top of the screen. Then adjust the vertical shift (A0) for a correct display at the bottom of the picture.

The A1/G2 voltage is set with the brightness and contrast at minimum. Adjust the potentiometer, which is on the tube base panel, so that the mute and prog LEDs are both out. As you turn the potentiometer you will see the LEDs light up and go off. When both are off the voltage is correct.

Adjust the colour oscillator synchronism for a nearly stationary colour display. When adjusting the RGB cut-off points you will notice that one of them is fixed: the mute and prog LEDs will both be on and the setting cannot be altered. So the grey-scale setting up must be done with the other two colours.

It is essential to press the memory button (>M) after each adjustment.

Option Bytes

A set's characteristics are determined by setting up various bits in the microcontroller system. The options are displayed by the numerical channel indicator: the left-

hand digit shows the byte, the right-hand digit the bits in the byte (see Fig. 4). When in the service mode you can switch the bits to 0 or 1 by using keys 0 to 7 on the remote control handset. When a segment lights, the bit is set to 1, when it is not a light the bit is set to 0.

The options don't change until the set returns to the normal operating mode, even when a new setting has been stored. If an incorrect mode has been selected and stored, when the set is returned to the normal mode it will still come on but may not, for example, have text or sound or refuse to tune. This can easily be put right by returning to the service mode and revising the information. The various option settings are shown in the accompanying chart.

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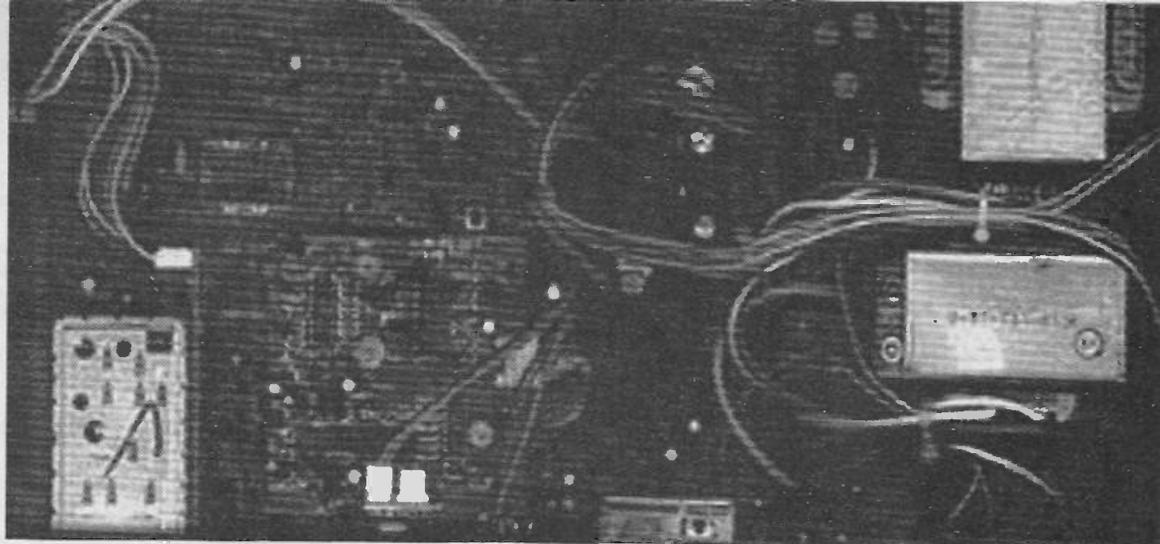
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The Flying Dutchman

Henk the Dutchman arrives here about once a month in a van loaded with all manner of decoders and receivers which he offers for sale. Recently he turned up with four very late production (November 1995) Pace PRD800+ IRDs which had been labelled "returns" by a large UK electrical retailer. They looked as if they had never been used, and had a collection of unusual/silly faults.

The first one produced a blue screen, with no sound, when a signal was applied. Baseband video was coming from the tuner but didn't get very far as one leg of an electrolytic coupling capacitor had never been soldered.

The mains bridge rectifier's reservoir capacitor (C2, 47 μ F) was open-circuit in the second receiver. This didn't help its operation!

The third receiver refused to power up, which was not surprising as the mains input filter choke T1 wasn't soldered in properly.

The fourth set was the puzzler. Reception via the scart socket was perfect, and I was beginning to believe that my luck was in. But when the UHF output was tried (after adjusting the intercarrier sound frequency - L7 - from 6 to 5.5MHz for use here in Portugal) there was a picture with a mass of faint diagonal lines on it. As this interference wasn't present at the scart outlets, I checked to see whether the modulator's supplies were clean. They were of course. After a lot more checking that got me nowhere I suddenly realised, looking at the bottom of the board, that there was no screening cover beneath the modulator. One was soon in place, taken from a scrap board. All trace of the diagonal lines

had then been removed. I've personally never had any reason to remove this cover. It certainly provides an efficient screen. H.C.

Satellite Finder

Henk also had in his van a 'digisat' satellite finder. This Swedish-made unit can be connected in line with the LNB's output. It has an LED bar display to indicate the LNB voltage, the current drawn and whether a 22kHz tone is present. Using a push-button to change the readout gives you a display of satellite signal strength. There's also an optional audio tone output. At less than £40 it's an ideal general-purpose tool for the installer and troubleshooter. The circuit, on a small PCB, is based on a 'PIC' 16C71 IC. It's very well made.

A label at the back of the unit indicated that it is made by Emitor AB in Sweden. Unfortunately there's no address. I did see the unit being displayed by a German exhibitor at the recent Cabsat '97 show. If you can find one, it's a worthwhile investment. H.C.

Another PRD800+

This early PRD800+ receiver (made in February 1994) came in with the complaint "blue screen, no sound". There was no difference when a signal was connected to the unit, though weak noise was coming from the tuner. Otherwise the receiver's operation seemed to be normal - the front display looked a little dim however. This was hardly surprising as the 5V supply was low at about 3.5V while the 12V supply was at around 9V, with a very nasty-looking dip in the waveform I'd not seen before.

The reservoir capacitors in the 5V and 12V supplies looked tired

and were replaced, but this made no difference. I did however notice that the receiver was running marginally cooler than they usually do. The higher voltages from the chopper transformer were more or less correct, and powering the circuitry from external supplies produced pictures. What could be left?

A wire beneath the board goes from the earthy end of the transformer's secondary windings to the main earth print area nearby (later PRD+ receivers I've seen don't have this wire). Although the wire's soldered connections looked OK, I decided to replace the wire and remake the soldering. Bingo! - the receiver then behaved normally.

Flushed with success, I downloaded new channel information from a later type PRD+ receiver. All the frequencies were 250MHz out despite the fact that both units had an FSS A/B 9.75/10GHz LNB changeover in the installation menu. All I can say is do this with care: I reset the frequencies manually, then took a memory dump to the Pace Link. This is now stored as "early 800+", the others being stored as "late 800+". The frequencies don't mix. H.C.

Channel 5 via Astra 1D

Channel 5 took over transponder 63 (10.931GHz horizontal) aboard Astra 1D from the old Filmnet E. Europe. It uses so-called 'soft' VideoCrypt encryption, similar to the QVC shopping channel, i.e. no viewing card is required. We subsequently had some requests to be tuned in from people with older systems that don't cover the 1D band and who mostly have VideoCrypt decoding facilities (IRD and non-IRD) but no viewing card.

Apart from supplying a 1D con-

verter, the easiest way to retune is to shift the LNB's local oscillator frequency by one Astra channel. This will take Channel 5 to around 10.960 on the tuning range of an old receiver. Sky Sports 3 will then be at around 11.7GHz (originally 11.671GHz).

How long soft encryption will last is a matter of opinion. At present it means that the channel is freely available across Europe to anyone with a VideoCrypt decoder.

Some receivers, such as the Pace SS9000, tune up to 11.750GHz, giving a 50MHz margin. With Amstrad receivers however there is no leeway: Channel 5 will be right at the bottom of the tuning range and Sky Sports 3 at the top!

To retune the LNB, take off the outer cover (the rivets have to be removed with the old Marconi Blue Cap LNBs) and locate a large screw that goes into the inner cover. It's usually locked with sealant. Turn the screw anti-clockwise, the exact amount depending on the make of LNB.

It is best to be able to see live signals while doing this. Go to say Sky News and turn the screw until 3 Sat appears. The LNB has then been tuned sufficiently. The LNB signal test source I described in the January 1996 issue of *Television* enables this to be done very easily. If it's difficult to see live signals while retuning the LNB, undo the screw by a quarter of a turn. This should be enough, leaving Sky Sports 3 at the top of the band.

Some channel retuning will then be required. This can be the worst bit of the job! Reseal the LNB well to prevent ingress of water, possibly putting some grease on the sealing ring between the two halves of the outer cover. H.C.

Pace SS9000/9200 Tuner Replacement

The Hitachi tuner originally used in these receivers ran very hot. This could eventually lead to its failure. Over the past few months I've ended up with some scrap PRD series receivers, whose tuners are very reliable. Recently an SS9000 came in with a duff tuner, though it was otherwise in excellent condition. So I decided to investigate the possibility of a PRD tuner transplant - with the minimum of alterations to the surface-mounted components.

This turned out to be very easy. The main requirements were to slightly attenuate the baseband output from the PRD tuner, and to add extra smoothing to the 5V supply.

The replacement tuner sits above the PCB horizontally (see Fig. 1), secured by its F socket. Extension wires are used to make the connections to the relevant PCB holes. The baseband video output is fed to the PCB via a 4.7kΩ preset which is mounted on the tuner - I adjusted it for no crushing on whites, with the receiver's contrast (set up 2, 5, 8 menu) set to medium. Extra smoothing can be added at the tuner's 5V input pin.

The print areas that were soldered to the original tuner's front lugs (the non F-socket end) must be linked together, as they connect two earthed print areas. Symptoms of missing print continuity here are dim LEDs and a rustling noise from the power supply. Solder a wire from the link to the replacement tuner's case. H.C.

Pace PRD800

We've had the "no sound with a blue screen" complaint several times now with these receivers. There have been several causes - the Nicky chip U9, the Q105 problem, and Q2 in the LNB power supply. This one would have been simple to deal with if I'd started at the right end. But with the silly ideas I get in my head I began messing about around the Nicky chip. After a while I decided to check the LNB voltage at the socket and found that it was zero. A look inside the tuner soon produced the answer: the centre pin of the socket had fallen off. C.W.

JVC TUAD1000

The customer complained that the "your card is invalid" message appeared when he removed the card and wouldn't change thereafter. At last a simple one: the card switch inside the reader slot was stuck.

This receiver has also appeared as the Cambridge ARD/ARX200, the BT SVS200, the Akai SX1000 and the Alba ISR7000/REC600. C.W.

Pace MSS1001-1

The moment this top-of-the-range receiver was brought out of standby there was a tremendous screeching from all audio channels, both from the four on-board audio amplifiers and via the scart and UHF outputs. By monitoring the inputs and outputs around the audio processing chip U18, and by isolating the output pins 25, 26, 28, 29, 33, 34, 36 and 37 one at a time, I was able to establish that the noise was being generated within the IC itself, in the left-hand channel only. A replacement chip (type MSP3400C-C6, part

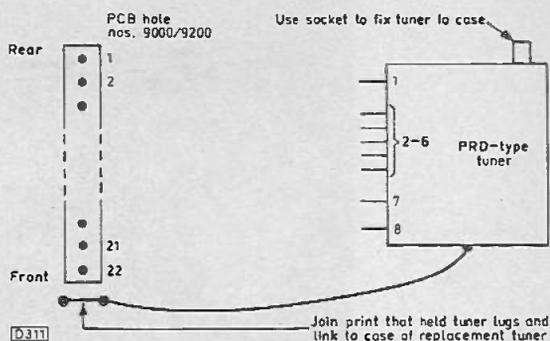


Fig. 1: Fitting a tuner from a Pace PRD series receiver to an SS9000 or SS9200. Tuner connections viewed from above. The pin connections are as follows:

Function	9000/9200	PRD
LNB supply	4	1
Prescaler output	6	8
5V supply	12	5
Tuning voltage	13	7
Baseband video output	18	6

Pins 2, 3 and 4 of the PRD tuner are not used.

no. 109 0340030) provided a complete cure. J.C.P.

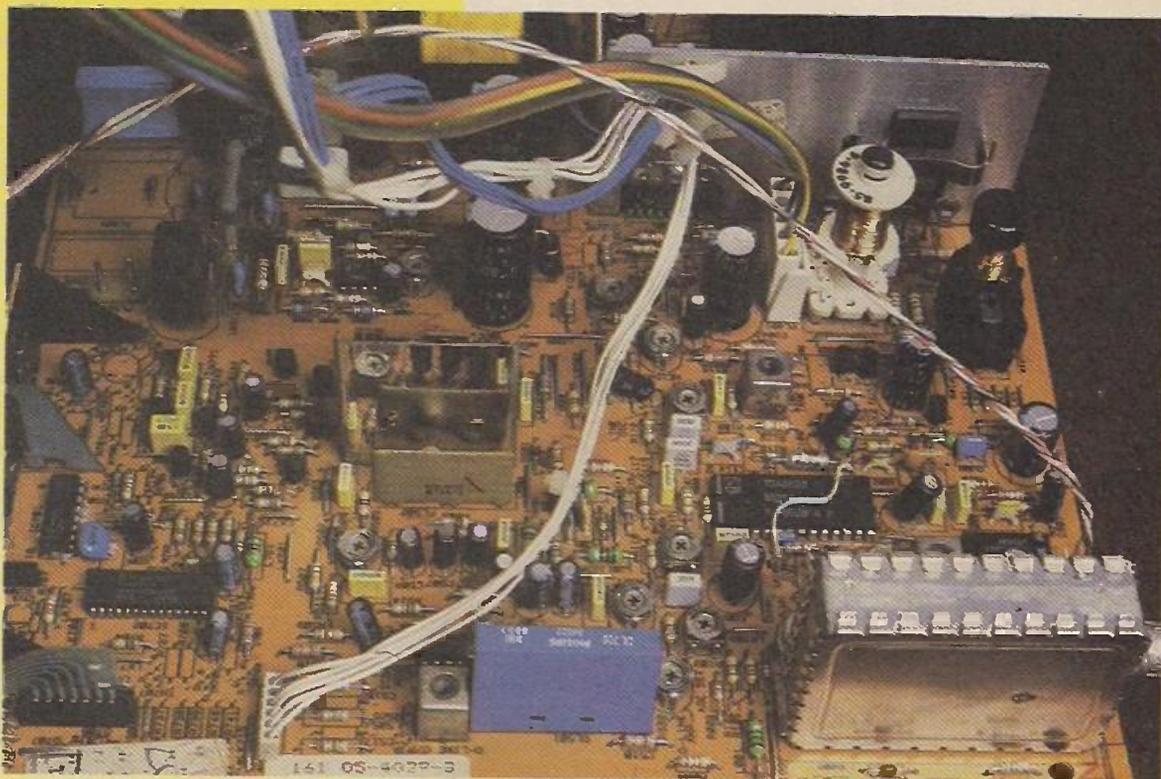
Pace PRD800

The symptoms were no decoding, no on-screen decoder messages ("Please Insert Card" etc.) and also lost video (blue screen) after removing the PCB from the case. I suspected the M50555 video graphics chip U10 as there was a video input at pin 13 but no output at pin 12, but it was OK. Next I suspected the TEA2130 sync separator chip U18 - there were no sync outputs at pins 15 (field) and 12 (line). U18 was also OK. The cause of the trouble was eventually traced to the 503kHz resonator X7 (part no. 171 0005030). J.C.P.

Pace MSS100

As a result of the recent thunderstorms a number of satellite receivers have come into my workshop with varying degrees of damage. Three MSS100 receivers that came in from different parts of the town were all dead: in each case the mains input fuse FS1 was open-circuit but not blackened, and tests failed to reveal any other damage. Replacement fuses (1A fast) restored normal operation, but as a precaution the receivers were given a two-day soak test before being returned to their owners.

The TOP200 type power supply is proving to be a robust little beast. A number of other machines received during the same period all needed major repairs to their power supplies, UHF modulators or tuners. J.C.P.



Servicing the Tatung 190 Series Chassis

John Coombes pays a return visit to these popular 14-21in. sets, with an up-dated run-down on possible faults

I have serviced a large number of these sets since last writing about them in the February 1996 issue. This up-date article presents latest information on faults and fault finding.

As with nearly all chassis, most faults relate to the power supply. The circuit of the FET chopper power supply used in this chassis is shown in Fig. 1.

No Results

The cause of loss of the sound and raster usually lies in the power supply. Mains switch S801 may be open-circuit. It can be all right electrically but operate incorrectly because the knob sticks. This can be dealt with by fitting a plastic collar, which is available from Tatung, to the switch spindle.

It is quite rare for the BY133 bridge rectifier diodes D801-4 to go short-circuit. If they do, the 3.3 Ω , 4W surge limiter resistor R801 goes open-circuit. Should R801 be open-circuit with the bridge rectifier diodes OK, check the mains filter coil FL801 for dry-joints.

There are two start-up resistors, R802 and R803 (15k Ω , 0.5W), which tend to go open-circuit. Replace them as a pair. Later production sets have 16k Ω , 0.6W metal-film resistors in these positions. They are more reliable.

Check for dry-joints at the chopper transformer T801.

These are usually at pin 8 or the surrounding area.

There are several causes of mains fuse blowing. The degaussing posistor R901 may be short-circuit. If the set works after replacing FS801 but the purity is incorrect, check the degaussing posistor R901 which can short intermittently. It can also blow itself in half – check by shaking R901 to see if it rattles. It's always worth checking the degaussing coils themselves for shorted turns, though this is a rare occurrence.

If FS801 has blown violently, check whether the wire-wound resistor R812 (33k Ω , 4W) has shorted to the chopper transistor's heatsink – this will also result in the transistor (TR801) going short-circuit.

TR801 can of course go short-circuit and blow the fuse. If this has happened the TDA4605 chopper control chip IC801 should also be replaced.

If the power supply is making a noise, check whether the BY396 17V supply rectifier D811 is short-circuit. If D811 has failed it may be necessary to replace TR801 and IC801 as well.

If the receiver is stuck in standby and R802/3 are OK, check whether D807 (BA157) is short-circuit. It may be necessary to replace IC801.

If the receiver is not in standby and there's no LED light, R810 (470k Ω , 0.5W) could be open-circuit. It's connected to pin 3 of IC801.

missing. If the supply is present, replace IC101.

Other possible causes of field collapse are an open-circuit scan coupling capacitor (C304, 1,000µF, 35V), open-circuit field scan coils or dry-joints at pins 1 and 2 of connector PL401.

Sound Faults

The most common fault here is no sound because the LM380M audio output chip IC601 is faulty. The output coupling capacitor C610 (220µF, 25V) or the speaker can go open-circuit, and dry-joints can be present at pins 1 and 2 of plug/socket PL601.

If the output stage is operational, check IC101 (TDA4505) by replacement.

No Colour

This fault is quite rare. The possibilities are the TDA3565 colour decoder chip IC501, the associated 8.8MHz crystal XL501, dry-joints at the chroma delay line DL501, or loss of the sandcastle pulses at pin 7 of IC501. These come from pin 27 of IC101 (TDA4505), which may have to be replaced.

Loss of One Colour

Loss or intermittent loss of one colour usually means that the relevant RGB output transistor is faulty or dry-jointed. The transistors are TR201 red, TR202 green and TR203 blue, all type BF422.

If the DC conditions around these transistors are correct, use a scope to check the outputs from IC501 (TDA3565). R, G and B should be present at pins 10, 11 and 12 respectively. Replace IC501 if any of the outputs are missing.

Tuner/IF Faults

A snowy raster with noisy sound (white noise) can be caused by loss of the tuning voltage. Check whether R009 or R010 (both 6.8kΩ, 0.5W) is open-circuit or the TAA550 33V regulator IC001 is short-circuit. If the tuner's 12V supply is missing at pin 2, check whether C005 (47µF, 16V) is short-circuit. Alternatively the tuner could be faulty.

If there is a blank raster IC101 (TDA4505) could be faulty or the SAW filter FL101 dry-jointed.

Dry-joints at FL101 can also cause a ghosting effect with a good signal.

Incorrect Display Segments Alight

A wrong number display could mean that the seven-segment indicator D701 (type TLR332T) or its driver IC701 (TC4511BP) is faulty. First ensure that D701 is fitted in its socket correctly and that there are no dry-joints.

Remote Control Faults

No remote control operation could mean that the TFMP2380 IR receiver chip IC703 is faulty, but first ensure that its 5V supply is present at pin 1.

If the remote control unit isn't working, suspect the batteries and their connections – these could be corroded or broken. If the LED is dry-jointed, there will be no or intermittent operation. The legs of the crystal can break or become dry-jointed, again resulting in no or in some cases intermittent operation.

If selection of just one channel gives trouble, suspect a faulty button. Repair kits are available from various sources, but it's best to replace the unit.

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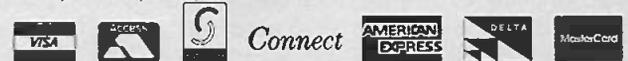
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There are also five runner-up prizes consisting of £50 Teletest PC vouchers.

In reviewing the Teletest PC in our July issue (page 638) Philip Blundell commented as follows:

"PC monitor repairs nowadays provide a useful addition to the work load in many service departments, making a worthwhile contribution to the cash flow. But you need a signal source. The Ozan Teletest PC pattern generator is well worth considering. Being battery-powered (9V PP3 battery) and pocket-sized, it's ideal for field calls. The Teletest PC generates sync outputs for VGA and SVGA monitors – the ones you are most likely to encounter – and eight patterns that are essential for aligning and testing monitors.

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scores in its role as a piece of field test equipment."

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Send your answers, with your name and address, to Teletest PC Competition, Room L302, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS, to arrive no later than September 30th. The first correct entry drawn from the sack after that date will win the Teletest PC, carry case and power supply. The next five correct entries will receive a £50 voucher off the cost of a Teletest PC. The Editor's decision will be final, and no correspondence can be entered into. Employees of Reed Business Information and Ozan are ineligible to enter. The competition is open to UK and overseas readers.

For an info pack on the Teletest PC, Freecall Ozan direct on 0500 009 070.

Long-distance Television

Terrestrial DX and satellite TV conditions and reception. News about the Clarke Belt and overseas TV. Details of a high-performance low-noise VHF preamplifier.

Roger Bunney reports

Sporadic E reception predominated during June, with some decrease towards the end of the month. A bonus was provided by a tropospheric lift on the 4-6th, with enhanced Band III and UHF propagation from the north and north east. During this opening Ryn Muntjewerff received a Faroe Islands ch. E6 test pattern (identification Foroya Sjonvarp) in Holland, also Bergen/Oslo ch. E12 (with interference from German DAB transmitters). Cyril Willis (King's Lynn) also experienced excellent tropospheric reception during this period, again with signals from the NE and several new stations logged.

Here is the collated SpE log for the period under review:

3/6/97 HRT (Croatia) ch. E4;
RAI (Italy) chs. IA, IB;
Canal Plus (France) ch.
L2; TVE (Spain) chs. E2-

4; LTV (Lithuania) ch.
R2; SVT (Sweden) chs.
E2-4.
4/6/97 LTV R2; SLO (Slovenia)
E3; RAI IA; Video (Italy)
E2.
5/6/97 STV E2-4; YLE
(Finland) E3; NRK
(Norway) E2.
6/6/97 TVE E3; MTV (Hungary)
R1; Video E2; Eesti TV
(Estonia) R2.
8/6/97 SVT E2.
9/6/97 RTS (Bosnia) E3; HRT
E4; TVE E2; RAI IA;
Video E2.
10/6/97 RUV (Iceland) E4; SVT
E2-4; RTP (Portugal) E2,
3; Video E2; TVE E2, 3;
SVT E3.
11/6/97 TVE E2-4; RTP E2, 3;
DR (Denmark) E3; MTV
R1; RTS E3. It seems
that Band I was jammed
all morning.
12/6/97 TVE E2-4.
13/6/97 RAI IA, B; SVT E2-4;
RTP E2, 3; TVE E4;
Video E2.
14/6/97 RAI IA, B; RTS E3; HRT
E4; TVR (Rumania) 2; C+
L2; MTV R1, 2; Syria
E2; JTV (Jordan) E3;
Iran E3; also an E2
Arabic floater.
15/6/97 TVE E2-4.
16/6/97 RAI IA, B; Video E2.
17/6/97 HRT E4; RTS E3; LTV
R2; NRK E2; RAI IA;
Video E2; Iran E3; TVR
R2.
18/6/97 RAI IA; Video E2; HRT
E4; SVT E2; LTV R2;
RTS E3; TVE E2-4; BR

(Germany) E2.
19/6/97 HRT E4; NRK E2; YT
(Ukraine) R2.
20/6/97 RAI IA; Video E2; TVE
E3; YT R2; Nova (Czech
Rep.) R1; SVT E2;
Arabic E2 signal.
21/6/97 TVE E2.
22/6/97 RAI IA, B; TVE E2, 3;
TVA (Italy) IA; Video
E2.
23/6/97 TVE E2; RTM
(Morocco) E4; RAI IA;
Video E2; NRK E2.
24/6/97 TVE E2.
25/6/97 TVE E2-4; RTP E3; RAI
IA; Video E2.
26/6/97 TVE E2.
28/6/97 RAI IB; RTM E4; TVE
E2, 3.
29/6/97 TVE E3; NRK E2, 3.
1/7/97 RAI IA, B.

Cyril Willis reports SpE reception of Iran ch. E3, Jordan ch. E3, Syria ch. E2 and another ch. E2 signal - suspected of being from the Lebanon or Dubai - during the month. These and other Arabic signals were "very strong indeed".

Overall a rewarding month, with something seen on most days and excellent tropospheric reception from Scandinavia in early June.

Writing from Australia, Robert Copeman (Victoria) mentions reception of all the Optus satellite channels at 224-300MHz from the south west during favourable tropospheric conditions. The signals are not permanently present, and suffer from severe fading. In view of the frequencies involved, it seems likely that the

**Digital 'DX'
reception via
Intelsat K by
John Locker,
using his
Nokia 9500
D-box.**



source of the signals is a poorly-engineered cable distribution system in a block of flats or a hotel. The Melbourne Crown Casino/Hotel is some fifteen miles away from Robert and has the Optus Vision package distributed throughout the building. He wonders whether this is the source. I personally suspect it's more likely to be very close to his home. The source of the mystery ch. A0 (46-25MHz, vertical) ABC TV signal received daily is still unknown. It has been seen in Western Australia via SpE. The Australian Broadcasting Authority says that the transmission is not listed and that it has no ideas as to the possible source.

Satellite Sightings

At long last my satellite dish system is up and running. It consists of a Unicorn Satellite Systems 'Reference' dish with a Chaparral LNB and a Racal wideband polariser, with the feed taken via CT125 cable. But there have been a couple of problems. First the Pace positioner, in purely east-west use, seems to be reluctant to maintain readout accuracy between standby modes. Secondly a local planning enforcement officer has suggested that my two dishes are in breach of DOE regulations (February 1992). He has asked for a full planning permission application to ascertain whether they can remain. Only the top third of the main dish is visible above the 6ft fence, but that's enough to introduce the problem of planning compliance. I asked for 'officer approved temporary permission' until permanent permission for two dishes is, hopefully, obtained in about September, but this has been refused. The planners have called for application paperwork plus £90. I'll report as the story unfolds! In fairness, the council has been pleasant about the problem and says it only wants to regularise the situation.

As I type these lines on June 30th there has just been an evening news feed from Jersey, Channel Islands, to the BBC South West evening magazine programme via Orion 1 at 37.5°W. The analogue transmission, from the BBC UKI231 SNG truck, was reporting on the Island Games at St. Helier, with competitors from islands around the UK and elsewhere. A pleasant, parochial break from the high-profile Hong Kong handover

featured by most other satellite carriers at the time. Orion carried the Denver Summit of Eight mid-month. A welcome sighting on the day I commissioned the dish, June 17th, consisted of colour bars with the identification "London Teleport HBO Test" via Eutelsat II F3 at 16°E. HBO is a major US cable carrier and programme producer: why the test at 16°E is a mystery.

Roy Carman (Isle of Wight) noted many corporate feeds to the UK from around the world: "Project Utopia", it transpired, was a mega outside broadcast event for British Airways to mark the change of corporate colours carried by the aircraft etc. The event started midday on June 9th and continued into the morning of the 10th. Live or recorded signals were received from Paris, Warsaw, Bangkok, Victoria Falls, Hong Kong, Berlin, various US airports etc. The BBC and Globecast managed signal distribution via Eutelsat, Telecom and Intelsat capacity. Telecom carried at least six international feeds via numerous transponders simultaneously. This suggests that Intelsat carried the original feeds in C band, with Eutelsat/Telecom providing the European downlinks. Other satellite enthusiasts noted an impressive edited compilation of Project Utopia's video feeds late in the morning of the 10th, via Telecom 2C. British Airways is obviously awash with funds!

Unfortunately I missed the Dr Dish programmes for satellite enthusiasts – they are transmitted on the second and fourth Friday each month via Kopernikus-2 at 28.5°E (tune to 11.55GHz vertical). To have clear sky from 16° to about 60°E is new for me.

American football dominated the Clarke Belt on the evening of the 14th, with both NTSC and PAL transmissions. We're now into long golf tournaments via Intelsat K and other summer sporting events. On June 15th a "TV Asawi Sports" feed from Holland to Tokyo featured a 24-hour race at the Nissan circuit. Even Michael Jackson popped up on the 14th, fresh from a concert in Germany.

A mid-afternoon feed from the Rolls Royce engine factory on the 15th featured a newly-designed engine to be used in the stretched A340 jet. This analogue feed was via Eutelsat II F2 (10°E) at 11.67GHz horizontal, using Optex hired equipment – the ident was



"Optex UKI 178"

I was thus pleased to find that analogue satellite TV is alive and well on my return to the Clarke Belt after four months – the feeds have not all gone digital!

John Locker (Wirral) is one of the few who have taken up digital satellite TV reception. He says that it's rewarding once you have mastered the techniques. John uses a modified (Bentley Walker)

An analogue NTSC identification from CBS New York via Intelsat K.

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A shot from the British Airways's Project Utopia presentation via Telecom

Nokia 9500 D-box. By using hidden red menus he can store the various parameters – FEC (forward error correction), bit rates etc. – of known news and other feeds. This avoids the need to overwrite an original parameter set-up with a new, second set of data. He's receiving superb pictures from the main broadcasters such as Reuters and APTV. The signal from the LNB is fed via a splitter to his Echostar 8700 receiver (with DC pass) and Nokia box (with DC block): the 8700 thus controls dish operation and main tuning. He finds it advisable to switch the Nokia box to standby when moving the dish, otherwise it can lock up.

We'd welcome comments from other satellite "DXers" who are experimenting with digital signal reception. It seems that there is no such thing as a weak, sparkly digital signal: either the receiver locks to a strong signal or there's nothing at all.

Terrestrial TV News

UK: The ITC is currently seeking applications for Restricted Service TV Licences. There are two types. Type 1 is for a specific day or event of up to five days maximum. Type 2 is for a specific fixed location base and will run for a maximum of two years, after which the licence will be re-advertised – assuming that the frequency is still available for the purpose. There's an application fee and an annual fee of £2,225.

Gibraltar: GBC is awaiting clearance from Brussels to go ahead with a second TV service. New equipment is planned for GBC-1 – valved gear is still in use.

There are suggestions that the 1,458kHz medium-wave transmitter's power will be increased. George Gaskin adds that the aerial seems to be tilting!

Malawi: The first TV service, Hey-U Africa, is to open later this year. Another TV service, TV Malawi, is planned for the end of the year.

Finland: Nelonen, the new Channel Four Finland, started to operate on June 1st, initially via satellite and local cable systems. A terrestrial transmitter network is under construction. It should cover 75 per cent of the population by the end of the year. Vaajakoski ch. E50 and Jyvaskyla ch. E41 have already been received.

Mexico: VHF TV is expanding. TV Azteca has just ordered 44 VHF transmitters and one UHF transmitter, with aerials and associated equipment, for thirty sites throughout the country and another in El Salvador.

Greece: The government has issued licences to the national broadcaster ERT and a number of other broadcasters covering the 430 channels available. ERT has been granted licences for 65 channels. Star, TV Macedonia, Antenna, Mega, New Kanali 5, 902 TV and Sky are the other broad-casters. The new arrangements come into operation in December.

Hungary: The first two national commercial TV franchises have been awarded to consortia led by CLT-Ufa, Europe's largest broadcasting and entertainment group, and Scandinavian Broadcasting System, which is 22.8 per cent owned by Walt Disney.

Australia: Budget cuts across the board have been imposed on ABC. Apart from substantial job losses (700), all radio and TV programme services will lose around four per cent of income. Radio Australia will carry only English-language programming.

New Zealand: A youth channel aimed at 18-30 year olds was due to come into operation in July.

Satellite News

News from Intelsat of various satellite movements. The 803 craft

will be launched in mid-September. It will take up position at 21.3°W, displacing 515 which will be moved to 31.4°W. Intelsat 506, which currently occupies this position, will be "de-orbited". Intelsat 804 is to go into orbit at a new position, 29.5°W, to serve African customers. Intelsat 801 is now in operation at 64°E. 802, launched in late June, is to operate above the Pacific Ocean – at 174°E. Future plans are to position 805 at 55.5°W and 806 at 40.5°W.

Canal Plus has registered a complaint with the EC against the Spanish government, which has stopped sales of Mediaguard Canal Plus digital TV decoders across Spain in favour of the decoding system used by state broadcaster RTVE. The Canal Satellite Digital package had gained 53,000 subscribers and was to increase its channels from 30 to 50.

The Italian government is seeking a common digital transmission standard for RAI, STET and Telepiu, which is now 90 per cent owned by Canal Plus.

France Telecom, Maxat and Keystone have formed the Globecast Communications Corporation with its HQ in Paris. The new global company, with interests in Europe, North and South America and parts of the East Pacific region, has access to a large number of satellites able to provide both analogue and digital services.

Another new name is NAPA Teleport, in California. This PanAmSat facility will provide direct uplinks to PAS-2 at 191°W and feeds to Europe via landline/satellite links and the PAS-1 and PAS-3 craft.

A fifteen per cent loss of power in the recently launched Tempo DBS satellite has delayed several PanAmSat launches, using the same Loral craft, while the cause of the problem is being investigated – modifications to the satellite may be required. The PAS-6 launch has been delayed from May to September and dates are awaited for PAS-7 and PAS-8.

The Brightstar International satellite operation has been taken over by BT Broadcast and Reuters, providing access to North America via Intelsat K.

Matra Marconi is to construct the new BSKyB digital TV uplink to Astra 2A at Chilworth, with 8.1m dishes. This will make Chilworth, just north of Southampton, the largest teleport in Europe.

Low-noise VHF Preamplifier

Our thanks to Todd Emslie (Victoria, Australia) for sending us the circuit – see Fig. 1 – of the low-noise preamplifier he uses for F2 and meteor scatter reception in Band I and weak tropospheric reception in Bands II and III. It's based on a BF981 MOSFET, which achieves a noise figure as low as 0.7dB at 200MHz in an optimised circuit. In Todd's version the noise figure is under 1.5dB with a gain of typically 20dB across a single 6MHz channel bandwidth.

The input, to gate 1 of Tr1, is tuned by L1 and D1. Tr2's drain is connected to a series tuned circuit consisting of L2 and D2. D1 and D2 are BB809 varicap diodes. For Band I operation, L1 and L2 set the basic frequency, the bandwidth being adjustable from 2MHz to over 6MHz by means of the two 25k Ω linear potentiometers which adjust the bias applied to D1 and D2 (a bandwidth of less than 2MHz might lead to instability). For Band II and III operation, the lower Q enables a single tuning potentiometer to be used.

Coils L1 and L2 are wound close spaced (wire diameter) using 0.5-1mm copper wire (19-22swg), e.g. coaxial cable inner conductor. Inside diameter is 0.25in. L2 is tapped a third of the way down from the LT supply end to provide a reasonable 75 Ω match at the output. L1 is 13 turns and L2 12 turns for 45.7MHz; L1 is 6 turns and L2 7 turns for Band II (88-108MHz); L1 and L2 are both two turns for Band III (175-221MHz).

The value of Tr1's source resistor should be adjusted to provide a drain current of about 10-12mA. Its drain voltage should be approximately 10V while its grid 2 voltage should be around 4V.

C1 is a 1-10pF trimmer: adjust for maximum output – typically at 4.7pF. Todd uses 0.25W metal film resistors.

Provided construction follows conventional VHF practice, i.e. minimum lead lengths, a metal case (approximately 4.25 x 2.5in.) and screening between the input and output circuits, there should be no problems. Mount the components on a double-sided copper board bolted to the lid of the metal case.

Those happier with traditional air-spaced capacitors might try the Jackson C-82Y (3-20pF), deleting

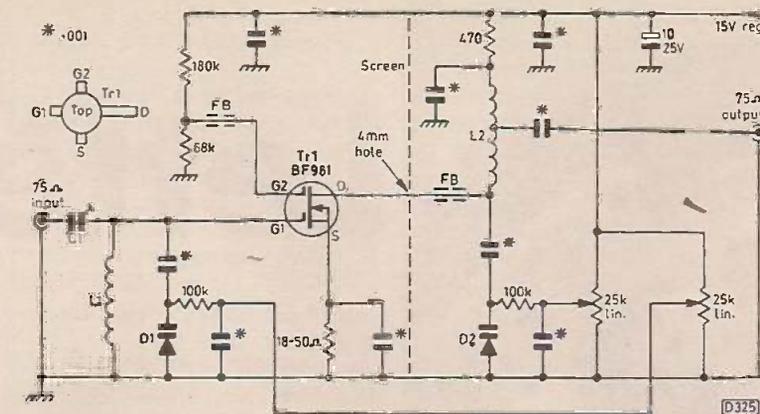


Fig. 1: Circuit diagram of Todd Emslie's low-noise VHF preamplifier.

the tuning arrangements. The BB405B varicap diode could be used: its should cover the intended bands though the maximum capacitance is higher. 0.25W carbon resistors might be better at the higher frequencies, to avoid lossy inductive effects.

Alignment for a given channel is simple. Tune the input coil L1 (adjust the spacing) to the video carrier frequency and the output coil L2 to the audio carrier frequency. Peak C1 for maximum output both before and after aligning L1 and L2. Higher gain with reduced bandwidth and thus better noise performance would be achieved by aligning both L1 and

L2 to the video carrier frequency, though this would result in a low audio output.

BB809 diodes and the BF981 transistor can be obtained from CirKit.

Mast for Sale

Does anyone want to buy my old 50ft non-telescopic lattice mast? It consists of five sections, each with three bolt-together sides, incorporating climbing rungs and a top cap for central positioning, with an internal lattice rotor mount and two rotors. The mast is now in store north of Romsey, Hants. It's going cheapish – buyer collects. If anyone is interested, drop me a line via the magazine.

Book Review

Digital Television = MPEG-1, MPEG-2 and the principles of the DVB system, by Hervé Benoit. Published by Arnold, a member of the Hodder Headline Group, at £19.99. 163 pages. ISBN 0 340 69190 5.

This timely and excellent book manages to cover a great deal of ground in its 160 or so pages. It does so because the author has given careful thought about how to arrange and present his information.

He starts with the TV systems we all know well – NTSC, PAL and Secam – as a way of briefly setting us on course. In this introductory section he also manages to provide clear and succinct accounts of MAC and PAL+.

We then proceed, in a logical sequence, through video signal digitisation, source coding (signal compression systems), source multiplexing (the arrangement of the MPEG-1 and MPEG-2 multiplexes, leading to the digital video broadcasting [DVB] standard), scrambling and controlled access, channel coding (the addition of error correction to the signal), carrier modulation with digital signals, digital TV reception and finally a

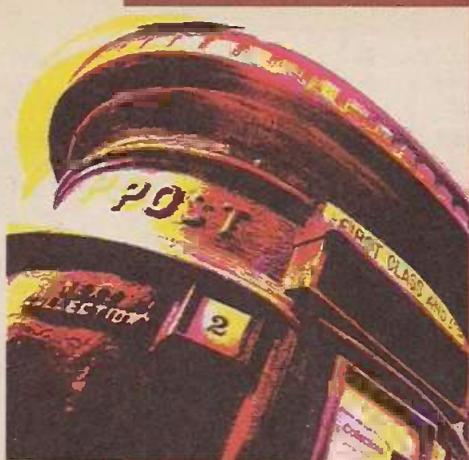
section on future prospects. Subjects that might have impeded our progress through the basics of digital TV are then covered in a series of appendices, after which there is a really useful glossary of abbreviations, words and expressions.

Frankly I do not see how the subject could have been covered better. There are bits of mathematics here and there, but they don't get in the way and you never get bogged down by them – in fact the more obscure technical points are left to notes at the end of each section.

We are all going to have to learn about digital TV pretty soon, as the start of transmissions is due within a matter of months. This book tells you what you will need to know, and with its glossary etc. provides a ready reference source. There are numerous excellent diagrams throughout. Highly recommended.

The book can be obtained from Bookpoint Limited, 39 Milton Park, Abingdon, Oxon OX14 4DT. Tel. 01235 400 403, fax 01235 821 511. Make cheques payable to Bookpoint Limited.

J.A.R.



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.

Mains Buffering

For some time I have been using a variant on Ian Rees's mains-buffering trip circuit (July issue). I use a smaller 150W halogen lamp as the buffer, with an Avo 8 in series to monitor the current. The arrangement is particularly useful when powering heavy audio amplifiers after repair: with the buffering trip in use, the meltdown effect often noted in the past as the quiescent current potentiometers are gingerly advanced is almost always prevented.

Some items we get for repair however, ones that use an auto-voltage sensing circuit to adopt to either American 110V or European 240V mains supplies, incorrectly select the 110V option when powered via my 150W load. Another unit that we occasionally see, also dual-voltage but with a manual selector, operates OK with 110V but switches in its voltage-doubler circuit when fed with 240V. The post-inrush current consumption is the same as that with normal 240V operation, so the crowbar doesn't fire. Much smoke ensues.

My advice is "build one and use it" – it will save you bucketfuls of fuses and hours of frustration, but beware that there are pieces of kit out there that do not take kindly to current limiting. It took me a day and a half and a dozen V-FETs to discover that the first such item I came across had been successfully

Letters

repaired and worked all right when not powered via the buffer.

*Adrian Spriddell,
Micomicon Electronic Services,
Diss, Norfolk.*

Panasonic G Deck

A couple of points need to be made regarding John Coombes's notes on the Panasonic G deck in the April issue (page 400). First, the capstan motor. If the clutch sticks, with the result that there is mistiming, it's the rotor (part no. VXP0777, now VXP1113) that needs replacement (any confusion between motor and rotor was probably an editorial fault – *Editor*). If there's no motor operation (no functions) then the stator (different part nos. for different models) and bearing need replacement. Secondly, with a number of direct drive drum motors the drive PCB, which contains the Hall devices and drive circuitry, is available separately at reasonable cost. There is thus no reason to replace a highly expensive drum because of a fault on the drive PCB. Thirdly, the back tension should be 22.5-27.5g at the start of an E180 tape.

Fourthly, the VXL1500 capstan brake is used in only early versions of the deck. The vast majority use the different VXL1873, which has been superseded by the VXL2088. Finally, one should be careful about following the alignment instructions in the original G mechanism manual: there are several mistakes that mean it won't work! Follow the instructions in my articles in the May and June 1991 issues of *Television*.

In the same issue Chris Watton refers to loss of the R – Y signal in the Salora J chassis (page 444). This is a confusing but quite common fault. The cause would have been slight misadjustment of the field hold control RT400: resetting cures the symptom. What happens is that the set flips to the NTSC/60Hz mode. The clue is excessive height – it's not just a chroma fault! If the potentiometer is noisy, replace it.

On page 445 Terry Lamoon refers to a Sony Model K VX2982 with sound faults. Other symptoms

include random display of the Nicam symbol. Sony recommends replacing RA2 and RA3 on board A – these are surface-mounted resistor arrays, and the new types are of modified construction.

*Nick Beer,
Bideford, North Devon.*

TDA8178S Chip

In the last two issues Michael Dranfield and Mark Allen have mentioned difficulty in obtaining the TDA8178S chip, which is used in the field output stage in the Mitsubishi Model CT21ASTX (Euro 12 Chassis). A replacement kit (part no. H27P014020) for this is available from Mitsubishi at £17.25 plus £4.50 handling charge and VAT. A similar kit (for 21 and 25in. models) is available from Irwin Electronics (Unit 200, JC Albyn Complex, Burton Road, Sheffield S3 8BX – 0114 273 9622) at £3.45 plus VAT and 95p postage. It pays to shop around!

*Derek Townsend,
Townsend's Televisions,
Matlock, Derbyshire.*

Editorial note: Our thanks also to Maurice Jones of Blackburn, Lancs who provided information on this subject.

Viability of Servicing

The viability of servicing low-cost electronic equipment has been questionable for years. Radio sets and Walkmans can be bought more cheaply than the labour cost of a repair.

As a retired professional engineer, I keep my hand in by maintaining the family's TV sets, VCRs etc., the satisfaction of achieving a successful repair being higher than that of completing *The Times* crossword – and my labour cost is nil. When my Sharp VLC7450E camcorder started to play up however (it took fifteen minutes for the auto exposure to settle down to the correct level, being OK after that) I knew it would have to go to professionals with the knowledge and test gear required to deal with it.

So I took it to a local Sharp

agent, who later rang me up to ask if I would pay £10 carriage to send it to SharpServ. I agreed. Two weeks later he phoned to say that he could offer four options:

- (1) Repair the camcorder at a cost of £865, half as much again as it cost.
- (2) Exchange it for the current model, at a cost of £600 (£550 in any Dixons etc.).
- (3) Dispose of the camcorder "free of charge".
- (4) Return the camcorder unrepaired at a cost of £57 plus £10 carriage.

I took the last option. So it cost me £70 to get the camcorder back in the same condition it left me. Apparently the cause of the fault was PCB corrosion because of the famous leaky capacitors.

I agree with paying for an estimate, but only if it can be an even remotely viable proposition to go ahead. Sharp commiserated when I wrote to the company, but was not prepared to take any further action as the camcorder was out of guarantee. It seems that Sharp does not feel itself to be responsible for the failure of capacitors in seldom-used, low-voltage equipment. SharpServ also commiserated, but explained that as a commercial operation these are the prices that have to be charged to stay in business.

In conclusion, it seems that servicing low-cost goods is no longer viable and the same now applies with high-cost items. For how long will we have a servicing industry?
*B.C. Lewis,
Pembroke, Pembro.*

No Longer Available?

The number of manufacturers that will not deal with someone who does not have a trade account has risen substantially in recent years. Those without such an account are referred to an official spares distributor. But when the distributor tells you that a part is no longer available, are you to believe it?

About a year ago I needed a part for a Matsui microwave oven. The distributor I contacted told me it was no longer available. A call to Partmaster (Mastercare) revealed that this was totally untrue.

I have now been waiting for two weeks for an Alba part from the same distributor. When I chased this up I was told that it was no longer available. Alba says that it's

in stock and I should contact the distributor.

Let this be a word of warning to other traders. If necessary, check the availability of a part with the manufacturer. If your customer takes his equipment to another dealer who can obtain the part, you will be left with egg on your face.

*Keith Pemberton,
Southampton, Hants.*

In Guarantee Spares

We have had problems recently in a number of cases where spares have been required for equipment still covered by a manufacturer's warranty – delays of up to two months have not been uncommon. As a result the customer loses faith in the product and the manufacturer, and very often the dealer has to provide a free-of-charge loan set while the part is being obtained.

Many manufacturers seem to be hell bent on production down to a price rather than up to a quality, but at least we should be able to expect of them that all service spares are held in stock.

I would be interested to know how a dealer stands legally in such cases, particularly when the customer insists on a replacement because of the delay. I understand that some manufacturers, notably Sony, offer to replace in-warranty equipment should it not be possible to supply a functional part within 28 days of ordering. Other manufacturers should follow this lead.

*Shane Humphrey,
Bideford, North Devon.*

Well done Bush/Alba

You probably know what it's like phoning a manufacturer or distributor for some technical help with a repair. Even if the company actually employs somebody to deal with queries, and you don't have to hold an account to talk to someone, getting relatively basic information can be a trial.

I was pleasantly surprised therefore when I had occasion to phone Bush recently – I don't have a direct account with this company. I was put through to a technician who was not only very helpful but in addition arranged for a small part I needed urgently to be sent free of charge. It arrived next day. But please don't all rush to your phones, and I won't embarrass the person concerned by giving you his name. Suffice it to say that I was able to complete the repair of what was a budget-priced piece of equipment quite cost-effectively without the need to buy a ser-

vice manual. A colleague in Croydon has told me a similar story about, you guessed it, Bush! Well done indeed.

Isn't it time that all manufacturers and distributors in our industry were required to provide a user-friendly technical service? One of the worst cases I've come across of stupidity by a major manufacturer went like this. I phoned the manufacturer, with whom I have an account, to ask for a service manual for a product about six years old. Sorry, it's not available as it is out of print. I phoned the technical department, which has a manual. Could it be photocopied? Sorry, this might infringe copyright!

I thought this a good one, unless someone out there knows of a better one?

*Colin Pearse,
A.E.S. Electrics,
Merstham, Surrey.*

Satellite Installation

I've read with interest articles on satellite dishes, siting problems and test equipment. Long retired from the TV field, I'd no suitable test gear to help with such an installation. So I called in an installer. The results were OK until we had the builders in to replace the flat roof. The dish was moved, also of course the signal.

I like a challenge, and decided that if I took a TV set up to the roof adjustment might be within my capabilities. I have an old 9in. Sony monochrome TV set with a tinted screen and an attached battery pack – so old that it's actually dual-standard! But with its help I soon found that adjustment was not difficult and resolved very good pictures. Meters are no doubt fine, but as in the old days installation is surely best when you can scrutinise an actual picture.

*Philip Bearman,
New Barnet, Enfield.*

Lamp Interference

The Hitachi TV set in my living room recently ceased to function correctly. It seemed that the micro-controller system was corrupted. My mind being a little more active than my body (my workshop is about 50 yards away), I coupled the set to my VCR via a scart lead and used the VCR as a tuner – only as a temporary measure of course! Then, after a few minutes' viewing, I noticed that the LED channel display was more entertaining than the programme. Random numbers and bars were being displayed, though

the picture remained perfect. The set then went into standby. Microcontroller trouble I thought, and switched the set back on again. When I switched off the wall light opposite the TV set the display functioned normally and the set stayed on.

The wall light is fitted with one of those high-efficiency fluorescent lamps. Its heaters must have been emitting infra-red radiation which was modulated by the HF-driven inverter that excites the tube.

It's not the first time that I have come across this effect. I nearly lost a rental customer who complained that his TV set kept changing channels spontaneously. After replacing the remote control receiver and then the set to no avail, I noticed that he had a chandelier with five of these lamps in the centre of the room. A brief experiment with a piece of black sticky tape to mask the IR receiver confirmed the cause of the problem.

*Peter Nutkins,
Charmouth, Dorset.*

Worth it for a Laugh

For once the workshop was quiet. A

couple of VCRs and three or four TVs were on the rack awaiting spares. Apart from that there were no outstanding jobs, and I sat waiting for the phone to ring. It did. At the other end there was an American with a VCR problem that was clearly the centre of a family debate. After a couple of diagnostic suggestions from his relatives he told me that the unit concerned, an old Sharp VC9800, would only partly accept a tape. "The last son of a bitch took me half an hour to remove" he said. After weighing the damage that this might have caused against the fact that the machine is of sturdy build, I decided to accept the job.

The VCR came in next day. Its owner mentioned that he'd bought the machine simply because it would play NTSC tapes. I couldn't argue about that! On opening the machine I discovered, to my horror, that Darth Vader's light sabre was entangled with the eject mechanism. The plastic toy was easily removed by cutting the sabre from Darth's clutches and operating the mechanism to remove it. After that the machine seemed to have escaped

damage from its 'run in' with the empire.

When I phoned the customer to explain what had happened he told me that his five-year old son places objects in the recorder hoping to see them on the screen. I told him that a copy of *Star Wars* might, in the long run, be cheaper. I charged him £5. It was worthwhile for the laugh.
*Richard Knotek,
Woking, Surrey.*

Correspondent Please

I am anxious to correspond with one of your technician readers. At present I'm serving a prison sentence, with about five years to go. Before coming into prison I used to repair TV sets. VCRs etc. What I need is to keep up to date with the trade, with a view to setting up my own repair business on release – rather than being a burden to the state.

I realise that as a prisoner I am not exactly popular, but I am remorseful for the crime committed and am just looking for a bit of help. A friend supplies me with copies of *Television*.
Don Sobey, CN3217, HMP Full Sutton, Moor Lane, York YO4 1PS.

Answer to Test Case 417

- see page 791 -

Roger finally sorted out the Mitsubishi HSB12 VCR – though he much prefers repairs that involve head cleaning or replacing duff mains on/off switches! But he should have been able to find the cause of the trouble without too much difficulty: he had forgotten to check one of the vital feedback signals to the main microcontroller chip, the SW25 pulses. Without these pulses the chip thinks that the drum isn't rotating.

The SW25 pulses should be present at pin 21 of the main microcontroller chip. There was nothing here. Nor were there any pulses at pin 14 of the servo chip IC4A0, or at pin 20 where the PG pulses should have been present (the SW25 pulses are derived from the PG pulses via a divider circuit within IC4A0). In fact the drum motor was faulty. Although it produced PG pulses when its board was flexed, it was not repairable and had to be replaced.

Many VCRs that carry out the fast-forward and rewind operations without the tape being laced around the drum do not require PG pulses for these operations to be maintained. This could have misled Roger. The HSB12 carries out its fast-transport operations with the tape 'half-laced' – it just touches the front of the drum – but the microcontroller chip nevertheless requires assurance that the head is rotating.

NEXT MONTH IN TELEVISION

Workshop Supplement

When did you last review your workshop needs – service equipment, tools, servicing accessories and aids? Needs keep changing, and there's always something that will make life easier. Next month's guide surveys products currently available for the workshop and lists suppliers.

Getting into Digital TV

You're going to have to, before long! So next month we're starting a new series, by J. LeJeune, that will go through what you need to know about digital TV and end up with some practical guidance on digital satellite TV receiver fault finding.

A Handful of Mitsubishis

John C. Priest sees a lot of Mitsubishi TVs in his neck of the woods. He provides a round-up of recent fault experiences.

Simple Intercom System

Andrew Tebbutt describes a very simple intercom system that, unlike other designs, does not require push-to-talk working and has full duplex operation.

Satellite Mods

Martin Pickering on how to convert the Pace PRD800 to provide 199-channel capability.

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Version 5 of the computerised index to TELEVISION magazine covers Volumes 38 to 46 (1988 - 1996). 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.

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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 46 at £3.50 each.

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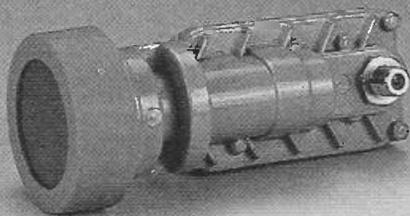
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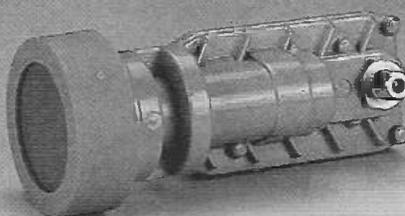


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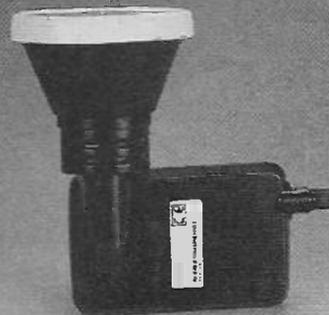


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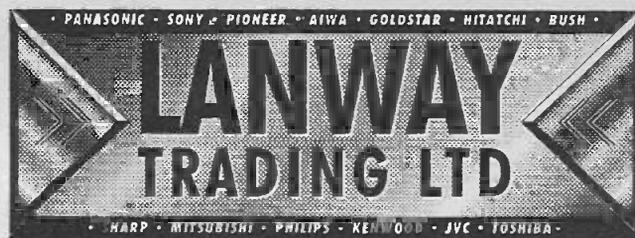
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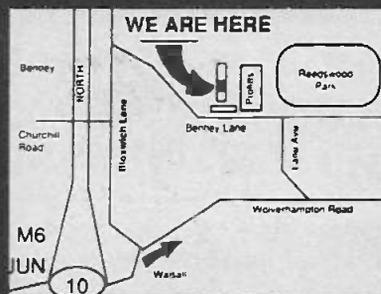
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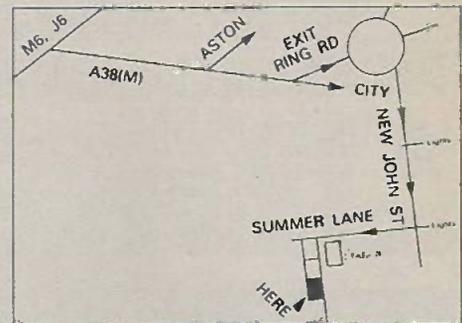
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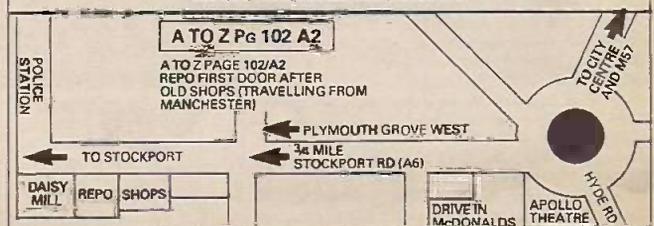
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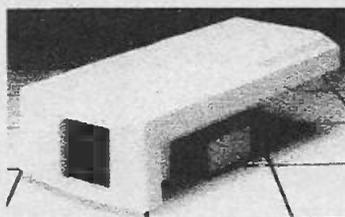
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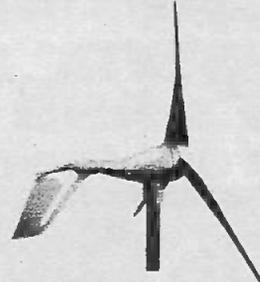
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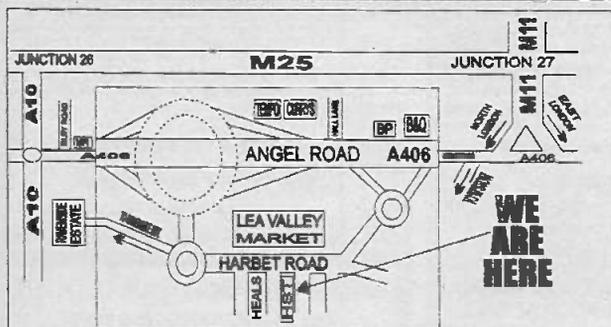
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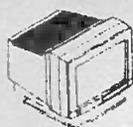
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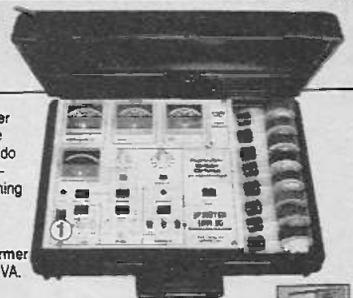
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<p>AMSTRAD DISPLAY PANEL - LONG CHASSIS - 1992/93 £4.00 FRONT PANEL FOR ALL 1992 MODELS £4.00 HEAD AND DRUM - 6000 £12.00 HEAD AND DRUM - NICAM £12.00 PANEL-CLOCK DISPLAY - 8.900 £5.00 PLASTIC FRONT WITH FLAP - 8.900 £3.00 POWER SUPPLY-V1000-VS1100 £5.00 POWER SUPPLY, LONG OR SHORT CHASSIS 1991/1992 MODELS £3.00 POWER SUPPLY SWITCH MODE - DOUBLE DECKER £5.00</p>	<p>GRUNDIG TRIPLERS BG2032-642-3002 £9.00 TRIPLERS BG2087-642-1005 £9.00 TRIPLER WITH FOCUS POT £7.00 UNIVERSAL TRIPLER - UPRIGHT PRINTED CIRCUIT TYPE £9.00 HITACHI DECODER-TELETEXT PC232AS - ISSUE 4 £15.00 HEAD AND DRUM - 620E £12.00 MAINS SWITCH WITH STAND-BY 50p MODULATOR No 5587881 £5.00 OSCILLOSCOPE 30MHZ DOUBLE BEAM - Y212 £18.00 PANEL-TELETEXT GRP - ISSUE 6 £18.00 PANEL-TELETEXT PC315-11 - ISSUE 7 £15.00 PANEL-TELETEXT PCB F.S.T. - ISSUE 6 £15.00 PANEL-TEXT-VT753E £20.00 POWER SUPPLY TV SWITCH MODE STR 4211 ISSUE 10 £8.00 POWER SUPPLY VIDEO SWITCH MODE VTM312ELM £10.00</p>	<p>MOTORS MOTOR - CASSETTE TYPE 12V WITH SPEED CONTROL 50p AMSTRAD LOADING-6000 £3.00 CANON 12V MOTOR 50p HITACHI CAPSTAN - ACE G4-B TO ACE G4-B £10.00 MICROWAVE TURNTABLE MOTOR £10.00 MATSUI CAPSTAN VSR1500 UC NO. M56730 A5P £15.00 MITSUBISHI MOD MRF7-UF32 £5.00 MOD TMUG3-103A £5.00 MITSUBISHI CAPSTAN-HSE41-4CM51782ASP £4.00 ORION MOTOR 50p</p>	<p>MOTORS DA2611A £1.00 DA2613 £1.00 DA2614 £1.00 DA2615 £1.00 DA2616 £1.00 DA2617 £1.00 DA2618 £1.00 DA2619 £1.00 DA2620 £1.00 DA2621 £1.00 DA2622 £1.00 DA2623 £1.00 DA2624 £1.00 DA2625 £1.00 DA2626 £1.00 DA2627 £1.00 DA2628 £1.00 DA2629 £1.00 DA2630 £1.00 DA2631 £1.00 DA2632 £1.00 DA2633 £1.00 DA2634 £1.00 DA2635 £1.00 DA2636 £1.00 DA2637 £1.00 DA2638 £1.00 DA2639 £1.00 DA2640 £1.00 DA2641 £1.00 DA2642 £1.00 DA2643 £1.00 DA2644 £1.00 DA2645 £1.00 DA2646 £1.00 DA2647 £1.00 DA2648 £1.00 DA2649 £1.00 DA2650 £1.00 DA2651 £1.00 DA2652 £1.00 DA2653 £1.00 DA2654 £1.00 DA2655 £1.00 DA2656 £1.00 DA2657 £1.00 DA2658 £1.00 DA2659 £1.00 DA2660 £1.00 DA2661 £1.00 DA2662 £1.00 DA2663 £1.00 DA2664 £1.00 DA2665 £1.00 DA2666 £1.00 DA2667 £1.00 DA2668 £1.00 DA2669 £1.00 DA2670 £1.00 DA2671 £1.00 DA2672 £1.00 DA2673 £1.00 DA2674 £1.00 DA2675 £1.00 DA2676 £1.00 DA2677 £1.00 DA2678 £1.00 DA2679 £1.00 DA2680 £1.00 DA2681 £1.00 DA2682 £1.00 DA2683 £1.00 DA2684 £1.00 DA2685 £1.00 DA2686 £1.00 DA2687 £1.00 DA2688 £1.00 DA2689 £1.00 DA2690 £1.00 DA2691 £1.00 DA2692 £1.00 DA2693 £1.00 DA2694 £1.00 DA2695 £1.00 DA2696 £1.00 DA2697 £1.00 DA2698 £1.00 DA2699 £1.00 DA2700 £1.00 DA2701 £1.00 DA2702 £1.00 DA2703 £1.00 DA2704 £1.00 DA2705 £1.00 DA2706 £1.00 DA2707 £1.00 DA2708 £1.00 DA2709 £1.00 DA2710 £1.00 DA2711 £1.00 DA2712 £1.00 DA2713 £1.00 DA2714 £1.00 DA2715 £1.00 DA2716 £1.00 DA2717 £1.00 DA2718 £1.00 DA2719 £1.00 DA2720 £1.00 DA2721 £1.00 DA2722 £1.00 DA2723 £1.00 DA2724 £1.00 DA2725 £1.00 DA2726 £1.00 DA2727 £1.00 DA2728 £1.00 DA2729 £1.00 DA2730 £1.00 DA2731 £1.00 DA2732 £1.00 DA2733 £1.00 DA2734 £1.00 DA2735 £1.00 DA2736 £1.00 DA2737 £1.00 DA2738 £1.00 DA2739 £1.00 DA2740 £1.00 DA2741 £1.00 DA2742 £1.00 DA2743 £1.00 DA2744 £1.00 DA2745 £1.00 DA2746 £1.00 DA2747 £1.00 DA2748 £1.00 DA2749 £1.00 DA2750 £1.00 DA2751 £1.00 DA2752 £1.00 DA2753 £1.00 DA2754 £1.00 DA2755 £1.00 DA2756 £1.00 DA2757 £1.00 DA2758 £1.00 DA2759 £1.00 DA2760 £1.00 DA2761 £1.00 DA2762 £1.00 DA2763 £1.00 DA2764 £1.00 DA2765 £1.00 DA2766 £1.00 DA2767 £1.00 DA2768 £1.00 DA2769 £1.00 DA2770 £1.00 DA2771 £1.00 DA2772 £1.00 DA2773 £1.00 DA2774 £1.00 DA2775 £1.00 DA2776 £1.00 DA2777 £1.00 DA2778 £1.00 DA2779 £1.00 DA2780 £1.00 DA2781 £1.00 DA2782 £1.00 DA2783 £1.00 DA2784 £1.00 DA2785 £1.00 DA2786 £1.00 DA2787 £1.00 DA2788 £1.00 DA2789 £1.00 DA2790 £1.00 DA2791 £1.00 DA2792 £1.00 DA2793 £1.00 DA2794 £1.00 DA2795 £1.00 DA2796 £1.00</p>

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