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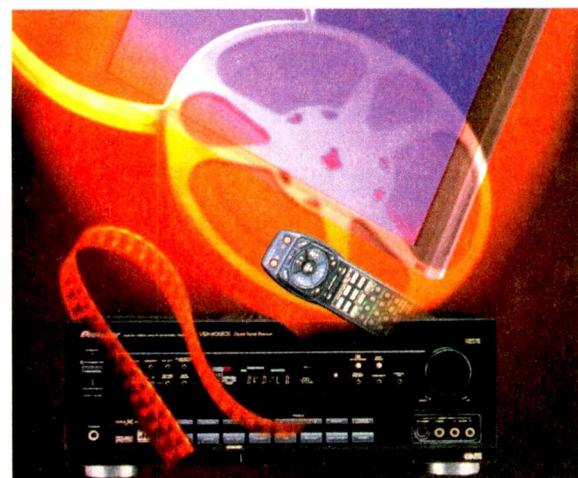
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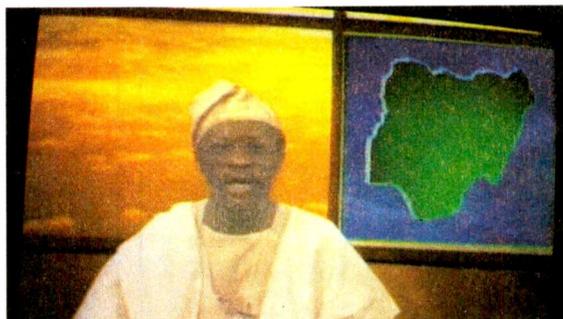
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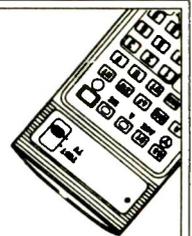
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# The Radio and TV Century

People nowadays take radio and TV for granted, relying on it as their main source of news and entertainment. It's hard to envisage a time when these media were not available. Yet this was the situation not so very long ago, at the beginning of the century that's about to end. It is quite amazing how, over just a few decades, radio and TV evolved to their current sophisticated state and came to play such a major role in our lives.

Much pioneering work on the fundamentals – the discovery of electromagnetic waves (Hertz), thermionic emission (Edison), the principle of tuning (Lodge) and the use of electromagnetic waves for wireless telegraphy – had been undertaken by the early 1890s. In 1894 Oliver Lodge demonstrated radio signalling over distances of about 60 yards and Marconi began experiments in Italy. Two years later Marconi obtained the first patent for wireless telegraphy (British Patent No. 12,039) and was carrying out tests in the UK. In 1897 he formed The Wireless Telegraph and Signal Company and established the first permanent radio station, for communication with ships, on the Isle of Wight. The first international radio messages (France-UK) were transmitted and received in 1899. The first transatlantic radio contact took place in 1901. But for some time communication was in the form of coded signalling. The first experimental broadcast of speech and music took place in the USA, in 1906. By 1915 transatlantic transmission of speech had been demonstrated. The First World War naturally increased research and development, in particular with thermionic valves.

1920 was a significant year. Dame Nellie Melba broadcast from the Marconi transmitter at Chelmsford, and KDKA Pittsburg became the first regular broadcasting station. In 1922 broadcasts from 2MT Writtle

and 2LO London started, and the British Broadcasting Company (it was to become the Corporation later) was formed. At about this time the production of commercial radio receivers started. Things had begun to move: we were at the start of the radio era, which was to last roughly from 1925-1955, when TV began to take over as the predominant medium. By 1939 few people were without a radio receiver.

Television also had its antecedents in the Nineteenth century. Paul Nipkow patented his scanning disc in 1884, providing a means of converting a picture to a serial data stream; light-sensitive materials had been discovered, enabling light values to be transmitted as an electrical signal; and by 1897 a primitive form of CRT had been devised – by 1906 its inventor, Karl Ferdinand Braun, had developed a version that could be modulated to produce varying light levels. But there was little significant development until the early Thirties. The nascent radio industry had work enough expanding its services, and one key element for a practical TV system was missing, an electronic camera tube. By the early Thirties this need had been met, with the development of the Emitron tube in the UK and the Iconoscope in the USA. Though using the same principles, they seem to have been developed independently. But in the depression era there wasn't the money to move forward quickly – in fact TV in the States didn't get going until the Forties.

There was another problem, shortage of broadcasting frequencies. A TV channel, with its wide bandwidth, meant a move to VHF. This was just managed for the start of TV broadcasting in the UK in 1936. But take up was poor, again because of money. Few people could afford TV sets in the late Thirties, and those who could didn't get much by way of programming – only a few hours a week. It

is estimated that between 1936 and 1939, when the UK's TV service was closed down with the start of the Second World War, less than 20,000 sets had been sold.

TV in the UK developed slowly in the immediate post-war period, but by the late Fifties and early Sixties things had changed. There were better valves and better tubes and, as production built up, cheaper sets. There were also more programmes and channels. By the Sixties TV was rapidly developing world wide – especially with the added attraction of colour.

The advent of solid-state technology had little impact on TV initially, but was to play a major role in making all sorts of developments possible. Teletext for example, which was introduced in the UK in 1976: a teletext decoder using valves would have been totally impractical. Once chips began to play a significant role we had sophisticated remote-control and tuning systems, Nicam and, eventually, digital TV.

Other technologies have contributed to the growing impact of TV on our lives, in more recent times all those satellites. With early TV services the VHF bands came into use: multi-channel TV took us to UHF, then satellites to SHF. There has also been the parallel development of video recording technology, which introduced viewing flexibility.

This technology has burgeoned during a relatively brief period in human history, but has changed most people's lifestyle for good. Nor does there seem to be any end to the technological prospects. Until comparatively recently, the worlds of computing and TV were quite separate. They have now converged, giving us games, interactive TV and access to the internet. During the course of the Twentieth century, radio and TV have become a major element in everyone's daily life.

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## SATELLITE FAULT FINDING GUIDE

NEW EDITION No. 5

You could say that what Martin Ploering doesn't know about satellite receivers isn't worth knowing. What he does know has become legendary. Having been at it since the start of consumer satellite TV, he has built up a massive database of on satellite TV receivers. Not only on their faults, common and less common but also on modifications and upgrades. Martin brings in-depth expertise to the subject, having previously been involved with equipment reliability testing and component specification. Originally entitled "Satellite Repair Manual", this book has become established as a bible for satellite TV repair.



But the subject doesn't stand still. New models, new faults - there is always something to add. So here we have the fifth edition, which has been completely updated and now has 300 pages and a more attractive cover. In addition to receiver fault notes and general information, you'll find many useful button sequences for resetting parental lock codes, resetting installation choices to factory defaults and other less well known operations, practical information on LNBs with typical current drains, a list of manufacturers and supplier addresses, other useful information and a beginners section. Digital receivers are now available so the manual includes a chapter to deal with these too.

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# What

# a Life!

## **A hissing Beko, a ticking Grundig and a Sanyo with an odd picture. All in a day's work. Donald Bullock's servicing commentary**

**W**e get some posh customers from time to time. A smart new Mercedes drew up and a bulky woman alighted.

"My husband says it's the transformer, but my son says it's the condenser. Personally I think it's just a loose wire."

I gave her an understanding look. At least I hope it was.

"We were watching Channel 5 when it went. That odd-looking woman with the spiky voice. Do the people on TV affect the sets?"

She led us out to the car, and we extracted a monster Beko colour set, Model 15225 – the one with stereo sound and Fastext.

Paul put it on the bench and switched it on. There was an ozone smell.

"Corona" I said.

He removed the back and made for the line output transformer. We could hear the EHT hissing away, but couldn't see it. When some breath was exhaled in the area the corona became a blue haze. So the transformer was removed and examined: there was a crack in the overwinding's insulation.

A replacement was ordered. When it arrived Paul fitted it hoping that all would be well. It wasn't: the set tripped. As the line output transistor was OK Paul checked the diodes in this stage, starting with the heaviest-looking ones. He soon found that D801 was short-circuit. It's a BY299 that produces the 200V supply for the RGB output stages. Once a replacement had been fitted the set worked perfectly.

### **A Ticking Grundig**

Mr Wappa sells ice cream in the summer and paraffin in the winter. He struggled in with a large Grundig set (CUC4620 chassis).

"This set a is dead a. My wife a switch him on a last night a and he went tica, tica, tica."

"Right" I said, "name?"

"Louise" he said, "what would I do a without her?"

"No *your* name" I said.

"Antonio" he said.

I wrote Antonio on the card and bade him good day.

As he departed he started on about his wife again.

"My wife a. So wonderful. Have I a told you about her?"

The set was tripping all right. Steven took over.

"Every time I've had one of these tripping it's been the line output stage" he said.

The chassis has an EHT tripler that sits upright, like a tower. When it was disconnected from the line output transformer the tripping stopped. Once a replacement had been fitted the set came to life, producing a very high-quality picture. Mr Wappa was delighted when we phoned to tell him the news.

### **Phone Calls**

The phone rang. It was the Reverend Goode.

"Ah Donald" he said, "our projection set in the church hall. Its screen is full of snow, and the sound is hissing."

"Sounds as if the aerial plug has fallen out" I said.

"Can you come with a ladder then?" the Reverend asked.

I decided that it would be quickest to pop along to the hall. The coaxial plug had in fact fallen out. When I popped it back in there was a picture and sound.

"What would we do without you?" beamed the Reverend.

When I got back the phone rang.

"Do you repair toasters?" a high-pitched voice asked.

"No madam" I replied.

### **Tube Trouble**

I noticed that Steven had a huge

Sanyo TV set on the bench. He looked puzzled. The picture was all right at the centre of the screen, but elsewhere it was a blur of colour.

He reached for the wand and degaussed the tube. There was no difference. Then he tried adjusting the purity magnets. He found that he could move the symptom about on the screen but couldn't cure it.

"What do you make of it?" he asked.

"We used to get this trouble in the early days of colour" I replied. "I remember one day having a set with exactly the same symptoms. A trade friend was in the shop at the time. He reckoned that for an accurate diagnosis I needed a short length of 2 x 2in. timber.

Steven's puzzlement increased. "What on earth for?" he asked.

"To lambaste the face of the tube" I said. "The problem can occur when the shadowmask becomes detached. A bit of vibration will shift it and the purity fault will move about on the screen."

In fact we didn't use any wood. I gave the tube face a good thump with the side of my fist and the miscolouring effect moved about. You don't often have to replace a tube nowadays, but that's what we had to do.

The phone rang again.

"Do you repair toasters?" the high-pitched voice asked.

"No madam" I replied.

### **A Sniffer**

The first thing this young fellow did when he came in was sniff. He was carrying an Alba colour portable, Model T14.

"Dead" he said, and sniffed again. "It didn't cost much, so it won't be worth repairing unless it's cheap." Sniff.

"We'll take a look at it" I said, sniff. He'd got me at it.

"Another one" said Steven as he pulled it on to the bench. "We're seeing more and more of them. And they're always dead."

The mains fuse had died a violent death, and the P5NA80F1 chopper transistor was short-circuit. It's an unreliable and expensive device. Better to fit a BUZ90A, which is five times cheaper and much more reliable. With this fault it's as well to replace the TDA4605-3 chopper control chip as well, and the 270kΩ resistor that's connected to pin 2.

When Mr Sniffler returned we presented him with the bill. He sniffled, which got us all going.

### Chewing and Flashing

A thin lady came in with a VCR. She smiled, then frowned.

"My husband's mad as hell" she said. "Chews tapes one after another and flashes."

"Is he under some sort of stress?" I asked quietly.

"I'm talking about this" she replied, pointing to the Toshiba V300B VCR she'd placed on the counter.

Paul took off the top, fitted a new idler assembly and tried a tape in it. The machine worked all right apart from the fact that there were flashing streaks in playback and with E-E operation. This usually means power supply trouble. After some investigation Paul found that C822 and C826 (both 47μF, 16V) had dried out. Replacements cured the flashing.

### Mr Wappa again

As Paul was reassembling the Toshiba VCR Mr Wappa paid us another visit. This time he was carrying a 21in. Panasonic colour set, Model TX21S1T (Z5 chassis).

"Belongs to my wife's people" he beamed, "have I told you about my a wife?"

"A lovely woman" I said, "what's wrong with this TV set then?"

"It's a ticking like a bomb a" he replied.

"Then it's the SAS you want" I said.

"Ha! I must tell my wife a that one! My wife a . . ."

Steven took over. There was obviously a power supply problem of some sort. He started by checking the electrolytic capacitors in the area, but they were all OK. Puzzled, he bridged most of them in turn, again to no avail. The chopper device is an STR51424 chip, IC801. As we didn't have one in stock Steven checked it carefully

with a meter. It passed with flying colours. Then he checked all the other components. As cold checks didn't reveal anything amiss we decided that it had to be the chip and ordered a replacement.

The new chip restored normal operation. Presumably its predecessor had been breaking down under load. Incidentally it's not an easy device to obtain. We found one at SEME, under part number STR51424M. Note that a different version, type STR51203M, is used in the 14in. version of the chassis.

### A Visit from Norman

Quiet Norman Glutton is short, tubby and casual. He sauntered in with a Pye colour set fitted with the Philips G90AE chassis.

"Have a look at this 'un, Steve" he said. "I'm popping over the shop to see what their pasties are like."

The set was dead, and it didn't take Steven long to find that the BUT11AF chopper transistor Tr7625 was short-circuit. It's a common fault. He also checked the BC858C transistor Tr7615 and the LL4148 diode D6623 in the drive circuit. They are both surface-mounted devices and were also short-circuit. As replacements made no difference Steve fitted a service kit for the chassis, reference number SBC7023. It's available from SEME under part number RK70G. This got the set going again.

In addition to all suspect items the kit includes a couple of modifications for improved reliability. It's as well to have a good copy of the circuit diagram for the power supply when fitting the kit, as the one that comes with it isn't too good.

When Norman returned he had a bag of pasties and was finishing off another one. "Not too bad, these Don" he confided. "Makes you dry though. Think I'll pop over to the Peacock for a pint or two."

### Toasters

Then a seedy looking fellow came in with a toaster.

"I hope you mend toasters" he piped. "I phoned twice to ask, but each time I tried the chap I spoke to was having trouble with some woman."

### Parliament

On our last visit to London Greeneyes and I were shown around the House of Commons and the House of Lords. The visit had been arranged by Barry Robertson, who was about to retire from the House of Commons Security department



and take up residence in Spain.

I was intrigued by some of the electronic security measures and the video system in the Commons. Half a dozen or so camera dollies are spaced around the walls, each with two cameras, one a wide-angle matrix type and the other a scanning camera that can zoom to a close-up of any subject in its field. The signals are passed to a well-equipped studio complex.

Greeneyes was impressed by the lavishness of the Lords furnishings compared to the Commons. I was surprised by the smallness of the Commons, the large number of hanging miniature microphones and the loudspeaker behind the head of every seated MP. As always, it's the little things that stick in the mind. For me it was in this case the Speaker's chair. Its left arm has a set of buttons that enable the Speaker to cut the video and microphone signals in the event of an emergency, or summon outside help. A pair of speakers is mounted at head level in the wings of the chair. Otherwise the chair is quite roughly put together – as maintenance work was being carried out, its padded seat had been removed. The Speaker has enormous power, but she will never seem to be quite so regally seated when I see her, on TV, keeping order.

*I was intrigued by some of the electronic security measures.*

# TELETOPICS

## Digital TV a Success

BSkyB and ONdigital have released their latest subscriber figures and financial results. By mid-October, BSkyB had signed up 1.8m digital subscribers, almost half of them (45 per cent) new customers to satellite TV. The company's turnover for the quarter was up 11 per cent at £391m, but marketing costs – including the provision of free set-top boxes – resulted in a loss of £14m before tax. This compares with a profit of £52m during the same period last year.

The total number of BSkyB subscribers at end-September was 7.86m, an increase of 419,000. While the analogue churn (drop-out) rate was 14.2 per cent, a decline on last year, it was only one per cent with digital subscribers. Of the total number of subscribers, 3.59m received their service via a dish. The digital-analogue break-down of these subscribers was 1.29m and 2.3m respectively. 591,000 of BSkyB's subscribers live in Ireland.

BSkyB's digital subscriber figures would probably have been higher had

there not been a shortage of digiboxes during the period. Production has been increased, and over 70,000 digiboxes a week are now being supplied to subscribers, but at mid-October there was a backlog of some 300,000 installations (this was split about 2:1 between Sky Home Services and the independent trade).

Open has launched its interactive system via SkyDigital: viewers are offered a mix of shopping, banking, information services and e-mail – a wireless keyboard is available for e-mail. Twenty radio stations are now available via SkyDigital, including the BBC's five national services plus World Service and the two Radio Four variants, Virgin Radio and Classic FM. These are free-to-air. For Talk Radio a subscription is required.

By end-September ONdigital's number of subscribers had risen to 411,000, an increase of 66 per cent since the end of June when the free set-top box offer was launched. The company expects to have between 500,000 and 600,000 subscribers by the end of the year. ONdigital is now offering a pre-pay sales service similar to that operated by mobile phone companies. ONdigital says it will add internet access, e-mail, interactive services, multi-player games and on-screen gaming in the form of spot-the-ball. Some of these services are expected to start early next year. A trial of the delayed digital teletext service is planned for the pre-Christmas period. It will use the MHEG-5 API (Application Program Interface). A

full service is planned for next year. There has also been a delay in the launch of ONdigital's plug-in conditional access module for adapting free-to-air DTT sets. In addition the introduction of audio description services has been delayed for some six months. ONdigital has been working with the RNIB on the development of modules for receiving audio description broadcasts, which were due to start in November 1999.

A survey commissioned by Pace Micro Technology has found that 42 per cent of those questioned intend to switch to digital TV by the end of 2002 – the total is considerably higher (64 per cent) in the 16-35 age group. The main reasons given for the switch were greater choice of programmes and better sound and picture quality. It seems that 17 per cent of the population expect to become digital TV subscribers by next summer. Commenting on the survey Malcolm Miller, Pace's chief executive, pointed out that in just two years the public has moved from the situation where two-thirds were unaware of digital TV to the current position where nearly half expect to subscribe within three years. "No mean feat" as he put it.

Of those questioned, 38 per cent said that their move to digital TV would probably take place when their current set needed replacement. 34 per cent said that they would delay because the analogue TV services meet their needs. Cost was a consideration for 33 per cent.



Toshiba Electronics has introduced what it claims is the world's smallest (10mm square by 6mm high) CMOS image sensor, with integral 3.6mm lens. It's compatible with the common intermediate format (CIF) for video-conferencing. The device is suitable for battery-powered camera and videophone applications. There are both colour and monochrome versions. A 2-8V supply is required, consumption being 15mW.

## Access to Free Satellite DTV

The BBC, Channel 4 and Channel 5 are to provide a joint customer service for those digital satellite TV viewers who want the free-to-view channels but don't wish to subscribe to pay-TV. Management and operation of the service, which will start in May 2000, is to be carried out by BT Broadcast Services. Viewers who require only the free-to-view channels will be able to register and request a viewing card.

Because satellite digital TV signals are encrypted for copyright reasons, a viewing card is required. This applies with both pay-TV and free-to-view programmes. The free-to-view card service has provision for other satellite digital TV broadcasters to join in future.

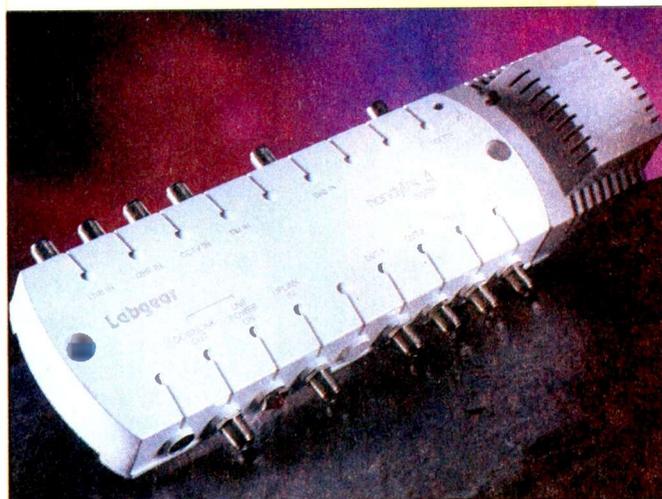
## Cable TV Update

Telewest is the second cable TV company (after CWC) to launch a digital TV and radio service, which it calls Active Digital. The package includes 150 TV and radio channels, with fifty channels dedicated to first-run movies, starting every quarter of an hour. Telephone rental is also available. Interactive services and fast internet access will be offered next year. By June 2000 the company expects Active Digital to be available to 90 per cent of its subscribers. Video-on-demand could be added to the network next year following a trial involving 20,000 households. NTL's digital cable TV service will be launched in the first quarter of 2000.

Kingston Communications has launched a cable digital TV service, Kingston Interactive Television (KIT), in the Hull area. It's the first in Europe to be based on ADSL phone-

line technology, which enables video-on-demand, internet access and interactive TV to be provided via copper-wire pairs. Initially 1,500 customers will receive the service: by next summer it will be available to all 155,000 subscribers in Hull and East Yorkshire. The distribution system, provided by Newbridge Networks, combines ATM (Asynchronous Transfer Mode) switching, ADSL (Asynchronous Digital Subscriber Line) technology and IP (Internet Protocol) routing at data rates up to 4.5Mbits/sec.

In a joint venture with nGame Ltd. NTL is to offer high-speed, multi-player TV gaming. It will be provided via NTL's interactive Games Channel, which is currently available as part of the company's TV-internet service. NTL's interactive channels will also be available via digital cable networks and digital terrestrial TV.



Labgear has launched the Handylink 4 digital remote control extender (RCE) and distribution amplifier system. This addition to the Handylink range has been introduced to meet the need for an integrated home distribution system with infra-red remote control extension capability. It's compact, simple to install and can reduce unsightly wiring on the outside of buildings.

Handylink 4 digital enables the householder to distribute digital and analogue satellite and terrestrial TV and radio, also VCR, signals around the home and control equipment from any room. An additional signal, e.g. from a security camera, is also available at all outlets via an auxiliary input. The infra-red interface is achieved using either a Labgear Handylink RCE unit or a SkyDigital 'TV Link' remote eye to control a digibox. Location is normally in the loft.

The system is available from TV aerial equipment suppliers and major UK electrical distributors. For further details of the new system call Labgear on 01223 366 521. Alternatively fax 01223 316 483 or e-mail sales@labgear.co.uk

## König's TV Classic Handsets

König Electronic is developing a range of TV remote control units to replace the handsets produced by particular setmakers from 1988 to the present. The aim of the TV Classic range is to enable engineers and retailers to provide quality replacements without having to stock a vast number of units. The first setmaker to be covered is Toshiba: 19 König remote control units will replace 111 original Toshiba ones. RC replacements for Sanyo units will be next, followed by other popular brands

such as Panasonic, Philips and Sony.

Advantages of the TV Classic range are: full compatibility with the original handset; no need for programming – the product works straight from the box; easy-to-use look-up tables both on card and on the www; each handset is based on the original design. Remote control units and look-up cards are available from König Club members and stockists. The web site address for cross-reference information is

[www.konig.co.uk/tvclassic](http://www.konig.co.uk/tvclassic)

## Satellite News

Astra 1D is being temporarily moved from 19.2°E to 28.2°E to provide extra digital capacity for SkyDigital's services and back-up for Astra 2A. The relocation will have no effect on current analogue and digital transmissions from 19.2°E. An identical procedure was carried out between February and October 1998, prior to the launch of Astra 2A, to enable test transmissions to be made. The reason for the relocation is a delay in the launch of Astra 2B until the second quarter of 2000. This delay is believed to have been caused by problems with 2B's solar panel construction. Two more satellites, Astra 2C and 2D, are to be placed in orbit at 28.2°E before mid-2001.

At mid-1999 Astra services were being received by 7.43m homes in the UK and a total of 76.97m in Europe. According to Eutelsat 81.1m homes in Europe are receiving transmissions from the Hot Bird satellites at 13°E, 24m via dish and 58.2m via

cable networks (the total figure is not the simple addition of the satellite and cable figures as some viewers choose both options in order to maximise the number of channels available). This is an increase of 10m during the past year. The viewer survey was conducted independently by various research institutes.

Hot Bird 6, which is due for delivery and launch in the last quarter of 2001, will include Ka-band and Skyplex payloads in order to meet the growing demand for digital broadcasting and interactive services. Skyplex is Eutelsat's on-board multiplexing facility, which is already used by two Hot Bird satellites. Hot Bird 6 will have seven operational Skyplex units. Capacity will be available in 2 to 6Mbits/sec slots with up to 18 carriers per transponder. The four-transponder Ka-band payload will provide SOHOs and small businesses with fully interactive IP and DVB services via a 60cm dish. Micro-broadcasting will be possible by combining Ka-band and Skyplex operation.

## DVD Update

Hitachi, Matsushita (Panasonic) and Toshiba have announced plans to launch DVD video recorders based on the DVD-RAM format. This enables up to 120 minutes of MPEG-2 video to be recorded on a single-sided 4.7Gbyte rewritable disc. Panasonic showed a DVD-RAM video recorder at the Japan Electronics Show in October. Samsung demonstrated a DVD-RAM recorder at the Korea Electronics Show in the same month: it uses a combination of Samsung and C-Cube technology.

The Philips Model DVD750 video player has a new optical drive system and upgraded interactivity. Interactive features include a three-setting zoom mode, freeze and slow motion, enabling the viewer to enlarge and customise the picture. The drive mechanism has twin lasers for optimum playback with all types of disc, including audio and video CD, CD-R and, for the first time, CD-RW. A 3D virtual surround mode provides a surround-sound effect without the need for additional speakers. MPEG-2, Dolby Digital (AC3) and DTS (Digital Theatre System) encoded discs can be played.



# Satellite Notebook

Reports from  
**Pete Haylor**  
**Hugh Cocks**  
**Christopher Holland**  
and **Chris Watton**

## Digital Faults - 2

Those who read my piece in the November issue about a digital reception fault where the installation had been taken to a new address might like to know how the saga developed. The customer phoned me again about two weeks later to say he had been told that "Sky says the dish is probably out of alignment and this is causing the loss of signal". I like their long-distance fault-diagnostic skills! I told him that, as the LNB had not been replaced, if the fault was still the same a charge would be made.

As expected, when I checked the dish I found that it was correctly aligned. The LNB was still faulty: reception was OK when a temporary replacement was fitted. At this point the customer had to decide whether to let me fit a new dish and LNB or wait until I could find a new LNB to fit his dish.

He decided that a new dish/LNB was the best option as he had been without a properly working system for several weeks. This was done, and everything worked well. He paid me, even though the system was still less than a year old. If you recall, Sky wouldn't replace the faulty LNB because I had fitted the system at the new address.

The next problem I have is with a customer who has a faulty receiver. I cannot get a replacement as the local suppliers have no stock!

I work for myself and endeavour to give my customers a better than average service, being available on the phone from 8 a.m. to 10 p.m. seven days a week and always arranging a timed call to suit their needs. But this 'digital revolution' is showing its snags. I hope the problems will be only temporary.

What will the trade do when the receivers and LNBs start to fail? As it's 'free', will the receiver be replaced make-for-make or repaired? What if the customer wants to keep the same make? Why aren't the dishes compatible, so that any make of LNB can be fitted? Will Sky end up controlling all aspects of this trade? P.H.

## Snowy Sky News

A number of customers have complained that the analogue Sky News and Sky 1 channels have become a little snowy. All other channels are noise-free. Sky News and Sky 1 remain on the original Astra 1A satellite, which has been in use for over ten years. Eurosport and MTV, which were originally on transponders 4 and 13 respectively, transferred to Astra 1C a couple of years ago - their frequencies remain exactly the same. Recently the German channels that were on 1A have transferred to 1F. Digital channels that were previously transmitted by 1F have moved to the new 1H satellite, making space for channels from 1A.

The cause of the poor quality with Sky News is that it's surrounded by adjacent signals, with opposite polarisation, from 1F, whose signals are much stronger (6dB or more here in southern Europe) than those from 1A. This effect isn't seen in northern Europe, where the signals are of similar strength.

LNB polarisation skew is now very touchy and critical here to be able to null out the much stronger, oppositely-polarised, German signals. Previously the horizontally-polarised signals from 1A were of almost non-existent strength here. I

now find that achieving perfect polarisation null is almost impossible with some installations.

When, with such installations, I have opened the LNB's plastic cover and checked on the angle of the vertical and horizontal pickup probes I have often found that they are not perfectly aligned - this is readily visible. Bending the probes back fractionally to their correct position produces much better polarisation nulling. This adjustment must be done with a non-metallic tool, as the probes are DC-coupled to the GaAsFET input amplifier stages, which are prone to damage from static charges.

Some older receivers also suffer from adjacent-channel interference problems with Sky News because there are approximately 6dB stronger channels with the same polarisation above and below it. A slight improvement can normally be obtained by tweaking the AFC centring potentiometer - particularly with Drake models.

At the time of writing, Sky 1, Sky News, Granada Plus, National Geographic TV and Sky Box Office 3 are the only channels transmitted via 1A. It's possible that they will remain on 1A for some time longer now that the German channels have left. The satellite's power drain will be much lower than before, and this may extend its life. H.C.

## Digibox Solar Outages

We've just been through another period when the sun tracks across the geostationary satellite arc. This happens twice a year, but we now have to contend with its affect on digital reception.

The effect on the picture is that

it breaks up into squares for a few minutes, while the sound can intermittently cut out – the effect is not unlike that produced by a heavy rainstorm!

Fortunately most customers don't watch TV just after 10 in the morning when the 'eclipse' happens, over the course of a few days, but a couple of anxious people did call in to ask about it. One digibox managed to lock up with the message 'searching for listings, please wait' on the screen. The simple cure is to unplug the digibox from the mains for thirty seconds or so then power it up again. **C.H.**

**New SkyDigital Channels**

The channels shown in Table 1 have been added to the SkyDigital package since my listings in June and October. The current EPG (Electronic Programme Guide) software is 2.5.12 or 2.5.12\* depending on receiver model.

EPG channel 673 is Phoenix Chinese News and Entertainment (formerly CNE). It was at this frequency before but wasn't listed in

the EPG – you had to install it via the 'add channels' menu.

The music choice soundtrack channels have been moved from 11.778GHz V (the receivers' default frequency) to 12.188GHz H. Only the EPG background music is transmitted at 11.778GHz, and the ITV identification (EPG no. 103).

For Box Office channel nos. remove the 7 from the EPG no. **C.H.**

**Amstrad SRD500**

This receiver would either fail to start up, would start up then go dead, or would run for a few hours then lock up with silly things displayed in the LED readout. I started by fitting the service kit, but this made no difference. Eventually I replaced all the components on the power supply panel except the transformer. Not actually all that many items, mostly costing only a few pence. The fault was still present however, the culprit being the transformer. Fortunately I had a scrap 520 panel, and the part number was the same. **C.W.**

**Table 1: New SkyDigital Channels**

EPG No.	Channel name	Freq. GHz	Pol
312	Sky MovieMax 5	12.266	H
480	Sky Business	12.246	V
519	S4C 2	12.129	V
539	N. Geographic TV (one hour delayed)	12.304	H
605	Nickelodeon Replay	12.304	H
606	Nick Junior	11.895	V
611	Fox Kids Plus	12.266	H
667	Bollywood 4U	12.129	V
673	PCNE	11.758	H
676	Zee TV	12.129	V
678	Music Asia UK	11.973	V
679	Pakistani Channel + Bangla TV	11.973	V
682	Asia 1 TV	11.973	V
685	Minaj TV (currently on test card)	11.973	V
691	Christian Channel Europe	12.090	V
694	Inspiration Network	12.129	V
751	Sky Box Office 18+ 1	12.304	H
752	Sky Box Office 18+	12.304	H

754, 755, 756, 757, 758, 765, 766, 767, 768 various new Box Office channels at 12.304H and tests at 12.363V

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# Servicing

## the Grundig G1000 chassis

**The G1000 chassis has a fairly predictable fault record and is reasonably easy to tackle and repair. Colin J. Guy summarises his experiences with these sets. They provide good performance and reliable operation once faults have been cleared**

**T**he Grundig G1000 chassis is used in a number of 14, 20 and 21in. models that were sold under various brand names, including Alba, Bush, Grundig and Matsui. There are versions with teletext and/or Nicam stereo sound: non-UK Zweiton stereo sound versions also turn up from time to time (I live near a large RAF base).

For some reason that I cannot understand, many engineers dislike the chassis. But it's simple and well laid out, and makes the best use of digital and analogue circuitry as relevant. The PCB can easily be slid out of the cabinet and stood on the bench vertically for servicing: to do this, it's only necessary to disconnect the degaussing coils and unclip the mains lead. A bonus for field engineers is the fact that the sets, compared with many, are light in weight. As with many other chassis, the Achilles' heel with this one is the poor quality of the soldering. Provided all dry-joints are attended to, reliable repairs are easy to carry out.

Apart from the microcontroller chip, the ICs used are industry standard ones that are readily available from the usual sources. A reasonable manual is available at under £6 and is well worth having if you are going to service more than an occasional set.

### The Service Mode

The service mode is entered by holding down both P+ and P- at the front of the set while switching on the mains supply. The service menu is then displayed across the bottom of the screen as "G L V H R G B A" (see below). To select an adjustment, press V+ and V- at the front of the set simultaneously or "menu" on the remote-control unit. To carry out the adjustment, press P+ or P-. The settings are stored automatically when you move to another adjustment. To leave the service mode, press V+ or V-, or TV on the remote-control unit. The service mode adjustments are as follows:

- G** Adjust the first anode control on the LOPT so that neither a red nor a green square appears on the screen.
- L** Vertical linearity.
- V** Height.

- H** Horizontal shift.
- R** Red background.
- G** Green background.
- B** Blue background.
- A** Tuner AGC.

Adjust the RGB backgrounds with the P+ and P- buttons for a correct grey scale.

### Power Supply

The power supply circuit is shown in Fig. 1. It's based on a UC3844 control chip (IC100) that drives a bipolar chopper transistor (TR100). Various types of chopper transistor have been fitted: the Motorola MJF18024 is the official replacement, but a BU508 works well and the PCB has holes that are large enough to take this device.

In some models the mains fuse is a Wickman type rated at 1A. It seems to fail for no reason and was upgraded to 1.6A (2.5A in stereo models). Other sets have a conventional fuseholder and fuse instead.

Stereo sets have slight differences on the primary side of the circuit and additional components on the secondary side to supply the audio stages, see Fig. 2. These differences are detailed in the stereo manual. The chopper transformer differs with CRT size and whether the set has stereo sound. I've yet to come across a faulty chopper transformer.

The power supply seems to be generally reliable. If the chopper transistor is short-circuit, check carefully for dry-joints around it, the snubber network components and the line output transistor, which might also be short-circuit. You might find that R113 and/or R114 is high in value or open-circuit when the chopper transistor has failed. The IC seems to survive. Here are some power supply faults you could encounter:

**Power supply runs in standby but trips when the set is turned on:** Check whether D108, a surface-mounted 2.4V zener diode, is open-circuit. This may occur after failure of TR100.

**Power supply pulsing:** R113 or R114 could be open-

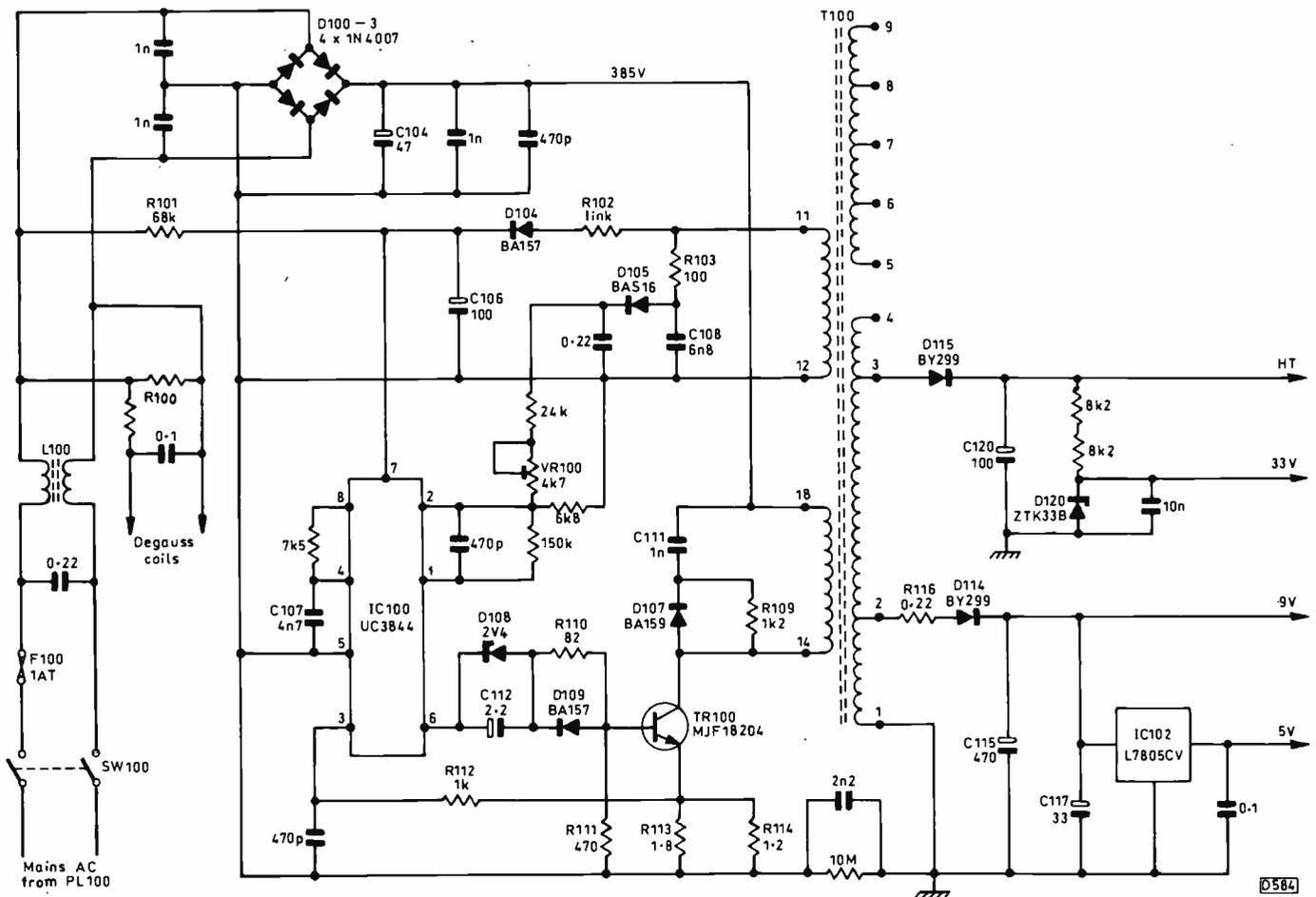


Fig. 1: The chopper power supply circuit used in mono-sound versions of the Grundig G1000 chassis.

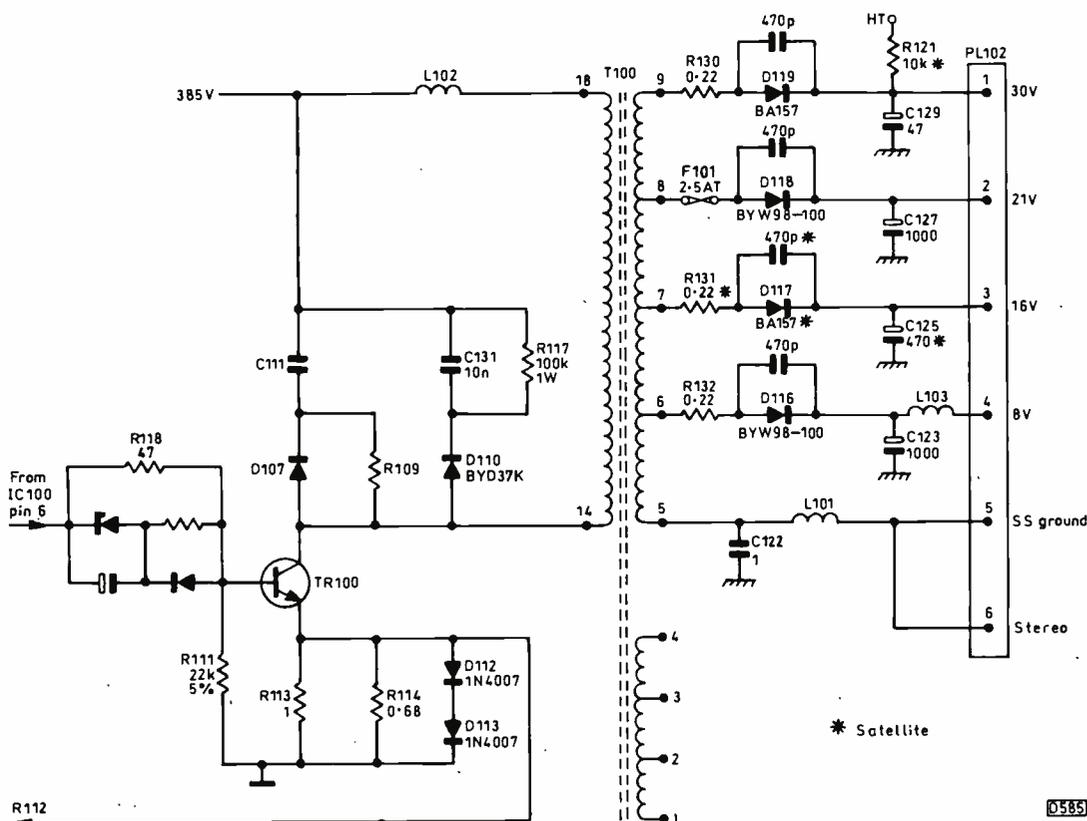


Fig. 2: Main power supply differences in stereo models. In addition:

C104 is 100µF  
C107 is 3.3nF  
C108 is 4.7nF

D105 is type LL4148  
D114 and D115 have parallel protection capacitors, 1nF and 470pF respectively

F100 is 2.5AT

VR100 is 6.8kΩ

Pin 8 of IC100 is decoupled by C140 (10nF)

\* Satellite

circuit or the LOPT may have failed. To prove the latter point, disconnect the line output transistor and check with a 60W bulb as a dummy load.

**Intermittent mains fuse blowing:** Replace the degaussing resistor R100.

**Set dead, 300V present across C104:** C106 (100 $\mu$ F) could be low in value or IC100 internally shorted.

**Power supply pulses a few times then stops. May start after several attempts:** C104 (47 $\mu$ F, 400V) low in value/has high ESR.

### Line Driver and Output Stages

These are simple and conventional. There are some component value variations depending on the type of tube fitted. LOPT failure is quite common: the usual symptom is power supply tripping. Check by disconnecting the line output transistor and fitting a 60W bulb as a dummy load. Note that several different types of LOPT, which are not interchangeable, are used: order by model number.

If the set is dead with the power supply working, check R314 (6.8k $\Omega$ ) which tends to go open-circuit, removing the supply to the line driver stage.

This area suffers badly from dry-joints. Check the following carefully: the LOPT's pins, the driver transformer T311, the connections to the scan coil socket, C301 (scan coupling) and the output transistor TR302.

### Field Timebase

A TDA8170 chip (IC200) drives the field scan coils. Dry-joints at its connections are a common cause of intermittent field collapse (symptom is no raster). For flyback lines on the screen, check whether C201 (220 $\mu$ F) is low in value. If the set is run for long in this condition IC200 may be destroyed with R200 going open-circuit.

### Signal Stages

A conventional (not frequency-synthesis) tuner is used. Its output is taken to an STV8224 chip (IC400) which provides IF amplification and demodulation, FM sound demodulation, AGC and AFC, volume control in mono sets, and switches the audio and video to and from the scart socket. Stereo models have a separate SAW filter and TDA4445 chip (IC600) to process the Nicam signal.

The only problems I've had in this area have been tuning drift and a noisy picture, the latter after a nearby lightning strike. Both faults were caused by the tuner. Although the manual includes a circuit diagram for the tuner, repair is not really viable, replacement being the only reliable cure.

### Audio Amplifier

Mono sets have a TDA2822M audio chip (IC550) to drive the rather puny speaker. No sound usually means that R550 (4.7 $\Omega$ , fusible) has gone open-circuit. This often happens for no apparent reason, though there have been cases where an owner has attempted to connect an external speaker to the set. I express my view about this in no uncertain terms. The IC itself seems to survive this treatment.

A common fault with these sets is noise on sound when the volume control is set at minimum. The noise originates in the IF chip IC400. If a customer complains about it, increase the value of R556 in the audio chip's input coupling circuit. A corresponding increase in the volume control setting is required.

### Video and Chroma Processing

IC800 (MC44007) provides video and chroma signal processing. It also carries out sync separation and generates the line and field drive signals. There's a sandcastle pulse output at pin 31. Sony and Sharp also use this chip. Colour decoding is carried out in conjunction with a separate MC44140 digital delay line chip (IC801). The colour, brightness, contrast and picture geometry control settings from the microcontroller chip IC500 are fed to IC800 via a conventional I<sup>2</sup>C bus.

A peculiarity of this chip is that it can produce a line drive output at twice the line frequency, and does this unless it's told *not* to by the microcontroller chip. The symptom is most confusing: a narrow, unfocused raster, with the line output transistor running hot. If you get this condition, don't condemn the LOPT or the line scan coils: check the frequency of the drive waveform first, then check the I<sup>2</sup>C bus lines for low resistance to earth. The microcontroller chip is the usual cause of this fault, but I've also known the teletext chip to be the cause.

Line-frequency pulses are fed to pin 13 of IC800. They come from TR300 (BC847), which receives its input from the collector of the line output transistor via two 220k $\Omega$  resistors, R302 and R303. When these pulses are missing the raster will be blanked out. Here are some faults I've had in this area:

**No picture, teletext OK:** The video input coupling capacitor C840 (0.1 $\mu$ F) was leaky. It's connected to pin 2 of IC800.

**Intermittent picture, odd colour effects, etc.:** Can be caused by the 17.7MHz crystal which is connected to pin 33. It may be dry-jointed or defective.

**Peculiar colour:** There was no supply to the CCD delay-line chip IC801 because R831 (47 $\Omega$ ) was open-circuit. This was in turn caused by C834 (10nF) being short-circuit.

### RGB Output Stages

The RGB output stages are mounted on the tube base panel and have proved to be reliable. An auto grey-scale signal generated by the emitter-follower transistors TR903-5 is fed back to pin 20 of IC800.

A bright, blank raster followed by tripping is often caused by loss of the 180V supply to the CRT base panel. You will almost certainly find that R315 is open-circuit. It's a safety resistor whose value depends on the CRT size. I've found no reason for the failure of R315.

### Teletext

In common with many other sets, teletext models have a Texas CF70095 or CF702000 text processor and a CF72306 data slicer/timing generator chip. They are very reliable. For no text, check TR653 (BC847) which could be leaky and for dry-joints at XT650 (13.875MHz crystal). Dry-joints here can also cause an erratic or frozen text display.

If one colour in the teletext display is missing, check TR650/1/2 (BC847) as appropriate for leakage. These transistors are not fitted with Eurotext (CF702000) versions).

### The Microcontroller Chip

The ST6365 microcontroller chip IC500 carries out the following operations: on-screen graphics generation; tuning voltage generation; non-volatile storage of tuning information, customer control settings and service settings; AFC; remote-control command decoding; and

communication with other ICs via the I<sup>2</sup>C bus. An 8MHz ceramic resonator provides it with clock pulses, and a reset pulse is applied to pin 33. Check these two points before condemning the IC.

The microcontroller chip can be responsible for many symptoms: a dead set; no sound; a red, green or blue raster (one OSD output high); odd or even channels missing; and the peculiar twice line-frequency drive mentioned earlier. It's worth keeping this IC in stock if you service many of these sets, as substitution is the easiest way of checking it.

One other fault I've had in this area is when the microcontroller chip won't initialise. The cause has been corrosion of the tact switches at the front of the PCB. My guess is that some customers clean the set's screen with Windolene or a similar product: some of it runs down the front of the CRT and then drops on to the PCB below, where it continues to do its dirty work unnoticed until a fault occurs!

### Nicam Sets

Stereo sets have an additional PCB that contains an MSP3410 IC. This chip can demodulate FM, dual-channel (Zweiton) and Nicam sound (European sets are fitted with an MSP3400 chip that doesn't include Nicam). The intercarrier input signal is fed to pin 58, the IC is controlled by I<sup>2</sup>C lines at pins 9 and 10, reset is applied to pin 24 and an 18.432MHz clock crystal is connected to pins 62 and 63. An 8V supply derived from the chopper transformer is fed to pin 39 via an RF filter. IC3 produces a regulated 5V output from the 8V supply: the fil-

tered 5V supply is fed to pins 18 and 57. In standby this supply is switched off by TR4 to reduce the power consumption. There are no circuit adjustments, as all processing is carried out digitally. Volume, treble and bass adjustments are carried out in the MSP3410 chip with control via the I<sup>2</sup>C bus.

This PCB also houses the TDA2615 audio output chip IC2, which supplies 6W + 6W RMS to the better speakers fitted in stereo models. IC2's 21V supply is derived from the chopper transformer. TR7, which is connected to pin 2, mutes IC2 in standby. There are no external speaker sockets: this tempts some users to try connecting additional speakers directly across the internal ones, the usual consequence being that IC2 dies.

If there's no sound though the output stage is operational, check the 8V and 5V supplies first then the reset and I<sup>2</sup>C signals. If these are all OK, it's likely that the MSP3410 chip has expired. Unfortunately this chip is very expensive. The MSP3410 chip can also be the cause of poor-quality sound, whistling/heterodyne noi-ses etc.

For no output at all, check fuse F101 in the power supply. If it has blown, IC2 may be short-circuit – see previous comments about external speakers.

### Conclusion

These sets are easy to repair and are capable of providing excellent results. Provided careful attention is paid to poor soldering, reliability will also be excellent.

Manuals and spare parts are available from Willow Vale Electronics (01189 876 444, fax 01189 867 188).

**C**ongratulations to brown-goods distributor JJ Components which celebrated its tenth anniversary in September. The company started back in 1989 at simple premises in North London, selling replacement spare parts to TV and video engineers. From the beginning JJ sold König Electronic spares, aware that supplying quality replacement parts would help in establishing a secure base of regular customers. This approach has proved itself: three years ago JJ Components bought and moved into new, larger premises and has not looked back since. Jay Popat, the proprietor, now operates a trade counter for local engineers to give them a same-day service. He uses this as a base to launch new products. Last year's catalogue was the biggest to date – and was all done in house.

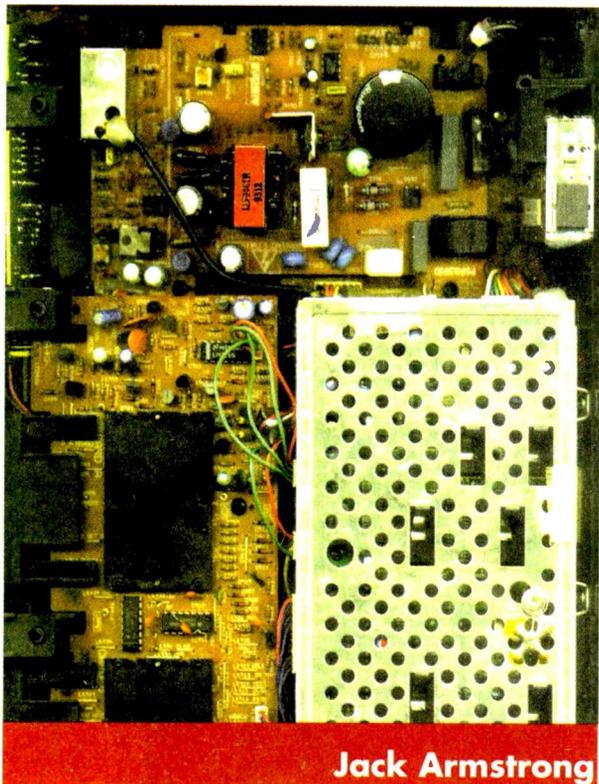
To celebrate his ten years in business, Jay is offering holiday vouchers to all customers who place orders over certain values. TW Electronics (Newbury) Ltd., the UK distributor of König products, is sponsoring pens which Jay will be supplying to his loyal customers.

To receive details of JJ Components' ten-year celebration offers, or a copy of the latest catalogue, contact the sales desk on 0208 205 9055.



Martin Lamb (right), Marketing Manager of TW Electronics, offers his congratulations to Jay Popat, proprietor of JJ Components.

# Satellite WORKSHOP



## Pace MSS100

This receiver arrived with a report that said "intermittent blue screen/no signal". D18 in the 12V supply had a bad solder joint so I fixed that and left the receiver on test overnight. Next day it was still working fine but, by afternoon, I noticed that there was a very pronounced interference pattern on the picture. It consisted of wavy coloured lines that ran down the picture – about twenty lines across the screen, each with three or four curves along its length.

When the receiver was unplugged and then repowered the interference disappeared, but it returned as a great number of fainter horizontal lines, about 2mm apart. The pattern would change quite suddenly, jumping from almost no interference to the pattern described initially. It was present on all channels, and could even be seen on the encrypted channels, on top of the mess of black and white lines. It was present with the TV and VCR scart connector outputs and, slightly

softer, with the RF output.

Use of a hairdryer revealed the cause of the interference – the 7812 regulator U3 at the front left corner. It already had a 10 $\mu$ F electrolytic capacitor strapped directly across two of its legs. I had measured the ESR of this capacitor and found that it was OK. Fitting a 1 $\mu$ F, 50V multilayer ceramic capacitor instead cured the fault.

These regulators are prone to parasitic oscillation and it was well known, at least in my design days, that an electrolytic capacitor has the wrong impedance characteristics to damp such oscillations reliably. We used to fit tantalum bead capacitors for this purpose. I imagine that a 1 $\mu$ F (or higher) tantalum capacitor rated at 25V would have done the job quite nicely, but I happened to have the 1 $\mu$ F/50V MLC type in stock.

## Nokia Mediamaster DVB9600

This is a sad tale with an unhappy ending, so you might want to get your tissues out now. For reasons unknown, the owner of this expensive digital satellite receiver had decided to screw something to the top cover. That might have been all right, but for the fact that one screw touched the heatsink on the TOP202 power supply IC. The receiver then died spectacularly.

The mains input filter was destroyed, and bridge rectifier diode DS04 (1N4007) had gone short-circuit. Fortunately the mains filter from an old Thomson SVA1 Sky Decoder fitted perfectly. I then replaced the rectifier diode, the TOP202 chip (KS01) and made several checks before I stood well back and plugged in.

The power supply sprang to life, producing 5, 12 and 25V outputs. There was no front panel display however, and nothing seemed to function. At this point I decided to cut my losses, since I have no service manual and not the slightest chance of discovering the cause of the trouble. It's quite possible that in its death throws the power supply had driven a massive voltage spike through all the ICs.

I think that the cost of repairing these digital receivers is going to be very high – assuming that it's actually possible. If anyone out there is able to offer a repair service, please let me know!

## BT SVS250/260

When one of these receivers had been in operation for about an hour a humming noise came from the TV set's speaker. The picture remained perfect. Use of freezer spray revealed the culprits, which were the two diodes D405/6 at the rear right of the lower PCB. It's best to replace them with the higher-rated BYV95A type.

## Grundig GRD200

I had to go out to deliver a receiver and, when I returned, I found a GRD200 resting inside the porch. With it there was part of a cigarette packet on which a note had been scribbled. It read "dead, collect later, Dennis". I should explain that Dennis is a local aerial installer who has no concept of thieving ways. He is so trusting that he will leave his wallet on the bar. Only once has he had anything stolen. He blamed the jackdaws for that!

When I connected the receiver to the mains supply it failed to light up. Quite often with these Grundig GRD series receivers all you have to do is to replace the fuse. The design is excellent: the fuse usually protects the power supply from mains spikes by melting. Sure enough, the fuse wire had melted and all the other components in the area were OK. So I fitted a new fuse and was rewarded with the green standby LED segment. Unfortunately the receiver was stuck in standby and wouldn't respond to button presses.

Fearing the worst, I came to the conclusion that this fault had also been caused by the mains power surge. Consequently I replaced the EEPROM, then the microcontroller chip and after that the tuner. They are all connected to the serial data bus. The job is made more difficult because Grundig produced several batches of these receivers in different ways. This one had two

SDA2526 EEPROMs with links 603, 604, 609 and 610 fitted. The only pre-programmed EEPROM I had was in a scrap GRD200 which had a 24C16 and no wire links. Despite replacing these items the receiver stubbornly refused to come out of standby. I also checked, without success, for broken tracks near the tuner. This was a common problem in earlier GRD150 and GRD250 models.

I then decided that the fault had nothing to do with the melted fuse, and that its cause was probably so simple I would kick myself. It's very common for crystals to fail in GRD receivers, so I replaced the 12MHz crystal next to the microcontroller chip (these parts have no silk-screen markings on the PCB). The fault was still present. On a whim, I connected my monitor TV to the receiver via a scart cable – and was rewarded with a scrambled Sky picture from all three outputs. Interesting, since the receiver was supposedly in standby! It should not have been routing video through the STV0030 chip mounted beneath the board. I placed my finger near this IC and the screen went blank. That rang bells in my head. I remembered seeing this previously, replaced the 4.433619MHz crystal X3 and reapplied power. Yippee!

When Dennis returned I said, all

innocently, "receiver, what receiver?"

"The one I left in your porch!"

"Don't know about that" I grinned, "reckon someone must have pinched it."

#### **Pace MSS508IP**

The reported symptom was no signals. When I checked the receiver a blue screen that confirmed this appeared. The LNB voltage was present, and tuning right through the band made no difference. So I pressed F then Store to toggle the blue-screen generator off. This produced a completely blank screen with no evidence of a video signal at all. Audio was present however, and I could get scrambled Sky pictures and flickering German channels from the decoder scart socket. I had seen this symptom before, and wasted twenty minutes on guesses: first that the ceramic resonator was faulty, then that the 1µF capacitor next to it was defective, and finally that the PTV111 sync separator IC had failed.

As these items were all OK I decided that it would be a lot quicker to find the cause of the fault properly! A scope check at pin 14 of the PTV110 chip showed that there was no video signal at the input to the decoder circuit. Q62 (BC846B) is the buffer transistor here, so I checked for

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

<http://www.ukstay.com/jack>

If you have no Internet access you can write to him c/o Television, Room L302, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS. Please enclose two first-class stamps.

signal at L19 which precedes it. The signal was fine. A new BC846B cured the fault. So much for guesswork!

#### **BT SVS250/260**

One of these receivers would switch off after two minutes. Prior to this the picture was OK but there was severe hum on sound. The cause of the trouble was the 6V regulator on the top heatsink. It's best to fit the replacement on the main heatsink. The two rectifier diodes at the rear right corner of the main board can also produce these symptoms. Replace them with type BYV95A.

If the fault is no field sync when cold – also, in severe cases, no decoder messages – replace C166 (220µF) on the main board.

## Test Case 444

The electronic circuitry in modern VCRs is very reliable, which is just as well in view of the difficulty one has in gaining access to the PCB and its components in many current designs. In some models, where skimpy plastic parts that are not man enough for the job are used, the reliability of the deck mechanics leaves a lot to be desired. Which aspect was the cause of the following problem?

One bright day a few months ago a very modern VCR confronted Sage on his bench: in fact it was still under guarantee, having been out on rental for about seven months. The reported symptom was a "rolling picture" and, yes, when the machine was set to play with a known-good tape inserted it produced a very poor picture. Not only did it roll, but the top of the picture had a very ragged appearance, similar to mistracking. Plainly the signal coming off the tape was poor!

Sage hooked up an oscilloscope to check the playback FM signal. The trace, triggered by the SW25 flip-flop waveform, showed an FM envelope that was of low amplitude generally, particularly at the beginning of the scan – the signal dipped at the start, then again about 3msec later. Hence the picture rolling: the field sync pulses are recorded at the start of the head scan, and were in this case being almost obliterated by noise.

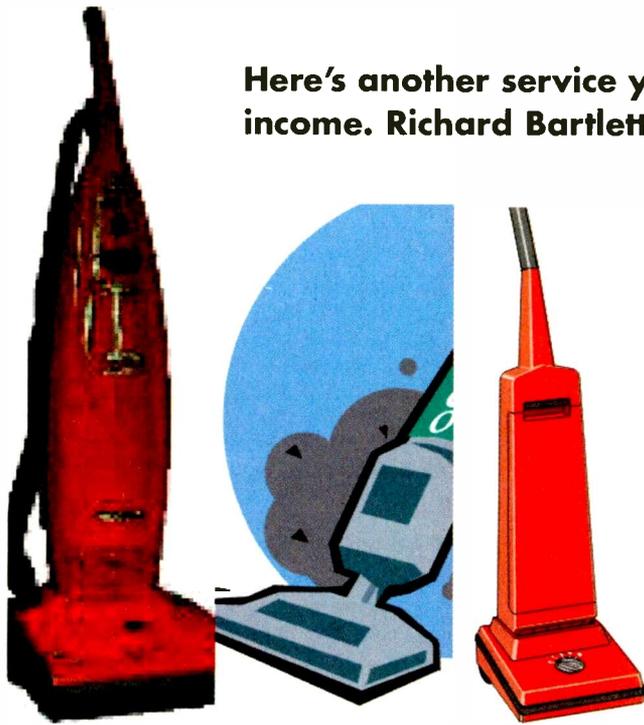
Sage, who is no stranger to VCR faults, started by cleaning the deck then inspected it and checked the setting of the back tension. Insufficient tape tension is a very common cause of this symptom – but not on this occasion! The setting was very

nearly correct, and its exact adjustment made no real difference to the fault condition. The setting of the tape entry guide was next checked, by careful adjustment while playing a good tape. Once more no real improvement was seen. What else could be responsible? The next suspects were the video heads, but Sage was reluctant to condemn them in view of the newness of the machine – it would have to be wear rather than a fault, as the output from both heads was the same.

Record-then-playback tests produced even lower and poorer signal envelopes, so Sage ordered a new video head assembly. In this model it comes as a complete unit, lower drum and all, at a net trade price of some £89 – not far short of the trade price of a new machine. But no matter, as this one was under guarantee. The drum came, was fitted, and completely cured the problem. A claim was made under guarantee, and the manufacturer duly paid. That, it seemed, was the end of that.

But it wasn't! About six months later the machine, now just out of guarantee, came back with exactly the same symptoms as before: loss of field sync and the top of the picture marred by noise, both worse with own recordings. Sage went through the same motions as on the first occasion and came to the same conclusion: worn or faulty heads. He decided to consult the technical department of the manufacturer concerned, and related the whole story to the man at the other end of the phone. The consultant had little doubt about the cause of the problem, and was dead right! What ailed the machine? For the solution, turn to page 119.

Here's another service you can offer to bring in extra work and income. Richard Bartlett explains the general procedure



# Servicing Vacuum Cleaners

**D**uring these hard times in the TV/video servicing trade, when it is so often more economic to replace equipment than repair it, you might as well give anything a try. Vacuum cleaners for example.

Should you add these to your repair repertoire you will find that you often get calls to say "my vacuum cleaner isn't working properly - the brushes aren't turning". If the bag has been emptied fairly recently there may be a blockage somewhere or the drive belt may have snapped. But if a strong electrical burning smell is evident the motor may have burnt out, in which case repair may be uneconomic.

The brush-roller type of vacuum cleaner is a bit more complicated

*"... my vacuum cleaner isn't working properly - the brushes aren't turning."*

than a suction only type. The original brush-roller type of cleaner was the Hoover, but others subsequently became available, such as the Electrolux 550. It's all too often assumed that occasional bag emptying is all that's necessary with these cleaners: periodic maintenance is also required however.

## Preliminaries

In the interests of electrical safety, first remove the mains plug from the wall socket. Turn the vacuum cleaner on its side, or upside

down, and place it on a bench or table for easier access. A rubber mat or soft newspaper on the table top will protect the cleaner - and the table - from becoming scratched.

It should normally be possible to rotate the brush-roller by hand. If the roller revolves with little or no resistance, the rubber drive belt has probably broken or stretched and needs replacement. If, on the other hand, it's difficult or impossible to rotate the brush-roller, something is likely to be jamming it - quite possibly an excessive accumulation of dust and dirt. Remove the brush-roller cover plate to examine inside. The plate is usually held by two white or chrome screws at either side. It can be hinged away once these screws have been removed. Don't attempt to remove the suction pipe from the cover plate. It might get damaged, and anyway does not need to be removed.

If this normally hidden area of the vacuum cleaner hasn't been cleaned out for some time, the whole area will probably be blocked with plugs of dust and dirt. Pick out the plugs of dirt with a small screwdriver or similar tool and a brush. Use of another vacuum cleaner to suck out the dirt will help stop it flying around.

## Servicing

If the belt is broken or damaged a replacement will be needed: belts can normally be obtained from a builders' merchant or hardware

/electrical shop. The brush-roller must be taken out to fit the new belt. Remove the cover plate then slide the roller from the groove at each side (some models require a different procedure).

It's a good idea at this point to clean out and lubricate the brush-roller bearings at each end of the roller. Gently pull off the roller's two end caps. The bearing at each end has a rubber cover cup which will either have come off with the end cap or will still be fitted over the bearing. Remove any dust and dirt from the bearing cavity at each end of the roller, then place a drop of thin oil on the bearings. Any excess oil should be removed with a rag. Refit the rubber bearing cover cups and metal end caps.

Push the brush-roller through the belt, with the latter properly fitted around the motor pulley, then refit the brush-roller by sliding the end caps into the grooves at each side - make sure that the rounded end of the cap goes in first.

The brush-roller should now turn fairly easily, with a certain amount of resistance (from the motor). Refit the cover plate and replace the screws. Don't over-tighten them.

## Final Test

With your fingers well clear, switch the vacuum cleaner on. It should burst into action, with the brushes turning very fast. You can then congratulate yourself on a repair job well done!



## Line Output Transformers

Part No	Code	Price
<b>ALBA</b>		
3714002	LOT02	1200p
043714002J	LOT02	1200p
43700000	LOT02	1200p
<b>AMSTRAD</b>		
3714002	LOT02	1200p
043714002J	LOT02	1200p
43700000	LOT02	1200p
<b>FERGUSON</b>		
06 D-3-084-001	LOT23	1100p
06 D-3-087-001	LOT23	1100p
<b>HINARI</b>		
3714002	LOT02	1200p
043714002J	LOT02	1200p
43700000	LOT02	1200p
<b>HITACHI</b>		
2424593	LOT44	900p
2433751	LOT01	1300p
2433752	LOT01	1300p
2433891	LOT23	1100p
2433893	LOT23	1100p
2433952	LOT33	1000p

Part No	Code	Price
<b>HITACHI continued</b>		
2434141	LOT33	1000p
2434274	LOT44	900p
2434393	LOT405	2250p
2434593	LOT44	900p
2435006	LOT401	1700p
2436201	LOT90	1000p
2433891H	LOT23	1100p
<b>MATSUI</b>		
3714002	LOT02	1200p
043714002J	LOT02	1200p
43700000	LOT02	1200p
7140021	LOT02	1200p
<b>mitsubishi</b>		
731003	LOT51	1550p
334 P 18506	LOT51	1550p
<b>ORION</b>		
3714002	LOT02	1200p
043714002J	LOT02	1200p
43700000	LOT02	1200p
<b>PANASONIC</b>		
TLF 14512 F	LOT39	1850p

Part No	Code	Price
<b>PANASONIC continued</b>		
TLF 14520 F	LOT40	1500p
TLF 14521 F	LOT39	1850p
TLF 14567 F	LOT39	1850p
TLF 14568 F	LOT40	1500p
TLF 14584 F	LOT41	1700p
TLF 14586 F	LOT42	1700p
<b>PHILIPS</b>		
3119 108 31260	LOT90	1000p
3119 198 62930	LOT57	1000p
3122 138 36920	LOT57	1000p
3122 138 36922	LOT57	1000p
3122 138 36923	LOT57	1000p
3122 138 37620	LOT90	1000p
3139 128 30400	LOT90	1000p
4812 140 10369	LOT90	1000p
4812 140 10421	LOT90	1000p
4822 140 10274	LOT123	1100p
4822 140 10306	LOT57	1000p
4822 140 10381	LOT128	1300p
4822 140 10384	LOT127	1550p
AT 2076 / 10	LOT57	1000p

Part No	Code	Price
<b>SAISHO</b>		
3714002	LOT02	1200p
043714002J	LOT02	1200p
43700000	LOT02	1200p
7140021	LOT02	1200p
<b>SHARP</b>		
RTRNF 1220 CEZZ	LOT39	1850p
<b>SONY</b>		
1-439-332-41	LOT100	1500p
1-439-332-42	LOT101	1450p
1-439-332-52	LOT100	1500p
1-439-387-11	LOT311	1450p
1-439-387-21	LOT311	1450p
<b>TOSHIBA</b>		
2433751	LOT01	1300p
23236098	LOT288	1400p
23236198	LOT288	1400p
23236255	LOT289	1300p
23236425	LOT288	1400p
23236428	LOT289	1300p

Many many more LOPT's in Stock... Please ring for ones not listed

## Replacement Video Heads

<b>AMSTRAD</b>	
VCR1000,VCR2000,VCR6000,VCR6100,VCR6200,VCR8600,VCR8602,VCR8700,VCR9005,DD8900,DD8904,TVR4	
ORDER CODE : VH93 PRICE : £7.00 + VAT	
<b>FISHER</b>	
FVHP420,FVHP510,FV4P520,FVHP530,FVHP615,FVHP618,FVHP620,FVHP622,FV4P710,FVHP711,FVHP715,.....etc	
ORDER CODE : VH16 PRICE : £9.00 + VAT	
<b>HINARI</b>	
VXL8,9,10,VXL11,VXL19,VXL90,VCR34H,VTV100,VTV200,H13V	
ORDER CODE : VH94 PRICE : £11.00 + VAT	
<b>HITACHI</b>	
VT522,VTM212,VTM622,722,722,822,922,925	
ORDER CODE : VH400 PRICE : £11.00 + VAT	
VT540,VT545,VT546,VT548,VTD660,VTD665,VTM598,VTM640,VTM645,VTM646,VTM730,VTM731,VTM735,VTM736,.....etc	
ORDER CODE : VH533 PRICE : £14.00 + VAT	
<b>JVC &amp; FERGUSON</b>	
BR1600,HRD140,HRD141,HRD142,HRD143,HRD150,HRD152,8947,8948,3V42,3V44,3V45,3V46,3V47,3V52,3V54,3V55,3V56	
ORDER CODE : JVC3HSSVA PRICE : £8.00 + VAT	
HRD154,HRD160,HRD170,HRD171,HRD210,HRD211,HRD217,HRD310,HRD320,HRD321,HRD350,HRD521,HRD522,....etc	
8950,8951,3V64,3V65,FV10,FV11,FV20,FV21,FV26	
ORDER CODE : VH04 PRICE : £7.50 + VAT	
HRD725,HRD755,3V43,3V53	
ORDER CODE : VH08 PRICE : £18.00 + VAT	
8930,8931,8933,8940,3V29,3V30	
ORDER CODE : VH200 PRICE : £5.50 + VAT	
BR9060,HRD330,337,440,441,637,641,660,670,720,730,740,820	
HRFC100,SR3300MS,FV44L	
ORDER CODE : VH379 PRICE : £11.50 + VAT	
<b>MITSUBISHI</b>	
HS349,HSE27,HSE31,HSE32,HSB27,HSB31,HSB32,HSM33,HSM34,35,37G	
ORDER CODE : VH324 PRICE : £14.50 + VAT	
HSE30,HSB30	
ORDER CODE : VH326 PRICE : £14.50 + VAT	
HSB12,HSE12,HSE22,HSM16G,HSM18,HSM23,HSM25,HSM30	
ORDER CODE : VH380 PRICE : £14.00 + VAT	

<b>MITSUBISHI continued</b>	
HSM20,HSM55	
ORDER CODE : VH548 PRICE : £15.00 + VAT	
HSB52,HSE50,52G,HSM36,50,54,55,57,58,60	
ORDER CODE : VH450 PRICE : £27.00 + VAT	
<b>NATIONAL PANASONIC</b>	
NV300,NV322,NV332,NV333,NV340,NV390,NV2000,NV2010,NV3000,NV7000,NV7200,NV7500,NV7800,NV7850,NV8170,NV8200,NV8400,NV8600,NV8610,NV8620	
ORDER CODE : VH10 PRICE : £6.25 + VAT	
NV100,NV200,NV370,NV380,NV630	
ORDER CODE : VH35 PRICE : £6.00 + VAT	
AG5150,AG5250,NV665,NVH75,NVH77	
ORDER CODE : VH405 PRICE : £18.00 + VAT	
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ORDER CODE : VH41 PRICE : £7.50 + VAT	
NV730,NV730F,NV770 4 HEAD	
ORDER CODE : VH32 PRICE : £10.50 + VAT	
AG6024,NVG33,NVG46,NVL23,NVL25,NVL28,NVJ47,NVJ49,NVJ700PX,NVSD20EE,NVSD400,NVSD44,NVSD45	
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NVG20,NVG21,NVG22,NVG25,NVG28,NVG200,NV448	
ORDER CODE : VH82 PRICE : £10.00 + VAT	
NVG7,NVG9,NV230	
ORDER CODE : VH111 PRICE : £7.00 + VAT	
NVSD40	
ORDER CODE : VH505 PRICE : £10.50 + VAT	
NVJ45,NVJ47	
ORDER CODE : VH498 PRICE : £10.00 + VAT	
<b>PHILIPS</b>	
VR6460,VR6520,64VR60,VR6420	
ORDER CODE : VH77 PRICE : £7.25 + VAT	
20DV1,20DV2,20RW7,21DV1,21DV2,21DV3,2SB01,2SB02,2SB11,2SB12,30DV2,VR201,VR202,VR203,VR215,VR212,....etc	
ORDER CODE : VH555 PRICE : £46 + VAT	
<b>SANYO</b>	
VTC5000,VTC5400,VTC600,VTC6000,VTC6010,VTC6500,VTCM10,VTCM11,VTCM20,VTCM21,VTCM25,.....etc	
ORDER CODE : VH45 PRICE : £18 + VAT	

<b>SANYO continued</b>	
VHR1110,VHR1150,VHR1300,VHR1700,VHR2300,VHR2370	
ORDER CODE : VH121 PRICE : £8.00 + VAT	
VHR3200,3270,3100,3110,3150,3300,3400,3310,VHRD500	
ORDER CODE : VH122 PRICE : £11.00 + VAT	
VHR120,VHR130,VHR14,VHR141,VHR143G,VHR14SP,VHR151,VHR15,VHR16,VHR171,VHR220,VHR23,....etc,VHRD4400,VHRD4410,VHRD4500,VHRD4600,VHRD4610,VHRD6700,....etc	
ORDER CODE : VH495 PRICE : £31 + VAT	
<b>SHARP</b>	
VC671,VC779,VC787,VC790ET,VCA50,VCA50S,VCA60,VCA602,VCA605,VCA615,VCD806,VCD810,VCD815,VCT610	
ORDER CODE : VH240 PRICE : £14.00 + VAT	
VC108,208,382,402,405,408,500,550,571,573,581,582,583,VC5W20E,VC600,....etc,VCA10,VCA100,VCA102,VCA103,VCA103A103,VCA103,VCA104,VCA105,VCA106,VCA111,VCA113,....etc	
ORDER CODE : VH56 PRICE : £8.50 + VAT	
<b>SONY</b>	
SLV275,SLV373VB,SLV410,SLV412,SLV427,SLV474	
ORDER CODE : VH42 PRICE : £9.25 + VAT	
SLVE7,SLVE8,SLVE9	
ORDER CODE : VH588 PRICE : £36.00 + VAT	
SLV615,SLV625,SLVE600,SLVE700,SLVE800	
ORDER CODE : VH590 PRICE : £34.50 + VAT	
<b>TOSHIBA</b>	
V71,V73,V74,V75,V77,V80,V81,V82,V83,V84,V85,V86,V87,V88	
ORDER CODE : VH126 PRICE : £8.00 + VAT	
DV90,DV96,DV97,NM3,V108,V109,V199,V200,V202,V205,V207,V209,V80,V93,V94	
ORDER CODE : VH127 PRICE : £9.00 + VAT	

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## Satellite PSU Repair Kits

MAKE & MODEL	CODE	MAKE & MODEL	CODE	MAKE & MODEL	CODE	MAKE & MODEL	CODE
<b>ALBA</b> SAT6600	SATPSU2	<b>FINLUX</b> SR5700 SR5100	SATPSU12 SATPSU23	<b>MATSUI</b> RD600	SATPSU20	<b>PHILIPS</b> STU802/05M, STU804, STU811, STU824	SATPSU1 SATPSU2
<b>AMSTARD</b> SAT250, SR950, SRD2000, SRD700, SRD950, SRX1002, SRX2001, SRX301, SRX501, SRX502	SATPSU16	<b>GOODMANS</b> ST700	SATPSU1	<b>mitsubishi</b> ST-PB10	SATPSU1	STU801 STU3301	SATPSU20 SATPSU22
SRD510, SRD520, SRD540, SRD545, SRD550	SATPSU3 SATPSU4	<b>GRANADA</b> KR1, LR1, LR2, M/N92MR1/A	SATPSU1	<b>NOKIA</b> SAT1500, SAT1600	SATPSU2	STU909 STU350	SATPSU9
<b>BRITISH TELECOM</b> SVS300	SATPSU17	HR 1, JR1	SATPSU2	SAT1700, SAT2200, SAT2202	SATP-	<b>SONY</b> SAT301	SATPSU10
<b>BUSH</b> IRD150	SATPSU12	NR2, PR2	SATPSU8 SATPSU9	SU23		<b>THOMSON</b> SRD11, SRD 14	SATPSU1 SATPSU2
<b>ECHOSTAR</b> SR5500 EARLY PSU WITH ADJ.	SATPSU12	M92MR2	SATPSU9	<b>PACE</b> PRD700, PRD800, PRD900, PSR800, PSR900, MRD950, MRD960	SATPSU1 SATPSU10	SRD7/8, SRS3, SRS4	SATPSU2
<b>FERGUSON</b> SRD 5, SRD16	SATPSU1 SATPSU11 SATPSU2	<b>GRUNDIG</b> STR1	SATPSU1 SATPSU2	MSS500, MSS1000 MRD920, SS9000, SS9010, SS9200, SS9210, SS9220	SATP-	<b>THORN</b> SAT99, SAT120	SATPSU1
		GIRD2000, GIRD3000 GRD150, GRD250, GRD280, GRD300, STR200S	SATPSU20	SU2		<b>TOSHIBA</b> SAT99, TU-SD200	SATPSU1
		<b>HITACHI</b> SR-1050D	SATPSU1	MSS100, PRIMA	SATPSU8	TS540	SATPSU10
		<b>MASPRO</b> SRE250S/1, SRE 350S/1	SATPSU1	APOLLO, MSS200, MS290, MSS300	SATPSU9		
		SRE250S, SRE350S, SRE450S	SATPSU2	<b>PANASONIC</b> TU-SD200	SATPSU1		
		ST5, ST-12	SATPSU20	TU-SD250	SATPSU9		

CODE	PRICE	CODE	PRICE	CODE	PRICE	CODE	PRICE
SATPSU1	600p	SATPSU4	600p	SATPSU10	1230p	SATPSU16	1250p
SATPSU2	550p	SATPSU8	650p	SATPSU11	650p	SATPSU17	850p
SATPSU3	600p	SATPSU9	900p	SATPSU12	1600p	SATPSU20	600p
						SATPSU22	1050p
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ALBA / BUSH	AKAI									
GOODMANS	HINARI									
JVC	MATSUI									
21" & 25" TV Kit <b>Order Code</b> MITSKIT1	29" & 33" TV Kit <b>Order Code</b> MITSKIT2									

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<p><b>SATELLITE REPAIR MANUAL</b> Edition 5</p> <p>346 pages of receiver faults plus notes and general information such as many useful button sequences for resetting parental lock codes, resetting installation choices to factory defaults.</p> <p>Order Code : BOOK03 Price : £16.00 - No VAT</p>	<p><b>SEMICONDUCTOR COMPARISONS</b> 1999</p> <p>With over 650 pages listing more than 34,200 Semiconductors with suitable alternatives complete with descriptions and base information</p> <p>Order Code : BOOK04 Price : £19.00 - no VAT (plus £2 Postage)</p>
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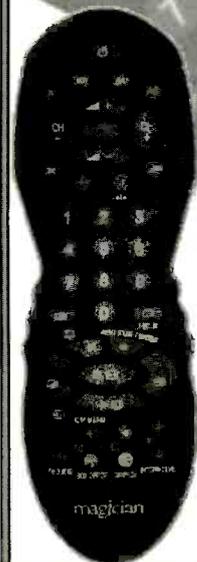
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BUH515 200p	IRF820 90p	S2055A 175p	HA13157 950p	STK5337 500p	STRD6108 450p	TDA4605 190p		
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BUH517D 175p	IRF9610 95p	TIP121 35p	LA4460 120p	STK73410 350p	STRS6709 600p	TDA8171 230p		
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**Reports from  
David C. Woodnott  
and Max Chaudry**

# Camcorner

## Canon UC1000

The fault report said "dead", which is not a common symptom with these popular camcorders. Internal inspection revealed that a 2A circuit protector in the power supply section had failed. As no short could be detected, a replacement CP was fitted. The unit then worked but wouldn't load a tape. The housing would open and close without a tape, but refused to operate correctly when a tape was present.

The cause of the fault could be seen and heard: the capstan motor was whirring around at maximum speed! Because of a damaged FG sensor, there was no FG control. Normal operation was restored once a new capstan motor had been fitted.

It's becoming quite common to find a capstan motor with a damaged FG sensor, possibly because grains of sand have scraped it – you can usually see a mark across the surface, in the line of rotation. The motor normally has to be replaced as a complete unit, the exception being certain Panasonic models for which the sensor can sometimes be obtained as a spare part. D.C.W.

## Panasonic NVM40B

We've had a couple of these full-size VHS camcorders in recently with the same fault symptom and, fortunately, the same cause. Both belonged to schools, and both had no camera E-E pictures, playback being OK. Another common factor was that both had been dropped on their lenses! In neither case had the lens unit been damaged, but in both

cases the ribbon cable that connects the CCD PCB to the process PCB had been severed. The screening can on the CCD PCB has a sharp edge which, when shunted forwards, neatly clips the cable in two.

All that was required was a new ribbon cable. It comes without fittings, which have to be transferred from the original assembly. There were no other problems. D.C.W.

## Nikon VN3100

The complaint with this handycam unit, a Sony clone, was that the camera picture was intermittent. I initially thought that the connectors between the CCD board and the process board might be the cause, as they often become unsoldered when a camcorder has been dropped.

On this occasion however the cause was different – the connectors were checked and resoldered to no avail. IC851 was the cause: it had become almost completely detached from the PCB at two of its four sides! I resoldered the chip, checked for any other dry-joints then, to complete the repair, carried out a service. D.C.W.

## Sony CCD-TR330E

The complaint with this fairly recent handycam unit was no camera picture. Playback was OK. A few checks revealed that the camera head powered up but didn't produce an output. As I've had similar problems with this range of models before, I decided to check its memory locations (in the EEPROM).

Pages D and F were read and stored using the Sony Lanlink system. They can be restored to the unit if required, which gives you a sense of security if somehow data gets lost! I found that the page F data was substantially corrupted. Downloading the basic data settings (new data held in the Lanlink firmware) restored normal operation, i.e. camera pictures.

Checks were then carried out to try to establish the cause of the

memory loss, but nothing was apparent. After a soak test lasting several days the camera head settings were set up individually, once again using the Lanlink – it's much easier and quicker than the old RM95, though the latter is still very useful for certain jobs. After another long soak test the unit was declared to be OK. D.C.W.

## Samsung VP-A20

One of these camcorders wouldn't accept a cassette. It would load without a cassette, but when a cassette was inserted it wouldn't load. There would be fast drum rotation, then the eject mode would be entered. The cause of the problem was no FG signal from the capstan motor. A new capstan motor had to be fitted. M.C.

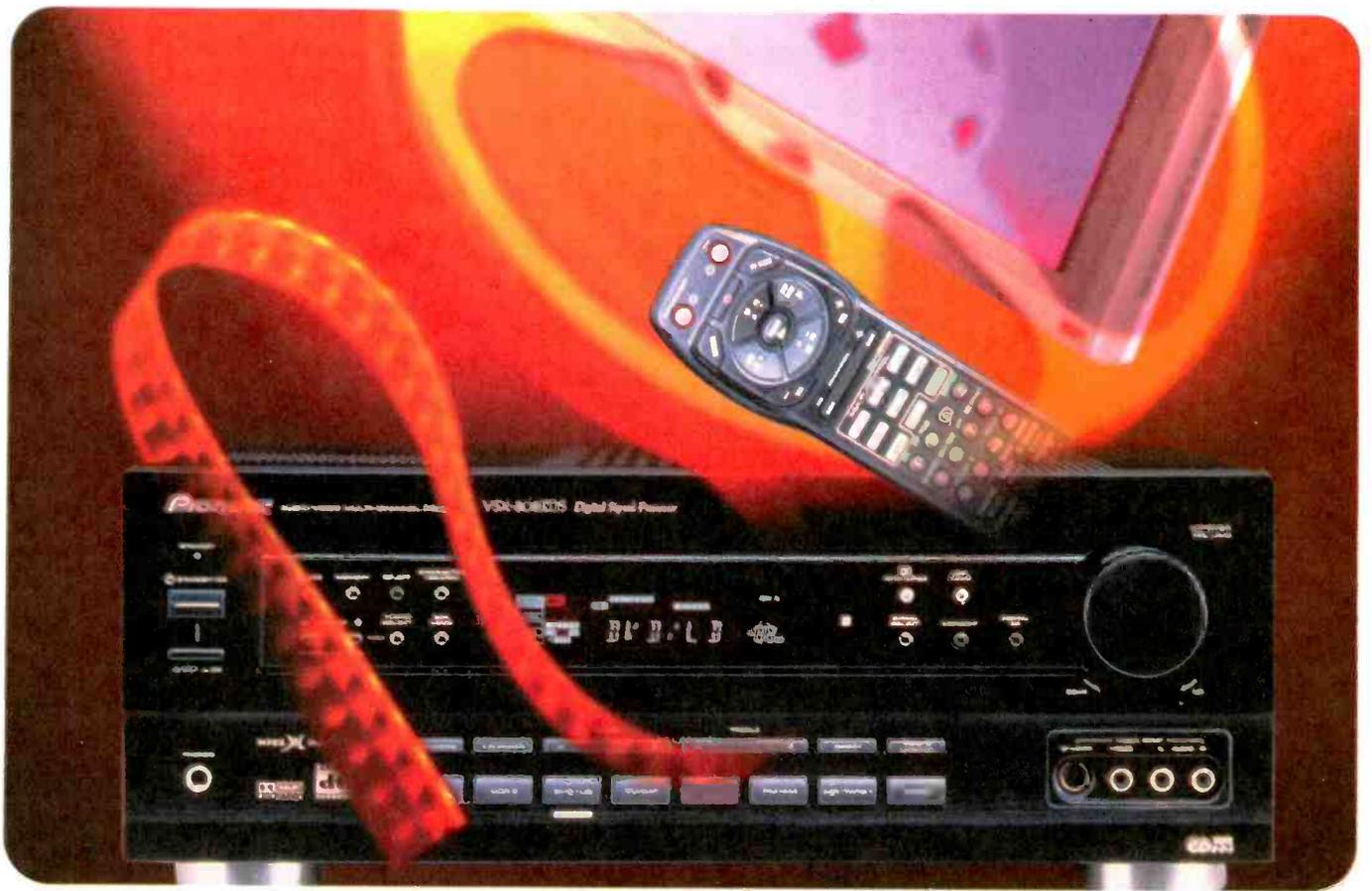
## Samsung Models VPK60/70/75

You sometimes get intermittent tape jamming because the mechanical timing is out of sync. When the mechanism has been reset, the chances are that the tape will jam again.

The problem arises because of damage to the pivot on which the slider assembly (reference no. 508 in the manual) slides. The pivot is part of the main chassis, which is now available under part number AC6112229A. The mode switch and gears have to be transferred to the new chassis, then retimed. After this there will be no further jamming. M.C.

## Samsung VP-A20

An intermittent dew indication sometimes occurs – the indicator blinks – even when the camcorder has been kept in a warm place. The dew sensor is part of the flexi connector that's mounted on the loading motor. Unfortunately when the sensor becomes faulty the loading motor has to be replaced. It comes as a complete unit, part number AC3112001P. M.C.



# Dolby Digital and Home Cinema

**Ian Martin** outlines the Dolby Digital technology and its history then describes a home-cinema installation, based on the Pioneer VSX808RDS receiver-amplifier, that enables you to make the most of multi-channel sound

**T**he number of 'home-cinema' systems with Dolby Pro-Logic surround sound has greatly increased over the last few years, thanks mainly to the introduction of large-screen TV sets with integrated surround sound amplifiers. If you want to see a movie as the director intended, you need a large-screen display and a big sound to go with it.

## Cinema Sound

Film formats have changed over the years. The latest development is to release some new movies to cinemas on digital tape. Originally however the sound was recorded as an optical track along the edge of the film. Two tracks would provide stereo, but that was about it. The system had limited bandwidth and,

using amplitude modulation, was prone to noise. In the Fifties, magnetic soundtracks were added at each side of the film: they could carry left, right and centre sound. But movie-going declined in the Seventies, and many studios reverted to optical, mono soundtracks.

As a result of improvements in noise-reduction and encoding technology, Dolby Laboratories introduced Dolby Stereo in the Eighties on optical film stock – this being a cheaper and longer-lasting medium. Phase encoding enabled four channels to be carried on modified stereo channel pairs. Cinema audiences increased over the next few years, and expected more dynamic and accurate sound systems.

Dolby Laboratories had already developed the AC-2 (Audio Compression 2) digital audio format, which had been successfully used in recording studios for several years. Building on this, the company developed a new multi-channel cinema sound format that, naturally enough, was called AC-3. It enables six channels to be encoded as a single data stream: five (left, right, centre, rear left and rear right) are full-bandwidth signals, the sixth being a bandwidth-limited subwoofer chan-

nel. For this reason the format is known as a 5.1 channel system.

The first Dolby Digital (AC-3) movie was released in 1992, on optical film stock with a two-channel Dolby Stereo track (to provide backwards compatibility) plus the digital audio which was squeezed on to the film around the sprocket holes!

## Home Surround Sound

In the Seventies the British public was introduced to multi-channel sound with the advent of three different and, ultimately, unsuccessful quadrophonic music systems. Two of these were matrixed systems (SQ and QS) while the third (CD-4) had the surround pair frequency-shifted and added to the front pair. This was no mean feat when you consider that the carrier medium in those days was vinyl, an 8-track cartridge or FM radio. A little later the BBC introduced, for FM radio, a system called Matrix-H. This, like the others, fell by the wayside. Surround sound enthusiasts were then left to wire up their rear speakers in an out-of-phase 'Hafler' configuration. This simply generated a difference signal from the stereo channels. The effect produced was artificial, but it did add depth to the sound. In the

absence of a recognised surround sound standard, almost every 'music centre' that appeared incorporated some sort of proprietary pseudo-surround system.

The success of Dolby Stereo in cinemas soon crossed over to home use however. We already had colour TV, teletext, Nicam stereo and VCRs, so the infrastructure was in place for the next saleable upgrade. To decode the surround sound in the home, a Dolby Surround (passive) or later a Dolby Pro-Logic (active) decoder was required. It recovered the phase-shifted information from the modified stereo channels to produce the familiar left, right, centre and surround outputs. The sound was further enhanced by the addition of an optional 'sub-woofer'. This was generally a filtered LF component that was extracted from the left and right channels and applied to a powerful amplifier to produce effects that were sometimes felt rather than heard.

Dolby Pro-Logic signals are robust enough to be used with almost any stereo sound system, and survive stereo broadcasting and recording without significant degradation. As a result, a wealth of programme material is available on film, TV, radio, tape, LaserDisc and, now, DVD – which has further stimulated the home cinema market.

### The Future is Digital

Dolby Digital, which is commonly called AC-3 after its coding system, is now used by most contemporary film studios and is beginning to make the transition to home theatre. It's the digital multi-channel audio format that is most likely to be encountered by *Television* readers.

For some time LaserDiscs (the videophile's choice for movies) have been available with CD-standard PCM digital audio. In some cases AC-3 signals have also been carried, though only NTSC discs have had the capacity for this and then only by dropping the analogue RH channel. In addition most LaserDisc players require an external RF demodulator to retrieve the digital audio. This limited the system's appeal to 'serious' home cinema aficionados.

More recently DVD discs have appeared with AC-3 audio as standard. In addition DVD players have a digital audio output jack, usually optical and sometimes with a demodulated RF output as well. This means that DVD players are ready for connection to a suitable Dolby Digital amplifier, using a TOS-link (optical) or a phono (RF) cable. While digital

terrestrial and satellite TV broadcasts in the UK currently carry only MPEG two-channel stereo sound, Dolby Digital has recently been added to the specification. This is good news, as it provides a quality-upgrade path for TV audio: DVB with Dolby Digital is already specified by some other countries, including Australia and Singapore, and several countries are already broadcasting AC-3 streams with other digital TV formats. In Europe, the German channel Pro 7 transmits Doby Digital signals at 19°E.

### Dolby Digital Encoding

My article in the February 1994 issue of *Television* included a full description of the operation of a Dolby Pro-Logic decoder – the device featured was an analogue type from Mitsubishi. Digital processors that carry out the same operations digitally were then just beginning to appear. The intervening years have proved that this is a cheaper solution, with the advantage of being able to add extra features via software. Another advantage is that the need for noisy and expensive analogue-to-digital converters is eliminated. The Dolby Decoder effectively becomes a program running on a digital processor.

Dolby Digital is a 'perceptual-coding' system, i.e. the audio compression applied is based on how the human ear perceives sound. Consider good old Dolby Noise Reduction first. This reduces hiss by reducing HF, where most of the noise is present, but only when the signal is relatively quiet. When the signal is loud it masks the noise, so there's no need to filter it out. This works with noise that occupies a similar frequency range to the sound signal.

If the audio spectrum is split into several frequency bands, selected because they correspond to the characteristics of human hearing, the noise in each band can be sharply filtered out. This greatly reduces the data required for each band. The same Dolby NR technique is used: the noise is either removed or is inaudible. A 'shared bit-pool' technique is used to encode the bands: the number of bits allocated to each band depends on its contents, i.e. the frequency spectrum and dynamic range of the sound. The overall effect is to greatly reduce the bit rate required for the 5.1 audio channels, with minimal effect on the perceived sound quality. For example, a reduction in the data available for HF will not be noticed when a large explosion occurs in another channel. Fig.

1 shows function block diagrams of a Dolby Digital encoder and decoder pair. Incidentally a 5.1 channel mix is not essential: many old mono-sound movies are coded in AC-3 with a two-channel mono mix.

### Other Digital Audio Formats

A new multi-channel surround system, from Digital Theatre Systems, appeared in 1993. It's called DTS and was released with the movie *Jurassic Park*. DTS uses less data compression than Dolby Digital and is incompatible in terms of decoding – some DVD players and AV amplifiers are equipped for both however. DTS has developed quickly because it's easier and cheaper to decode, thus appealing to many smaller theatres. It is a true six-channel system, with a normal bandwidth sub-woofer (effects) channel. Comparative demonstrations of Dolby Digital and DTS show that there is a slight difference in the sound quality, but it's hard to say whether one is better than the other.

Whether DTS becomes as popular as Dolby Digital in the long term remains to be seen. For future-proofing it is best to install a Dolby Digital system that's DTS compatible. This involves a DTS-compatible DVD player and a DTS decoder/amplifier (assuming DVD discs are the sound source). A 'standard' DVD player doesn't demodulate the DTS data stream, in the same way that older LaserDisc players can't demodulate Dolby Digital. 'Third-generation' players such as the Pioneer DV515 usually can. A few NTSC LaserDiscs carry DTS signals, but to make this possible both analogue sound channels are omitted. A LaserDisc player would also require an external DTS demodulator, so LaserDisc releases are a rarity.

A few European region 2 DVDs have MPEG audio, which was originally proposed as the European standard with 5.1 or 7.1 sound channels. As the world DVD market is driven by the Americans, or more accurately Hollywood, the US preference for AC-3 has reigned supreme. The European specification now includes AC-3 or MPEG and new MPEG discs are hard to find.

Recently Dolby Laboratories has announced Dolby Digital EX for theatres. This is effectively Dolby Digital with the addition of a rear centre channel. The first movie to use the format was *Star Wars Episode 1*, but there's no suitable home cinema equipment so far. One

can't help but wonder where the next audio channel will be: my guess is overhead!

### A Practical System

Thus in addition to the wealth of Dolby Pro-Logic material available there's a growing catalogue of Dolby Digital software. Currently no TV setmaker has a digital audio solution, though this is sure to appear in time. Right now if you want to enjoy movies as closely as possible to the theatre experience, you need a large-screen TV set and a Dolby Digital amplifier. With the help of information from Dolby Laboratories and Pioneer Home Entertainment, I set up a system based on the new Pioneer VSX808RDS receiver-amplifier.

Price is a very important point. The VSX808RDS costs just under £400. Previous digital surround amplifiers and receivers were considerably more expensive at typically £1,000 plus. Lower priced receivers (£400-£600) offered only Dolby Pro-Logic decoding. The VSX808RDS features Dolby Digital (AC-3), DTS, MPEG and PCM (the CD standard) as well as Dolby Pro-Logic. In addition there are four sound-field modes that operate in conjunction with the surround modes, and six DSP effect modes that can give depth to even monophonic sound. The unit contains an RDS radio receiver, and has a programmable remote control which is also designed to operate Pioneer 'System Remote' compatible equipment.

As Dolby Digital – and DTS – produce full bandwidth left, right, centre and surround channels you can take advantage of full-range speakers. The VSX808RDS can provide five channels at up to 60W RMS power each or, in the stereo mode, 100W per channel to left and right speakers. The sub-woofer channel is merely preamplified, so an external power amplifier or active sub-woofer is required for this – the lat-

ter is the most popular option. If you should want more power you can use the VSX808RDS as a preamplifier, feeding its 5.1 outputs to more powerful external amplifiers.

### Inputs and Outputs

The VSX808RDS's input selection is much improved in comparison with previous models. It can accept inputs from five video sources (one on the front panel) and five audio sources, including the internal radio tuner. It can also accept an audio input from an external six-channel decoder source.

There are also four digital audio inputs. These must be used if you wish to get AC-3 or DTS sound from a DVD or LaserDisc player. They also provide direct digital connection with standard CD audio (PCM). Three of these inputs are optical TOS-link ones, the fourth being a coaxial RF input. These inputs are unassigned initially. To use them they must be individually assigned to particular input sources. This is done via the remote-control unit and the front-panel display. The set-top box could be connected via these digital inputs when Dolby Digital broadcasts begin via satellite or terrestrial digital TV.

As well as improved sound quality, the digital audio connections provide a small but useful reduction in the amount of 'spaghetti'. Unfortunately a wiring tangle is inevitable with a product of this type, with the back resembling a telephone switchboard. The receiver's rear panel is well laid out, but even with a clear wiring plan and the best intentions it soon becomes 'busy'. I found that drawing a wiring diagram before I started was a big help.

The VSX808RDS provides analogue and digital audio recording outputs for cassettes and mini-discs, two AV recording outputs for VCRs, and a video output for an external monitor. All video inputs and outputs have both composite and S-video connections. The composite and S-video channels are completely separate: thus if you connect composite video to a monitor while using an S-video VCR connection you won't see anything. This may not be obvious to a casual user, and I didn't see it mentioned in the instruction book. There is a potential problem here if you

connect some S-video and some composite-video inputs and intend to use the monitor output. You would need to use both S-video and composite-video monitor outputs.

Speakers are connected via binding posts (the front channels) and snap connectors (rear channels). A second pair of stereo posts is provided for a second pair of speakers. These are all disappointing: it was not possible to get all 79 strands of my 79-strand wire under the post. Likewise the holes in the posts are too small to accept 4mm banana plugs. This makes speaker connection fiddly, and diminishes some of the advantage of using quality speaker cables.

### Remote Control Unit

The receiver comes with a chunky, preprogrammed multi-function remote control unit that Pioneer describes as a "heads up remote control". I found it easy to set up: in fact the default setting operated my Philips VCR (Pioneer VCRs are Philips clones) and all my Pioneer AV equipment. A table at the back of the instruction manual lists the codes for other makes/products. So it was quite simple to set it to operate the 33in. Panasonic TV my friend Ray Meadows had lent me. I noticed that there were codes for US cable boxes but none for any European set-top boxes.

In theory the handset can have nine different control modes: for the receiver, for two TV sets, two VCRs, a DVD and a CD player, the tuner (integral) and a tape/MD recorder. When a different mode is selected, the receiver is not automatically switched to that source – this is a separate operation. The main buttons perform different operations depending on the unit's mode. When you press a command button the last selected mode button flashes red to remind you which mode you are in.

I am lucky in having mostly Pioneer equipment. Those who don't have such a fortunate collection of gadgets to control might find a learning-type RC unit better.

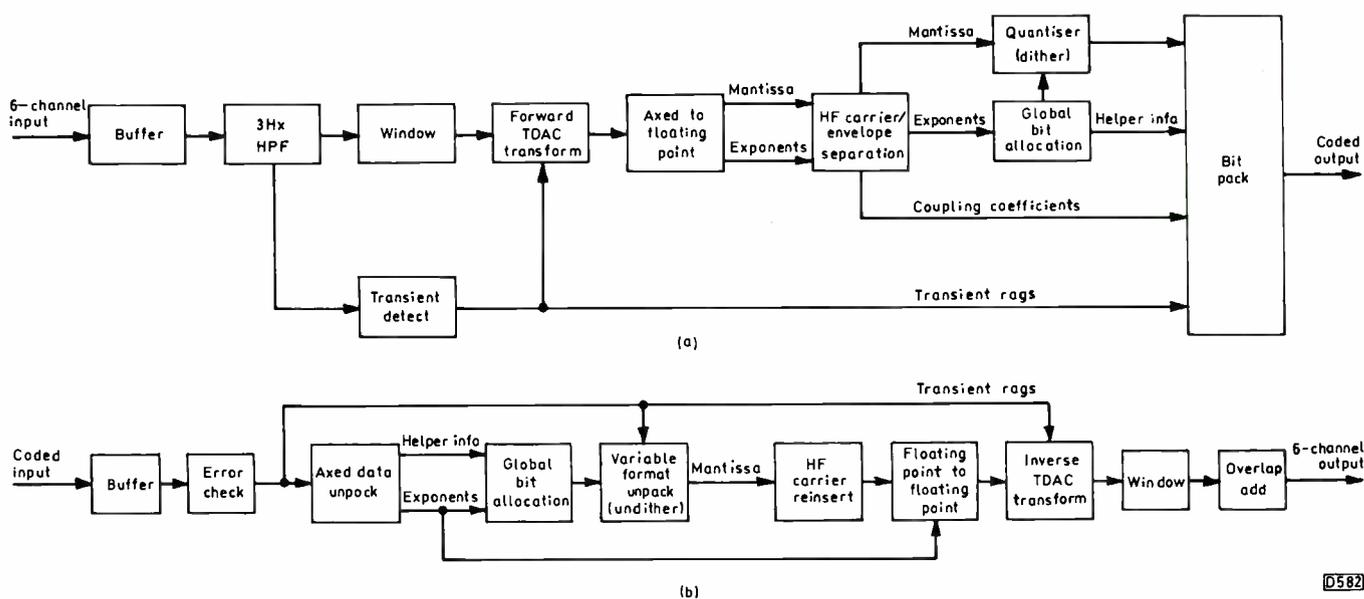
### Front Panel Controls

There are two power switches, a 'real' one that switches the power off and a 'standby' one that can be operated remotely. When the 'real' switch is pressed power is applied and the receiver goes to standby.

Previous Pioneer amplifiers had a motorised volume control that sometimes generated noise as it rotated. This model uses an electronic attenuator for volume control:

The Pioneer VSX808RDS receiver-amplifier.





D582

turning the control steps the volume up or down. The old motorised control was a weak point – I've had to repair three older receivers in which the control circuit for the potentiometer motor had burnt out, in one case taking the corner off the PCB.

Considering the range of functions provided, the rest of the front panel is very straightforward. Most of the buttons are concerned with tuning and storing radio channels.

There's a camcorder input with composite and S-video jacks, also a headphone jack for stereo listening.

### Setting up

When the receiver is switched on for the first time the vacuum fluorescent display prompts you for some settings (the receiver doesn't generate on-screen displays). Some of these settings require thought and reference to the manual. For example, do you set the main front speakers to 'large' or 'small'? If you select L the bass sound will be sent to these speakers and not the sub-woofer (if you have one). 'Crossover frequency' is another option: this sets the frequency below which sounds are sent to the sub-woofer. Another option enables you to enter the distance between your seating position and each speaker – this replaces the 'delay' feature in older amplifiers. The system will work with its default settings, but will produce better sound when adjusted to suit your room and peripheral equipment.

You are next asked to assign the digital RF to an input: I selected DVD. I then assigned digital optical input 1 to VCRI, to which I connected the LaserDisc player. The amplifier doesn't have a dedicated LaserDisc input: I assume that

Pioneer would prefer you to buy its DVL919 combination DVD/LaserDisc player. The remote control unit has to be set to 'CD' to control the LaserDisc player attached to the VCR-1 input, because only this mode can be programmed to the remote-control commands for a LaserDisc player. The confusion potential here became apparent later when I was away from home. Suffice it to say that once you get used to the positions of the buttons and stop looking at them everything falls into place.

The final stage is the 'pink noise' set-up. This sends a test signal to each speaker in turn. The volume from each can then be adjusted so that they all sound the same from the listening position.

The amplifier is now ready for action. Some other useful features are worth a mention however. Unless a digital input is detected, the unit's default surround sound mode is Pro-Logic. When you are in the digital mode, pressing the 1 button steps the amplifier through various 'advanced theatre' modes. Some, such as '5D Theatre', are useful for mono or plain stereo digital sources. There's also a range of audio ambience effects: pressing 2 steps you through off, hall 1, hall 2, jazz, dance, theatre 1 and theatre 2. Two other remote-control keys enable the selected effect to be increased or decreased. These effects can be assigned as required: you could set the DVD input for say no effects and the tuner to hall-1 ambience. These settings are called up each time the relevant input is selected.

The best feature has to be the 'midnight' button. This compresses the audio's dynamic range and boosts the loudness and surround effects:

perfect when you are setting the thing up at one in the morning!

### The Radio

The unit's radio is a thirty-preset AM/FM tuner with full RDS (Radio Data System) functions including RT (Radio Text), PS (Programme Service name) and PTY (Programme Type). Having previously experienced RDS only in the car for automatic travel announcements, I was pleasantly surprised by these additional features. Basically RT enables programme information to be viewed, PS displays the channel name and PTY enables the receiver to search for programmes of a particular type automatically, e.g. popular music, news, etc.

Inclusion of the radio in the amplifier saves space – the receiver is a little smaller than the combined size of my previous amplifier and tuner.

### Performance

The digital inputs are as noise-free as you can get, but the receiver has a 'digital noise reduction' system that operates with analogue inputs, processing them when the signals are in the digital circuitry. This is very effective for the removal of hiss, with negligible effect on the audio. It's particularly effective with weak FM signals and cassette tapes – the same system is built into Pioneer's latest cassette tape decks. The feature is switchable and is set to 'off' by default.

I thought I'd start with something loud, so I inserted 'Armageddon' in the DVD player. When the 'Universal' logo appeared however only the Dolby Pro-Logic icon illuminated – because the default audio mode for most discs is Pro-Logic. A quick visit to the set-up menu sorted

**Fig 1: Functional block diagrams of a Dolby Digital encoder (a) and decoder (b).**



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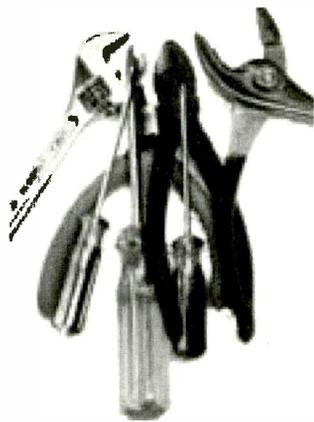
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# John Edwards' Casebook

## Toshiba 258T7B

The owner of this set came straight out with it. "A puff of smoke, then it went dead. My mate reckons it's the tube. If it is, forget it. He says no telly's worth a new tube. I can buy a cheap new one down the road. They give you a five-year guarantee you know, even on the cheap ones. And they deliver and plumb them in for free. I suppose it's not worth fixing really. Still, you might as well take a look."

I humbly thanked him and removed the back cover. C646 (2,700pF, 2kV) in the line output stage had split open. A replacement brought the set back to life, and the repair bill was a lot less than the cost of a cheap new set that comes with a five-year guarantee, free delivery, expert installation and of course a free digibox, satellite system and microwave, not forgetting a free portable for the kitchen, free internet access and so on . . .

## Philips G110 Chassis

I don't seem to have much luck with this chassis. My first experience with one of these sets involved a blown-up power supply. So I had to undertake the fiddly job of fitting a service kit. All those tiny components: I don't enjoy it at all. I remember spending hours trying to figure out why it wouldn't produce enough HT before I discovered that I'd fitted a surface-mounted diode the wrong way round. Another set bounced three times after a power supply rebuild before I got round to replacing the degaussing posistor. It was while I remembered the stress involved that I reluctantly hoisted this set on to the bench.

Fortunately the power supply was OK. A short-circuit across the line output transistor had shut it down. The transistor itself was OK, and when I disconnected the line scan plug P5542 the short-circuit was removed. Some cold checks on individual components could then be carried out. This led me to the 390nF, 250V line scan coupling/s-correction capacitor C2550 which was short-circuit. When it was removed a definite bulge in its case was apparent. Although the repair was quick and painless, I'm still not keen on this chassis.

## Sharp C3705HD

The only sign of life was produced by the red standby LED. It didn't take long to discover that one of the AC relay's terminal pins was very dry-jointed. In fact the terminal and the surrounding print had to be given a lot of scraping, cleaning and tinning before fresh solder would take. I then had a relay with nice, shiny soldered

joints, but the set would still come on only in standby. I was annoyed that I'd forgotten the remote control unit when I collected the set, and pinned my hopes on the unit being needed to power up.

A few minutes later I had my trusty universal remote control unit in my hand and entered the code for Sharp TV sets. The first code entered turned the set's LED to green. This was followed by a healthy click from the relay. The very welcome sound of EHT rustle as the picture appeared made my day.

## Matsui 1410

Although the HT supply to the line output stage was correct the power supply made a loud buzzing noise. There was no line drive, and a check on the voltage at the collector of the line driver transistor Q401 produced a reading of 0.1V instead of the correct 35V: the driver transformer's primary winding was open-circuit. With the aid of a powerful magnifying glass I was able to see that the winding's fine wire had broken where it wraps around the terminal pin. Very careful soldering enable me to join a strand of wire to the 2-3mm protruding from the transformer coil. I gently wrapped the other end around the pin and soldered it in place. It doesn't sound much, but it took a few attempts before I was satisfied that the soldered joint was OK. To add a little strength, I finished off by applying a blob of glue to the joint.

With line drive thus restored the set worked normally.

## Tatung B Chassis

There was a nasty fault with one of these sets, because it was very intermittent and would clear itself if left alone. The symptoms could have been caused by almost anything in the RF or IF circuitry. The picture would gradually degenerate to snow, with slight tuning drift. Sometimes the fault would clear within seconds, restoring a nice clear picture. On rarer occasions the picture would suddenly be totally obliterated by snow, as if the aerial had been disconnected. After a very long wait for the latter symptom to appear I was able to make some meaningful measurements.

The tuner is on the main board, with the IF strip on a subpanel. Connection is via plug PL001 on the main board. This was a convenient point at which to make some checks. Pin 1 carries the tuner AGC voltage, which varied wildly between 5-10V. So the tuner was being continuously pulsed on and off. The 12V supply at pin 2 was rock steady, so there was no supply problem. At pin 15 there was intermittently varying composite video,

pulsing at the same rate as pin 1. By now I'd ruled out a tuner fault and come to the conclusion that there was a control fault. Pin 18 carries the ident signal to the microcontroller chip. Not surprisingly, it was varying between 0-10V in sympathy with the variations at the other pins. The biggest clue was obtained when I checked pin 11 of the tuner, where the tuning voltage is applied. I should have checked this at an earlier stage of course. The voltage was randomly varying up and down by a few hundred millivolts. Then, to my annoyance, it suddenly settled at the correct value for the channel being watched and produced a good, locked picture.

At least the fault had remained for long enough to convince me that it was caused by the tuning voltage. I traced this back from the tuning pin to a 22k $\Omega$  resistor, which was OK, then the 33V stabiliser IC001. Definitely a possibility I thought, but the voltage remained stable when I engulfed IC001 in freezer spray. The next item was a 15k $\Omega$  resistor, R004, which is fed from the 150V supply via another similar resistor. I had at last struck lucky. When I touched the body of R004 with the meter probe the tuning voltage jumped all over the place. Further light tapping varied the extent of the mistuning. I kept prodding it, trying to convince myself that it really was an intermittent resistor. The problem was cured when I finally fitted a replacement.

Even with my powerful magnifying glass I couldn't see any imperfection in the resistor's body, but when I attached my meter to its leads the resistance reading randomly went from 15k $\Omega$  to open-circuit and anything in between. This proved beyond doubt that I'd found the culprit.

### Kioto FD6943

I've never come across this make before. Its 2SD1555 line output transistor was short-circuit and C910 (10 $\mu$ F, 50V) in the power supply was very leaky. I replaced these two items, using a BU2508DF in the line output position, then crossed my fingers and switched on. A picture appeared, but before I had time to congratulate myself I saw that it was slowly pulsing in and out – the whole picture was contracting and expanding. The cause was another leaky capacitor in the power supply, C909 (47 $\mu$ F, 25V).

### Philips G90AE Chassis

After a short while fine horizontal dark lines appeared over the entire screen area. Otherwise the sound and picture remained normal. But the picture would then gradually deteriorate to produce a line tearing effect with vertical jitter, and the sound would intermittently mute. If the set was left in this condition it would eventually go into the standby mode.

Perfect results were obtained with an input via the scart socket, and when a spray of freezer was applied to the casing of the U743 tuner the problem was instantly cured for a short time, a good, clear picture being produced. The trade price for a new tuner is typically over £40 including tax. With a small labour charge added, the total cost of the repair was, as usual, going to be more than the customer would be prepared to pay. So I took a chance, opened the tuner and soldered every joint. During two days on soak test the receiver then produced stable sound and vision. The customer was content with a low repair bill and no guarantee.

### Bush 1433

Although the BUZ77B chopper FET was short-circuit the fuse was still intact. R809 (0.47 $\Omega$ ) was open-circuit. The chopper transformer in this and similar models is known to be unreliable. So, rather than destroy too

many FETs or, worse, have the set bounce after a short period, I fitted the equivalent, reasonably-priced HR9104 transformer. This gave me greater confidence when I returned the working set.

### Sharp 51AT15H (5BSA chassis)

During the repair of this set there were moments when I seriously considered looking for an alternative career, even at what's considered to be the ancient age of fifty one. The symptoms were reduced scan at the top and bottom of the screen, with only noise in between. Neither the remote control nor the on-board user controls had any effect.

The discrete-component field driver and output stage circuitry operates with  $\pm$ 10V supplies. I discovered that the reservoir capacitor for the -10V supply, C713 (1,000 $\mu$ F, 16V), was leaky. When it was replaced there was full field scanning. So far so good.

I next decided to carry out checks around the SDA5254 microcontroller chip IC1001 for any further clues. The 18MHz clock signal was present at pins 12 and 13, so at least its engine was running. The circuit diagram tells us that a pulse from the field timebase should be present at pin 46. It was missing. After some time spent carrying out cold checks in the field output stage I discovered that D506 (5.1V zener diode), D504 (1N4148) and Q509 (BC635) were all short-circuit. Once replacements had been fitted the on-board user controls and remote-control functions worked, but there was still only noise on the screen.

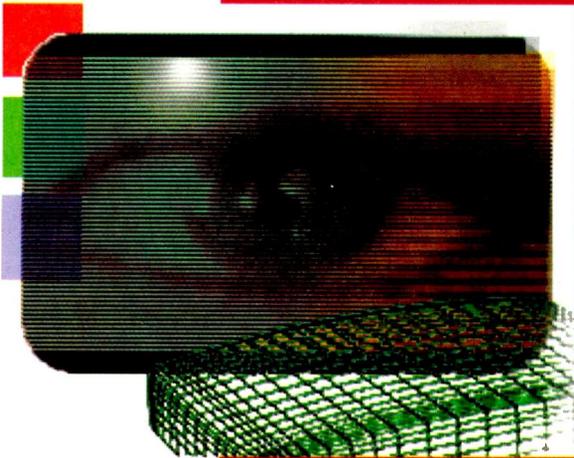
The next bit is embarrassing, but proves that I'm only human, living on my own wits and my largely self-taught knowledge. The luxury of phoning the manufacturer's technical department wasn't on. So it was a matter of persevering or admitting defeat – but that doesn't pay bills.

A signal fed in via the scart socket produced a perfect picture, so the remaining fault had to be in the tuner/IF section. I set the receiver to channel search and watched as the channels came and went: the set wasn't locking on to any of them. The AFT pin 31 of the microcontroller chip fluttered slightly as the channels came and went, and pin 11 of the STV8223A signals chip IC201 briefly produced a video signal. I spent another half an hour checking waveforms and voltages and getting nowhere fast, all the time sensing that I was close to the answer. It was by now late evening. I decided to leave the problem until next day.

During the night I awoke, thinking about the problem. I bet it happens to you too from time to time, doesn't it? "Service mode" I thought, "get into the service mode and have a look at the settings."

Bright an early the following morning, full of confidence, I returned to the job. My circuit didn't have the code to access the service menu. An hour later, after numerous phone calls to fellow engineers, I had scribbled notes of a few combinations to try. Success came when I pressed the channel up and volume down buttons while using the on/off switch to switch the set on. I scanned the various settings, and excitement welled up when I noticed that the AFT was switched off. The display was in the form of a bar with the pointer at the extreme left. Using the remote control unit's channel plus button, I moved the pointer to the centre of the bar and switched the set off, hoping that this would auto store the setting.

I then switched the set on again and retuned the channels. Each one locked correctly. I sat on my stool staring at the set. "What a way to earn a living" I said to myself. But it does feel good when you win.



Reports from  
Ian Field and  
John Edwards

### Samtron 8514/A

There was no display because the CRT's heaters were out. Disturbing the CRT base panel brought them to life and a display appeared. But when I tried to rework the solder I found that there was a thick coating of lacquer: it had to be scrubbed off with a wire brush before the solder, which didn't look that bad, could be remelted.

Suspecting that CRT pin scale might have been the cause, I cleaned the pins with fine emery paper then left the monitor on test. Shortly after I saw that it had a bright green screen with flyback lines. A wisp of smoke came from the CRT base panel – one of the common-base output stage transistors was tracking across the PCB from collector to emitter. I now knew why the lacquer was there!

As the PCB material was deeply discoloured, I decided to file it away around the collector track to all three transistors and replace the track with stout link wire.

The monitor was back a week later. I'd underestimated the damage caused by the lacquer, which had contaminated the CRT socket. A new socket had to be fitted. I.F.

### Triumph Adler EM1438

This monitor is almost identical in appearance to the **Escom EM1448LR** and is very similar internally: both have "Memplan Design" markings on the PCB. It was tripping, and some quick checks revealed that the SGSF444 line output transistor Q403 and the BDT61C HT control emitter-follower transistor Q405 were both

# Monitors

short-circuit. As no other damage or possible cause of the failure was obvious, I replaced the two transistors and also the 5.1nF, 1kV flyback tuning capacitor C415. It was a Philips polyethylene type: though it looked OK, I prefer to fit the resin-dipped type. The monitor then worked normally.

If there is any suspicion about the condition of the line output transformer it's worth leaving Q405 out temporarily and using a 60W bulb to complete the current path. If all is well this will produce about half-width scan. If all is not well, at least you've not destroyed two new transistors in finding out!

As I keep running out of BDT61Cs I decided to seek an alternative: the Toshiba 2SD633 either equals or exceeds the BDT61C transistor's specification. I.F.

### Compaq V50 (Model 610T)

This monitor came in dead with the fuse blown. It has a **Philips** chassis, with the usual discrete diode mains bridge rectifier. One of the 1N5406 diodes had gone short-circuit. I replaced all four, as the one that's failed puts a strain on the one that is effectively in series with it during the relevant half cycle, and I couldn't be bother to find out which one that was!

As this chassis doesn't include a metal-oxide varistor in the mains filter circuit for transient suppression I decided that 1N5408 diodes might last longer. I.F.

### Data General 7031

I'm sure that this is a very old **Acer Peripherals** monitor. It has a less substantial metal chassis than the 7033, and looks more recent. This one had come in for a basic refurbishment.

The monitor needed a lot of cleaning, inside and out, but seemed to be in good condition. The CRT required more than just a clean up to brighten the display however. So I replaced the electrolytic capacitors

in the heater supply smoothing circuit – C704 and C712 (both 470µF, 10V). With the heater supply restored to what the designer had originally intended, the CRT recovered well while running for a few hours with a peak-white raster.

This supply is also used by the optocoupler in the regulator circuit, which is another good reason to ensure that C704 and C712 are in good condition.

The soldering was showing its age – I think that a good tug would have pulled the LOPT out of the PCB. The degaussing resistor and one or two other components that run hot had crystallised solder. In short, the whole PCB needed a general resoldering. I.F.

### Samsung CQA4147L

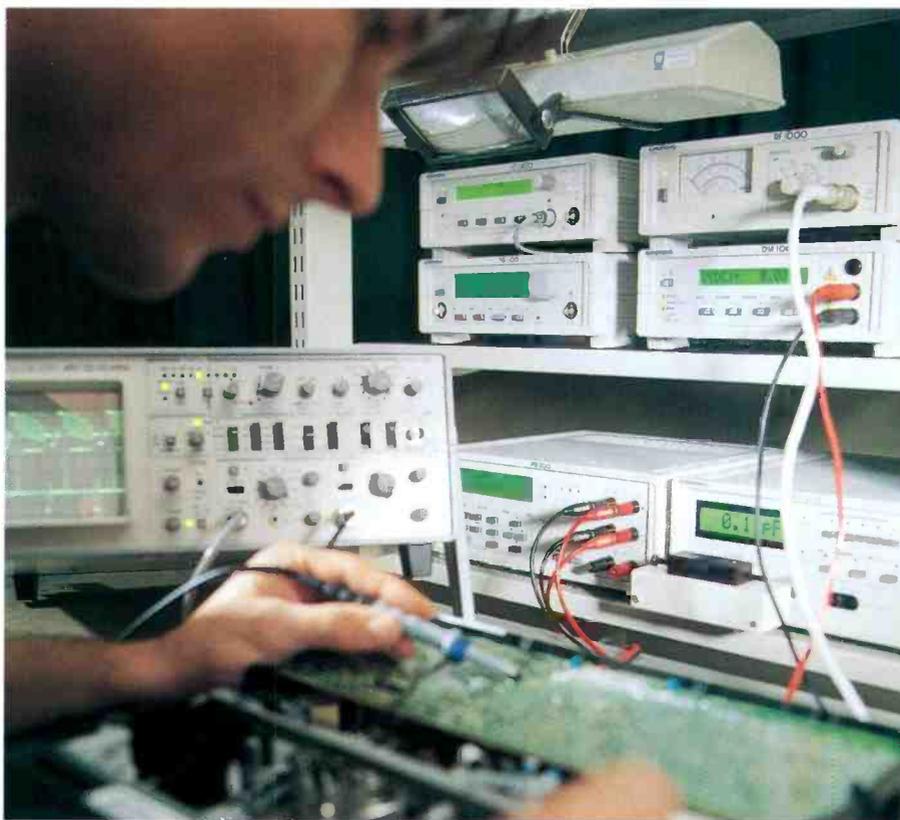
This one was brought in because it was 'dead'. I found that D618 on the secondary side of the power supply was short-circuit.

Unfortunately before I could note the type number I dropped it on the floor and couldn't find it! D618 provides a 50V supply, so I decided that a UF5404 would be a reasonably generously-rated replacement – though the PCB holes had to be enlarged.

As usual the nine-way socket at the back needed fresh solder. So did all the TO220 encapsulated components (transistors, MOSFETs and three-terminal regulators). The frame output chip also showed signs of solder fatigue. Unusually, Q406 (KSE800) in the EW drive circuit was properly soldered. This item often becomes loose from the PCB, causing all sorts of problems – and sometimes damage.

I had difficulty refitting the back. The problem was that I'd moved the nylon support pillar next to D618 while unsoldering it. This item has an oblong hole that locates with a plastic lug which is part of the back moulding. Once the pillar had been restored to its correct position the back could be fitted with no trouble at all. I.F.

*continued on page 97*



Text and research by Eugene Trundle

# Workshop Equipment

## For field, bench and rooftop applications

During the past year digital TV has become established in the UK, with about one and a half million DTV receivers (satellite, terrestrial and cable) now in use. Servicing of these boxes has so far been in the hands of the broadcasters and manufacturers, virtually the lot being under guarantee or on 'loan'. But the trade has gained a lot of experience of DTV reception – aerial characteristics, distribution system requirements and so on. Reflecting this, our survey this year pays special attention to instruments for checking signal reception.

Other types of test gear have, during the last year or two, become better-specified, wider-ranging, more efficient and more technician-friendly. Some units have come down in price as well! As before, we'll be looking into what's good, what's new and the latest test-gear technologies.

A list of manufacturers and distributors appears on page S8.

### Oscilloscopes

Amongst the range of conventional oscilloscopes available, there's a new dual-channel, dual-timebase 100MHz bench model from Tenma at under £650 and a 30MHz type, Model M030, from Grundig. For more demanding applications, such as servicing digital TV equipment, digital storage scopes are now coming to the fore. In this category Kenwood offers the dual-trace DCS 7020 and 7040 models: they are both 50MHz types with a 2kword memory per channel. By way of competition, Tektronix has the four-channel 100MHz DSO Model TDS224 at well below £1,600.

The latest in scope display technology is DPO (digital phosphor oscilloscope). With this, the waveform is not displayed on the screen directly: it's analogue-to-digital converted and then presented on a TV-style raster, with regular refreshment of the display panel. A microprocessor analyses and measures the incoming signal to produce on-screen digital readouts and provide a storage facility. The Tektronix TDS300 series with bandwidths

from 100-500MHz provides examples of this type of scope. In the exotic category comes Leader's 5000 range of precision video monitors, the 5212 vectorscope and 5222 waveform monitor, both of which have PAL/NTSC capability.

These sorts of instruments don't fall into the economy class! But second-user equipment is available from Stewart of Reading, which currently has available Philips PM3217 dual-trace 50MHz scopes at £200-£300, Gould OS1100 dual-trace 30MHz scopes at £200 and Fluke Scopemeters (Models 93/96/99) from £400.

Mention of Fluke Scopemeters brings us to hand-held LCD scopes. Alongside the excellent Pico OsziFox DSO there is now a £225 Tenma model from CPC. This combines a 2MHz DSO, an autoranging true RMS DMM and a 10MHz frequency counter in a single 83 x 210 x 50mm package, with an RS232 interface and software – a complete measuring centre in one pocket!

### Multimeters

Digital multimeters probably form the most

# Workshop Equipment Supplement



The Promax GV798 pattern generator from Alban. Ideal for the TV/video workshop.



The Tenma hand-held digital storage oscilloscope. New from CPC.



This accurate laser power meter has been added to CPC's range of test equipment.

diverse class of electronic test equipment, from the new Digitec D7 with 22 ranges and a DC accuracy of 0.5 per cent  $\pm 2$  digits for less than £6 at one end to the latest Fluke 80 series at the other, providing twelve different measurement functions, a 4½-digit display and 0.025 per cent accuracy for £225.

A good general-purpose meter for the service engineer is the Select Model DM506 from SEME at £22, order code EQU481. This is a hand-held 3½-digit 'big-display' model with AC/DC ranges to 10A, resistance readings to 200M $\Omega$ , capacitance measuring at up to 20 $\mu$ F and temperature measurement (a probe is supplied) from -50°C to 1,000°C.

For consummate accuracy on the bench you can buy the TTI Model 1604 from Thurlby-Thandar for £199. This has a 4¼-digit LED display and provides true-RMS readings. If you are economy-minded, Stewart of Reading has second-hand Solartron 7045 bench multimeters with a 4½-digit display at £30.

## Pattern Generators

TV pattern generators fall into two basic classes. First there are hand-held types such as the Ozan Teletest range and the Burosch type, with prices in the range £150 to £200 or so. Watch out for a new product or two from Ozan in the very near future, including an 'ultimate Teletest' with, it's rumoured, a 4:3/16:9 test pattern that includes a circle, stereo audio and RF out, all in a pocket-sized instrument that will sell for about £200.

At the other end of the scale two new video

generators from Grundig, Models VG1100 and VTG700, both generate 4:3 and 16:9 test patterns, the former being virtually identical to the well-established Philips PM5544 pattern. These wonderful instruments have just about every feature you could imagine, but at prices I dare not even mention here!

The Promax GV798 comes closer to the realities of a TV/video workshop budget. In addition to all the usual special-purpose displays it generates two sorts of test patterns with a facility to switch the between the 4:3 and 16:9 widescreen formats. It has the same features as the Grundig models plus the ability, for the first time with a workshop signal generator, to provide vestigial-sideband RF signals, simulating exactly an analogue TV transmission.

## Power Supplies

Bench PSUs come in variable- and fixed-voltage form, the latter typically rated at 13.7V to simulate a car battery. Altai has a very good range of 13.7V units that provide from 2A to 7A at prices from £12 to £31.

There's a very wide choice of variable PSUs. Grundig and Kenwood have introduced several new types this year, notably the PN series and PDS range respectively. The cheapest regulated supply for bench use is the MW 3/4-5/6/7-5/9/12V, 1.5A switched type which is available from CPC. This supplier also offers what seems to me to be the best value-for-money bench PSU, which has a continuously-variable 0-30V DC output at 0-2.5A (presentable), an LCD voltmeter and ammeter, plus fixed outputs at 5V/500mA and 12V/500mA. All this for £64 – the order code is IN00700.

## Audio Servicing

It cannot be denied that 'low-end' audio equipment is very difficult to repair at a profit. It is still viable to repair the more exotic and expensive gear, also high-value mobile audio equipment, but it's not exactly money for old rope, especially when the equipment has to be dealt with in situ!

Daydreaming again for a minute, the Leader 5836A Surround Sound monitor displays on screen a two-dimensional image of the sound field between the L/R/C/S speakers in a Surround Sound system and will work with digital or analogue inputs. I don't at the moment have a price for this, honestly!

Tenma has a 5MHz sweep function generator with a built-in counter (up to 10MHz) at £180, also a 10MHz function generator with frequency counter to 1.6GHz on an 8-digit yellow LED display at £230.

New from CPC, and relevant now that DVD-video players are likely to be encountered, is an accurate (5 per cent at 1mW) laser power meter. Order code is IN01190, price £173. In the audio generator field Kenwood offers some excellent sine/square instruments in the AG range. This starts from Model AG203D, a five-range 10Hz-10MHz unit at £235.

## TV Servicing

We've already considered some of the pattern generators that are available for checking TV and picture-tube operation. Tenma has recently introduced a couple of useful high-voltage probes. One, at £30, is for use with an existing DMM to check up to 40kV. The other, at £44, has a built-in analogue meter. It measures 0-40kV, with an accuracy of 2 per cent at 25kV, but because of its handle-and-probe construction is not suitable for use with the negative EHT supplies found in microwave ovens. Isn't there a market here for a dual-purpose job that incorporates a rectifier? Willow Vale stocks the Hameg HZ58 and HZ59 high-voltage probes, which can be used with either a multimeter or an oscilloscope.

A new capacitance tester from Electronic Design Specialists, designed to measure DC leakage and ESR, is as relevant to TV sets as any other class of equipment. It works with capacitors in situ, provides a readout on a field-array of red, green and yellow LEDs, uses a single-handed tweezer-type test probe and sells for less than £250 from component distributors.

## VCR Servicing

VCR repair and servicing has become a largely mechanical affair nowadays as the electronics have become ever more condensed and reliable. A large choice of alignment/test tapes is now available from £13 upwards. They can be used to check many aspects of VCR performance: head-switching point, back-tension, ACE head alignment and video head condition.

## PCB Testing

As PCBs become more intricate and complex – six or more conductive layers are now used in some consumer-gear panels – various devices have been introduced to help with servicing them. Perhaps the most innovative is the CT100 outfit from Circuit Trace. This is a hand-held continuity checker that quickly shows up interconnected (or short-circuited) points on a PCB. It's claimed to be a good time-saver, especially where layout or circuit diagrams are not available.

The Tektronix TR210 Huntron Tracker, which works in conjunction with an oscilloscope, is designed to locate 'stuck buses' and other problems. It will quickly find the location of a bus-line fault.

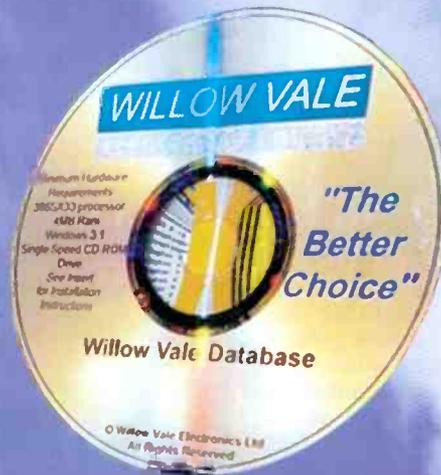
Some new probes for checks on tiny PC-mounted components have become available from CPC: the E-Z Pico Hook can be used for

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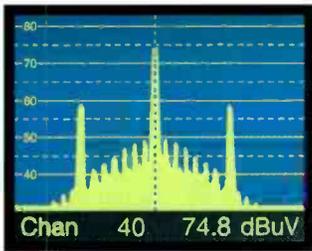
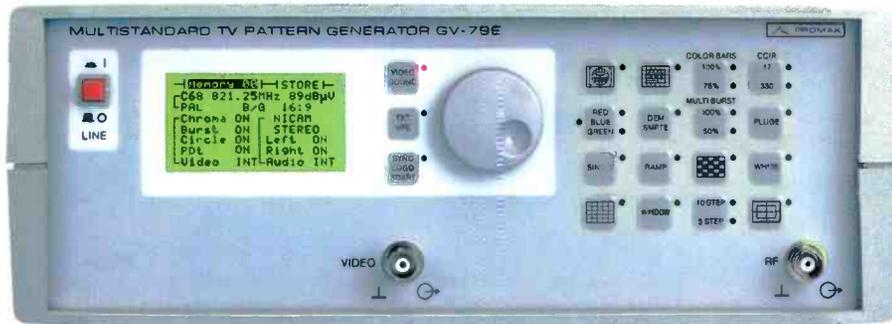
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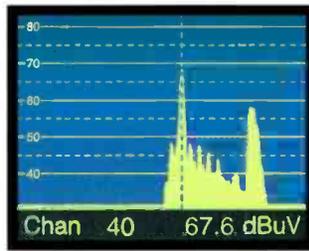
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PROMAX

## ANALYSERS FOR DIGITAL TV



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# Workshop Equipment Supplement

IC pin connections etc. while SMD probes in tweezer form (product code IN01393) give reliable connection to two-terminal surface-mounted devices.

## Soldering and Rework

Still on the subject of PCBs and assemblies, but this time in the hot and hazardous business of repair rather than test, the four big manufacturers JBC, Leister, Pace and Weller are still in competition. More recently the Solomon hot-air SMD rework station Model SR979, which is available from Vann Draper at £500, has presented a challenge. Solomon also produces a soldering and desoldering iron station, Model SL916, with a dual bar-graph temperature display, a 48W iron and a 48W desoldering gun at £300, and a couple of temperature-controlled 48W soldering stations, the SL20 at £60 and the SL30 at £70.

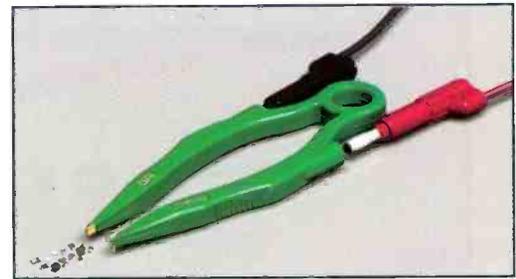
Established types of rework equipment are now challenged by a completely new technology for SMD board servicing in the form of OK International's Metcal MX500, which is available from SEME Ltd. It uses RF heating and was reviewed in the March 1999 issue of *Television*.

## Reception Testing

Now that, for new satellite installations, digital

TV has taken over from analogue much equipment has been introduced to assist with dish positioning and distribution system checking. One of the longest-established manufacturers in this field is Promax, whose equipment is handled in the UK by Alban Electronics Ltd. The company's range starts with the MS250, a simple £50 in-line satellite signal strength meter. Going up the sophistication/cost scale there are the Prolink 1 level meter, the MC277B spectrum analyser with FM/VHF/UHF/satellite capability for both analogue and digital signals, and the Prolink 3 series of spectrum analysers with BER (bit error ratio) measuring capability. The current flagship in the Promax range is the Prolink 7, which can handle QAM, QPSK and CODFM modulation: it displays a band spectrum, a picture or a data screen that shows signal status, error rate etc. There are many models in the Promax range, including the MC877C which has a colour LCD screen.

Coastal Aerial Supplies markets in the UK the products of another established manufacturer in the RF meter/analyser field, the Spanish company Sadelta. The company's range includes the new TC58 at £600: it's a satellite field strength meter with synthesis tuning and quantitative readout (dBµV and dBmV ± 3dB) on a 5-digit, backlit LC display. Coastal Aerial Supplies also



Probes in tweezer form for use with surface-mounted devices. New from CPC.

handles the products of a French manufacturer, Perifelec, whose current range of RF instruments is crowned by Model MC30A. This is a spectrum analyser/picture monitor/signal-strength meter with digital carrier measurement. It provides continuous coverage over 46-860MHz and 920-2,150MHz in four bands, and quantitative signal-level indication. The price is around £950.

Back at the lower end of the scale the Satfinder/Digisat meter, now in Mk III form and pre-programmed for five digital satellites, has proved itself well. It's available for £199 from SEME under order code EQU491. ARD Electronics also has a product (order code 340-00053, price £55) called the Digisat: it measures

## Digital Satellite dish alignment meter



Order Code  
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**£199.00**

### Pre-programmed for 5 satellites

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Monitor tester Order Code EQU488

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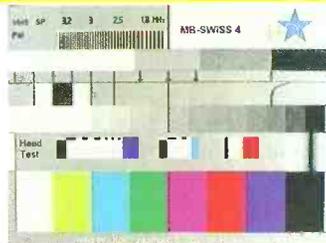
Visual indication of:

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- Head P/B quality
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As featured in the October 1998 issue of *Television* magazine

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The Promax GV241 from Alban provides test patterns for use with PC monitors.

LNB voltage and current, indicates the presence of a 22kHz tone, and shows signal strength by means of a LED bar-graph and an audible tone.

Some of this equipment works with terrestrial TV signals in the UHF band as well. Measurement and analysis of UHF signals has become crucially important since the advent of Channel 5 and now DTTV signals. The band seems to have become a chaotic jungle of conflicting and ill-matched transmissions.

The Imdigital-T hand-held installer's meter from Swires Research, a British company, has been specifically designed for use with terrestrial DTV signals in the band 470-860MHz. It detects whether the signal is in analogue or digital form automatically, and scans the noise floor to give strength (accuracy typically 1dB) and signal-to-noise ratio readings for the selected channel. The result can also be presented as a simple readout of 'pass' (>26dB), 'marginal' (23-25dB) or 'fail' (<23dB).

Other instruments dedicated to terrestrial signals include the Sadelta TC700 and Perifelec MC25, which are both meter/monitor/spectrum analysers. Prices, which reflect their specifications and capabilities, are £1,500 and £750 respectively.

### Computer and Monitor Servicing

Back down from the rooftop to the workbenches of those who tackle faults in computers, monitors and peripheral devices. Promax has recently introduced a test-pattern generator, Model GV241 for use with PC monitors: it can produce colour fields, colour bars, a grey scale, multiburst and other patterns, and is compatible with a wide range of monitors (50-90Hz and 640 x 200 to 1,600 x 1,280). Monitor pattern generators are available from Ozan and Burosch in hand-held form and from Black Star in benchware and PC-software forms.

For computer fault-finding the excellent Dr Bear card from CPC, mentioned in this feature a year ago, has come down in price from £490 to £282. New diagnostic software has become available to help tackle higher-level faults, software and hardware conflicts and so on. McAfee

First Aid 2000 costs £30, while the latest version of Symantec's excellent Norton Utilities is priced at £34.

Thurlby-Thandar has introduced two new stand-alone instruments for computer system fault-finding and analysis work. Model TA320 with a built-in LC display is a logic analyser with 32-channel capability at 25MHz and 100MHz asynchronous operation. Analyser Model DA100 is an inexpensive instrument (£85 plus accessories) for trouble-shooting with asynchronous serial data systems, e.g. RS232 and RS423: it works in conjunction with any simple oscilloscope.

### Appliance and Safety Testing

Safety testing is relevant to both brown and white goods. It involves visual and electrical tests for earth-leakage and insulation faults and, with metal-cased and earthed equipment, the integrity of earth-bonding links. The Europa and Supernova portable appliance testers (PATs), made by Seaward, have recently been added to the range of equipment available from SEME. Europa, a very compact microprocessor-controlled tester with 500V/300M $\Omega$ /25A capability, costs about £770. It has a VGA-type LC display. The Supernova at about £980 has a similar specification plus a 1.5kV/3kV flash test and compatibility with software packages from Seaward and others. Seaward's PAC500 is available at a more affordable £175: it meets legislative requirements and is suitable for smaller businesses that don't carry out hundreds of safety checks a week or log them by computer.

Willow Vale has the Celtek range of equipment for microwave oven safety and power checks, including the all-important radiation leakage monitor (order code 12295) at £140. CPC stocks a simpler test/warning device, 'the yellow peril', that comes complete with accessories at £91, order code IN00096.

### Service Aids

Most of what we've looked at so far has been for test, measurement and fault diagnosis. We also require gear that helps us inspect, handle,

clean, lubricate, solder, stick and cobble equipment in the workshop and the field, while protecting it from static charges and ourselves from electric shock, pollution, fumes and burns.

OK International is a leading light in this field. It supplies cored solder wire down to 0.7mm in diameter and special SMD rework solder wire as thin as 0.46mm diameter. There are also two new solder cream products and a wide range of PCB mask and coating compounds.

The company also has, at £280 a super-duper illuminated versatile magnifier with two fluorescent lamps - for the better off technician who wants to see what's what?

Cheaper fluorescent-lamp magnifiers from Ledu are available from all the larger component wholesalers. Notable here is the new Model DS251 with two (x1.75 and x2.25) 12cm glass lenses and a 22W circular daylight tube. It has a fully-balanced 110cm arm and sells for about £87.

Several new anti-static products from Vermason are available from CPC: ESD-protected storage bags, bubble bags and static-dissipative boxes: a rather expensive (£92) 1m x 600mm ES-dispersal floor mat; and a bench-protection kit, complete, at £55. For the field technician who doesn't want to bristle there's a static-dissipative tool roll at £27. Cheaper bench- and floor-mats are available from ARD Electronics at £25 and £43 (bench/floor, Nitrile) or £32 and £53 (bench/floor, Neoprene).

Workshop equipment also includes 'plant'. This category includes the fume-extractor systems recently introduced by SEME: they can filter and recirculate or vent through the workshop wall, and comply with HASAW legislation. More details on 01664 484 001.

### Second Users

Some examples of used equipment prices from Stewart of Reading have been quoted previously. Telnet, another specialist in this field, has the following current bargains: Gould OS3350/51 40MHz dual-trace scopes at £175; Hitachi V212 20MHz scopes at £150; Black Star/Orion TV/video pattern generators at £125; and Thurlby-Thandar dual 30V/2A bench power supplies at £150. All are tested and come with a 30-day guarantee.

### In Conclusion

This is our brief run-down on workshop gear as we pass into the twenty-first century AD. I wonder how they celebrated the arrival of the year 1000? Certainly they didn't have any trouble with DTTV interference at UHF then, nor were there any real bargains on offer from Telnet!

All the prices quoted here are trade, ex-VAT, and are subject to variation between suppliers etc. My golden-probe award this year goes to Tenma for its range of good and realistically-priced test gear. My booby prize for 1999 is hereby awarded to those makers and suppliers who, when asked for information on equipment suited to our cost-constrained trade, sent me details of instruments priced at five thousand pounds or more!

## 3-15V/6A Variable Regulated Output Power Supply



A compact, high quality bench-top power supply for laboratories, workshops or education establishments. The unit offers valuable voltage and current outputs and features dual precision moving coil meters.

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For full technical data see IN00702 on page 1753 of CPC's 2000 catalogue

order code **CH00517** price each 1-4 **£44.89** 5+ **£42.33**

## Temperature Controlled Soldering Station

- Professional quality
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- Tolerance  $\pm 5^\circ\text{C}$
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- Wide range of long life tips available - see CPC's catalogue for details



ONLY

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### Technical Data

Power 240V ac 50Hz  
Dimensions 170x120x90mm  
Iron Length 200mm

## OPM-570L Laser Power Meter

A laser power meter for measuring the strength of infrared lasers used in compact disc players, laser disc players, CD-ROM drives, laser printers, bar-code readers, etc. Supplied with ultra-slim, tiltable optical sensor probes with 0.9m cable, carry case with strap and instruction manual.



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- 650nm to 680nm wavelength range for CD-ROM drives, barcode readers and office automation equipment
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order code **CH48972** price each **£154.95**

## Large Display Multi Function DMM

- Transistor hFE test
- All ranges overload protected
- Diode test, continuity check with buzzer sound
- Rugged case, drop proof
- Capacitance measurement 1pF to 20 $\mu\text{F}$  in 5 ranges
- Auto power off



### Ranges & Accuracy

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AC Voltage 2, 20, 200, 700V,  $\pm 0.8\% \pm 3$   
DC Current 2m, 20, 200mA, 20A  $\pm 0.8 \pm 1$   
AC Current 200mA, 20A,  $\pm 1.8\% \pm 3$   
Resistance 200, 2k, 20k, 200k, 2M, 20M 200M $\Omega$   $\pm 0.8\% \pm 1$

order code **CH01588** price each 1-4 **£23.34** 5+ **£23.22**

## GoldStar 20MHz, 2 Channel Oscilloscope

2 channel, dual traced, X-Y mode oscilloscope with 6" rectangular CRT with integral graticule (8x10 div). It has high sensitivity triggering with a sweep magnification of x10 (20ns/div).

Supplied with operating manual. Probes are not supplied but are available separately.

For a suitable mains lead, order code PLCORD4.



For full technical data see IN01000 on page 1804 of CPC's 2000 catalogue

order code **CH00519** price each **£229.55**

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## TEST EQUIPMENT MANUFACTURERS AND DISTRIBUTORS

*Items with brand names mentioned in the text but not listed here are available through distributors such as CPC, Chas Hyde and Son Ltd. (CHS), HRS, SEME and Willow Vale Electronics.*

**Adroit Technology Ltd.** Available from CPC.

**Alban Electronics Ltd.**, 6 Caxton Centre, Porters Wood, St Albans, Herts AL3 6XT. 01727 832 266.

**Airidus.** Available from CPC.

**Altai.** Available from SEME.

**A.R.D. Electronics Plc**, Shorten Brook Way, Altham Business Park, Altham, Accrington, Lancs BB5 5YL. 01282 683 000.

**Avo/Megger.** Avo International, Archcliffe Road, Dover, Kent CT17 9EN. 01304 502 100.

**Black Star**, 2 Glebe Road, St Ives, Huntingdon, Cambs PE18 7DX. 01480 450 409.

**Bofa.** Available from CPC.

**Burosch.** Available from CPC.

**CHS**, Prospect House, Barmby Road, Pocklington, York YO4 2DP. 01759 303 068.

**Circuit Trace**, PO Box 70, Retford DN22 05Y.

**Coastal Aerial Supplies**, Unit X2, Rudford Industrial Estate, Ford, Arundel BN18 0BD. 01903 723 726. S.distributor for Saldeta and Perifelec.

**CPC plc**, Component House, Faraday Drive, Fulwood, Preston, Lancs PR2 4PP. 01772 654 455.

**Daiwa.** Available from SEME.

**Fluke.** Available from Willow Vale Electronics.

**GoldStar.** Available from Maplin.

**Grundig.** Available from Vann Draper Electronics.

**Hama**, Unit 4, Cherrywood, Chineham Business Park, Basingstoke, Hants RG24 0WF. 01256 374 700.

**Hameg Instruments Ltd.**, 70-78, Collingdon Street, Luton, Bedfordshire LU1 1RX. 01582 413 174. Also available from CPC, SEME and Willow Vale Electronics.

**Huntron.** Available from SEME.

**Instek.** Available from Maplin.

**JBC.** Available from Willow Vale Electronics.

**JVC (UK) Ltd.**, JVC House, JVC Business Park, Priestley Way, Staples Corner, London NW2 7BA. 0208 450 3282.

**Kenwood.** Available from SEME and Vann Draper.

**König.** Available from CHS, Willow Vale Electronics.

**Leader.** Available from CPC.

**Lodestar.** Available from Vann Draper Electronics.

**Maplin Electronics plc**, PO Box 3, Rayleigh, Essex SS6 2BR. 01702 554 161.

**Maxcom.** Available from Vann Draper Electronics, Willow Vale Electronics.

**Metcal.** Available from OK International.

**Metex.** Available from CPC, SEME.

**Müter.** Available from SEME in the UK, from Donberg Electronics, Ranafast, Co. Donegal (075 48 275) in Ireland.

**MW.** Available from CPC.

**OK International**, Eagle Close, Chandler's Ford, Hampshire SO53 4NF. 02380 489 100.

**Ozan**, Freepost, Wimborne, Dorset BH21 7BR. Freecall 0500 009 070.

**PC Control Systems Ltd.**, Hamilton House, 66 Palmerstone Road, Northampton NN1 5EX. 01604 601 677.

**Perifelec.** Available from Coastal Aerial Supplies.

**Philex plc**, 110-124 The Broadway, West Hendon, London NW9 7PP. 0208 202 1919.

**Pico Technology Ltd.**, 149-151 St. Neots Road, Hardwick, Cambridge CB3 7QJ. 01954 211 716.

**Precision Gold.** Available from Maplin.

**Promax.** Available from Alban Electronics Ltd.

**Sadelta.** Available from Coastal Aerial Supplies and Willow Vale.

**Satellite Solutions (UK) Ltd.**, 1 Hartburn

Close, Crow Lane Industrial Estate, Northampton NN3 9UE. 01604 787 888.

**Satfinder.** Available from Willow Vale Electronics.

**Satlook.** Available from Satellite Solutions.

**Seaward.** Available from CPC, SEME, Willow Vale Electronics.

**Select.** Available from SEME.

**SEME Ltd.**, Hudson Road, Melton Mowbray, Leics LE13 1BS. 01664 484 000.



**Sencore.** UK agents ITM Ltd., 34 Beaufoys Avenue, Ferndown, Wimborne, Dorset BH22 9RH. 01202 872 771.

**Solomon.** Available from Vann Draper Electronics.

**Swires Research**, 40 Hornsby Square, Southfields Industrial Park, Laindon, Basildon, Essex SS15 6NZ. 01268 417 584.

**Tektronix.** Available from CPC.

**Tenna.** Available from CPC.

**Thandar/Thurlby.** Available from Willow Vale Electronics.

**Unaohm.** Available from Satellite Solutions.

**Vann Draper Electronics**, Unit 5, Premier Works, Canal Street, South Wigston, Leics LE18 2PL. 01162 771 400.

**Vermason.** Available from CPC.

**Wavetek.** Available from CPC.

**Willow Vale Electronics Ltd.**, 11 Arkwright Road, Reading, Berks RG2 0LU. 01189 876 444.



**Test gear is also available from: HRS Electronics Ltd.**, 100 Great Barr Street, Birmingham B9 4BB. 01217 666 668.

**Stewart of Reading**, 110 Wykeham Road, Reading, Berks RG6 1PL. 01189 268 041. Also supplies used equipment.

**Telnet**, 8 Cavans Way, Binley Industrial Estate, Coventry CV3 2SF. 01203 650 702.

Our heading photo on page S1 shows a service station equipped with Grundig test gear. Grundig test equipment is available from Vann Draper Electronics.

**monitor faults continued****VTECH EM1430K**

The first job with this monitor was to replace the VGA cable. It had an RS Components 15-pin sub-D plug held to it with half a roll of PVC tape. I always salvage these cables when a monitor is scrapped, and had one in stock.

Internally, the monitor needed a good resolder – in particular the centre pin of the degaussing resistor had completely let go. Before casing up, I replaced C513 (100 $\mu$ F, 25V) in the power supply. In the UC3842-based chopper circuit used in this monitor regulation is carried out entirely on the primary side of the circuit, to avoid the need for an optocoupler. C513 doubles as the UC3842 supply (V<sub>cc</sub>) reservoir capacitor and error voltage sampling capacitor. When this capacitor fails the power supply goes bang! I don't like returns.

Some versions of this design have two electrolytic capacitors, which is a point to watch. **I.F.**

**Viglen 1528E**

This monitor is clearly a descendent of the **AST LR14**, but the chassis has been radically redesigned. There's an all push-button front panel, and most of the presets have been replaced by an 'electronic-screwdriver' interface. The problem was a jammed on/off switch. The plastic push-rod is similar to that in earlier models, but this one had a small square of PCB material glued to the contact face that pushes the switch. The required thickness had been underestimated – I had to add a second piece.

As the chassis has been redesigned there is little or no correlation between its component reference numbers and those used in earlier models. The notorious C322 is now C307, the value being 5.6nF rated at 2kV. With previous models that have a 5.6nF capacitor in this position the rating is 1.6kV. Hopefully the 2kV component will prove to be less troublesome. **I.F.**

**AST TE1764G**

Whenever there was a contrast change a dull, steel-blue comet-tail effect appeared around everything on the screen. There seem to be two reasons for this and similar effects with these monitors. One is a faulty base-emitter junction in the common-base section of the relevant cascode RGB output stage. The other is an invisible dry-joint at either the relevant cathode feed resistor or CRT base pin. The CRT socket was so securely fixed to the

tube that the base panel had to be dismantled in situ to enable the socket to be cut free from the tube's neck! When I examined the PCB I found that some of the dry-joints were not exactly invisible, while a few of the transistors had what looked like heat scale on the pins and one had bent pins and damaged solder pads.

I decided to check the base-emitter junction of each transistor, using my DMM's diode-test function. No faulty junctions were found. Thorough PCB cleaning and resoldering cleared the fault. **I.F.**

**Tatung TM3401**

There would be an EHT rustle then this monitor would shut down. The soldering looked as if someone had reworked it using a fire poker rather than a soldering iron. This reminded me to clean the solder off T801's pins to check whether the solder pads were still attached to the tracks. They were. Powering the monitor with the line output stage isolated proved that neither of the two shutdown thyristors in the power supply was being activated. The line output stage overvoltage shutdown thyristor D418 was being activated because the 4.7nF, 1.6kV flyback tuning capacitor C420 was open-circuit. When I removed and examined it I saw that it was 'bloomed'. **I.F.**

**Wang 1428**

This monitor came from a local computer dealer who had acquired it in part exchange for a new system. It was completely dead. I couldn't understand why there was 325V across the mains bridge rectifier's reservoir capacitor and at the primary winding of the chopper transformer but nothing at the collector of the chopper transistor. Then I spotted a fuseholder with no fuse in it. I was forced to believe my eyes when I traced the print from the fuseholder to the transistor's collector. How unusual!

The transistor checked out OK, and there weren't any obvious shorts in the power supply. So I fitted a 1.5A fuse and applied the mains voltage via my variac, increasing it slowly. When the variac's output reached 130V AC with still no signs of life from the monitor I realised that something else was wrong. There was now 325V at the collector of the transistor, but there was no base drive from the UC3842 control chip. There should be 14-20V at pin 7 of this device, the start-up feed normally coming from the bridge rectifier's output

via a resistor – two 36k $\Omega$  resistors in series in this case. Just over 1V was present however, and the resistors were OK. The cause of the problem was the 1N4148 diode D112 which provides the IC's supply after the initial start up. It measured 300 $\Omega$  each way.

I replaced the diode, carried out a much-needed resoldering job in the line output stage, then again cautiously powered the monitor. This time it came to life, with the power supply providing 130V at the cathode of D103 on the secondary side of the circuit. **J.E.**

**Apricot XJ52178**

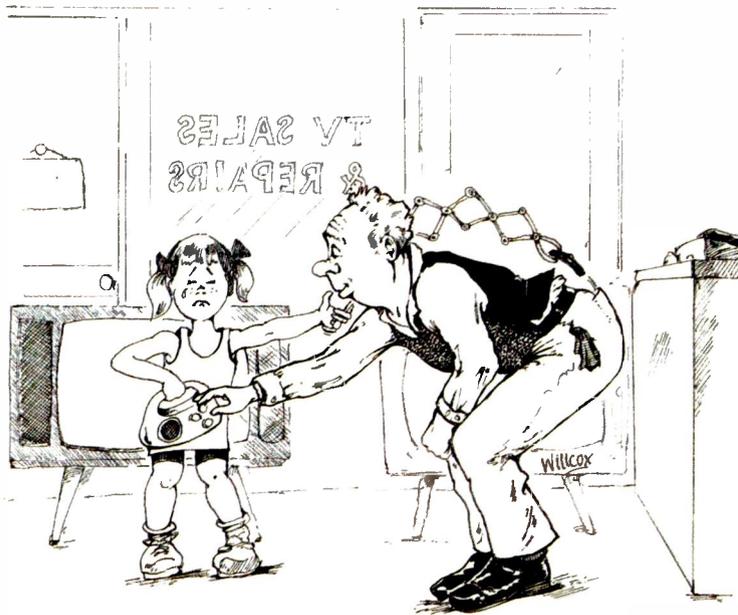
There was no power supply operation with this monitor because the start-up resistor R805 (50k $\Omega$ ) was open-circuit. It supplies about 17V to pin 7 of the UC3842 chopper control chip. **J.E.**

**IBM 2124**

Apart from the yellow power-on LED flashing on and off there were no signs of life. It didn't take me long to discover that the BU2508AX line output transistor Q310 had failed. I didn't have one, and couldn't find a stockist, so I fitted the common BU2508AF type. This brought the monitor to life, with a normal display, but I was a bit concerned about the transistor's operating temperature. It seemed quite hot. Nevertheless a two-day continuous test proved that it was working all right.

I was about to give the cabinet the usual wash and brush up prior to returning the monitor when the screen suddenly blanked, reappeared then blanked again. The display finally remained off. The line output stage was still working, and when I cupped my hands over the tube neck I could just make out the faint glow of the heaters. So, feeling somewhat annoyed, I reached for the freezer spray and squirted this and that in the line output stage area. I eventually discovered that a burst of spray on the body of a small, very discoloured and cracked 220pF, 2kV pulse capacitor, C336, would make the display come and go at will.

I was hoping that the replacement capacitor would lower the working temperature of the line output transistor, but it made no difference. Still, at least the blanking problem had been solved. As the transistor held its own during a further two-day continuous test I finally gave the cabinet a clean up and sent the monitor on its way: **J.E.**



**Eternal vigilance is required to avoid being caught out. As a warning to the unwary Robert Blair describes some attempts at deception**

# Tricks of the Trade

**D**uring my many years as owner of a TV repair shop I have never ceased to be amazed at the lengths to which some people will go to try to swindle others out of their hard-earned cash. I don't know whether or not my experiences are out of the ordinary, but here are some of the attempts (fortunately unsuccessful) that have been made to part me from either my goods or my money.

## The House Call

It was four o'clock in the afternoon of what had been a fairly run-of-the-mill day in the shop. A young man walked up to the counter and asked if I was interested in buying an almost-new portable colour TV set. Yes, he had the remote control for it, and the paperwork. The only problem was that he had no transport. So could I possibly call at his home to look at the set?

His price seemed to be about right, so I asked him where he lived. The address was at a high-rise block only half a mile from my home. I agreed to call, with the cash, at eight o'clock that evening.

After finishing my meal at home I was preparing to go and have a look at my prospective purchase when I began to have misgivings. It was beginning to get dark, and here I was about to go out alone to an estate where crime was no stranger, carrying a wallet-full of cash, at a time when there would be very few people on the streets.

My daughter and her husband Nick happened to be visiting us that day. I voiced my fears to them and Nick, a well-built man of fourteen stone, agreed to accompany me.

It was quite dark when we arrived at the block of flats. A saloon car containing two men was parked outside the entrance. We entered the block and took the lift to the ninth floor. Here my suspicions were confirmed. The address I had been given was that of a derelict dwelling. I'd been set up. By the time we reached the street the car

with the two men in it had disappeared. There's little doubt in my mind that had I gone on my own I would have finished up minus my wallet, and possibly been given a beating into the bargain.

What bothers me in particular is that had the event occurred in summer, with longer daylight hours, I might not have anticipated any danger.

## The Tenner

Once, several years ago, I left my daughter in charge of the shop while I went to the bank, which was just around the corner. I had no sooner gone than two teenage girls came in and bought a PP3 battery, tendering a five pound note for which they were given the correct change. They then spent a few minutes chatting pleasantly to my daughter about things in general. As they were about to leave, the girl who had made the purchase looked at the change, which was still in her hand. "Excuse me" she said, "but I gave you a ten pound note – this is change for five." Her friend vigorously agreed.

At that moment I returned and my worried daughter explained the situation. I went behind the counter, opened the till and beckoned to the girls. There were no tenners. I'd just banked them.

How they apologised. It was of course a genuine mistake. I must say!

## The Loan Set

I sometimes suspect that there's a large sign above my head saying "sucker". If not, there are occasions when I feel there should be. Like the time a gentleman came into my shop late one Friday afternoon with a Fidelity ZX2000 that he wanted me to look at. It was, he said, rather urgent as his children were driving him mad with no set to watch. I told him that I would do my best to look at it the following day.

He returned just as I was about to close the shop on Saturday evening. It had been a busy day, and I'd not been able to look at his set. What, he asked, was he going to do? Life was going to be pretty bleak with no telly for the weekend.

Taking pity on him, and partly blaming myself for not looking at his set, I decided to lend him a Philips portable from stock, on the understanding that it would be returned on the following Monday. I had his address and phone number, so I didn't have any qualms about letting him borrow it. Anyway, he seemed a nice enough chap.

On Monday morning I took a look at the Fidelity set. Oh dear! The tube had an interelectrode short. So I rang the number on the job ticket. "Sorry" said the woman's voice at the other end, "you must have the wrong number."

I looked at the card. Must have written the number down incorrectly. But there was the address, only five minutes away. I decided to pop round and see him.

As soon as I saw the old lady who came to the door I knew that all was not well. She lived there on her own, and had never heard of the person I was looking for. And no, she didn't have any grandchildren.

That might have been the end of the story. But, fortunately for me, the man had at least given his correct name. As a result of a series of coincidences, I was eventually reunited with my Philips portable.

It transpired that he lived at a mobile home site. As I approached the caravan in which I had been reliably told he lived, I could clearly see through the window that his wife and kids were happily seated watching my TV set.

With the Fidelity ZX2000 in one hand, I knocked at the door. His wife opened it.

"I've brought John's telly back" I said, as if I was a personal friend and nothing was amiss. "It's beyond repair, so I've come to collect the one I lent him."

She at first refused to hand over the Philips set. But mention of the possibility of the local constabulary becoming involved helped change her mind. I'll bet her hubby was none too pleased when he returned.

### The COD Scam

This final tale of woe didn't happen to me. It involved a friend of mine who owned an electrical shop in a nearby town.

Peter, as I shall call him, was in his shop one day when a well-dressed gentleman approached him with an offer he couldn't refuse. The man was, he said, charged with the disposal of returned electrical goods for one of the major London stores. He was at this very moment looking for a buyer for fifty video recorders at a cost of £40 each. The only stipulation was that the store wouldn't take a cheque. Cash only.

It was arranged that Peter would travel to London the following week, with the cash, to collect the machines. When he arrived at the bustling store he was greeted by the agent, who was in his shirtsleeves carrying a clipboard. He was immediately joined by a second man, also in shirtsleeves, carrying a leger. Peter was told to hand the cash, two thousand pounds, to the second man who promptly departed, ostensibly to acquire a receipt.

The first man then asked Peter to remain where he was while he went to the office to arrange for the release of the video recorders. He disappeared through the swing doors, never to be seen again.

These men were caught in a later attempt, when they approached an acquaintance of Peter with the same offer. He, recognising the technique, informed the police.

The moral of this particular story is, of course, that if something seems to be too good to be true it probably is.

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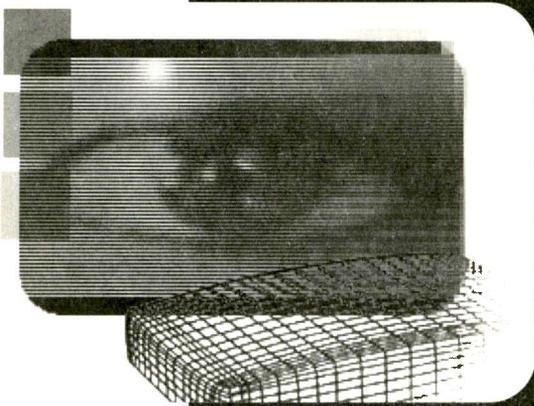
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### **Mitsubishi CT21M3TX (Euro 14 chassis)**

This set had a snowy picture or sometimes a blank screen. There were also no on-screen displays and the set wouldn't tune in. Checks around the microcontroller chip IC701 showed that the field sync input at pin 27 was missing. It comes via Q707 and Q708, both type DTA124ES, and returned once these transistors had been replaced. With the on-screen displays restored I was able to tune the set in. G.S.

### **Nokia ST51D2**

This set wouldn't power up. Checks on the primary side of the power supply showed that it would start, begin to run then cut off, cyclically. The supplies on the secondary side were all at about half what they should be, and the standby supply was even lower. Normal operation was restored by replacing diode V035 (BA157). G.S.

### **Beon CTV1405R**

There was excessive height. In addition there were lines on the picture. The supply to the field output chip was low at 19V instead of 28V, but no fault could be found in this area. I then found that the HT supply was low at 90V. When the smoothing capacitor C119 (47µF) had been replaced it came up to

# TV

## Fault Finding

115-120V and the fault symptoms had cleared. G.S.

### **Sharp 51AT15 (5BSA chassis)**

This set was dead with no operating functions. The front LED would pulse red but wouldn't go green. Checks in the power supply revealed that the +5VB output was low. When I replaced Q708 (BC338-40) and the 5.1V zener diode D715 in its base circuit the +5VB supply came up. The set could then be brought out of standby and operated normally. G.S.

### **Beko 20320NX**

If the field scanning is non-linear, with the picture stretched out over the top half of the screen, check or replace the 220Ω resistor that's connected across the scan coils. A.S.

### **Genexxa CTV10**

This set was completely dead. It has a switch-mode power supply inside a tin can that's bolted to the back cover in much the same manner as a Baby 10 transformer. On investigation I found that RP04 (180kΩ) was open-circuit. A.S.

### **Loewe-Opta Studio Art 1/894-64481 (C8001 chassis)**

The line output transformer was arcing from around the focus potentiometer and the main HT line was high at 160V. I fitted a new transformer and replaced the 100µF electrolytics C624, C626 and C641 in the power supply – the usual culprit C638 (1µF) had already been replaced. I then checked around and found that C548 (2.2µF) in the line output stage was open-circuit. This was replaced and the set was then fired up with the HT set to minimum.

There was normal sound with cramped field scanning, the usual

result when the HT is at 120V. When it was increased to the normal level, 142V, the picture blanked out and the sound went with it. A check was then made on all the remaining electrolytics – another ten were either open-circuit or low in value! It's a testament to the design that the set worked at all. There was still no sound when they had been replaced, because the mute line was being held down. I had to replace the 1N4148 diodes D496-9 to restore the sound. A.S.

### **JVC C140EK**

The complaint was failure to store channels. I suspected the memory chip IC001 on the station-select module but decided to make some quick scope checks around it. There were healthy squarewaves at pins 11, 14 and 15 but the clock pin 10 was dead. The clock pulses come from pin 31 of the tuning micro chip IC002. They weren't reaching pin 2 of the DA converter chip IC003 either. A wire jumper link restored normal operation. A.S.

### **Beko 20320**

Blue was missing from the teletext display. The cause was traced to C501 (10nF) on the main PCB being open-circuit. (C502 and C503 are the corresponding capacitors in the red and green signal paths.) A.S.

### **Granada C22XA5**

We've had three of these Hitachi clones in recently, all with differing complaints but the same cause – C608 (22µF, 160V) going low in value. It's next to the field module. The symptoms vary but give a combination of top cramping with high brightness and flyback lines. A.S.

### **Toshiba 1400RB**

The 0.5mA fuse F803 in the HT

line blew intermittently. I discovered that the three rubber wedges under the scan-coil assembly had hardened and become conductive. The line scan coils arced across to the CRT coating from two of them. **A.S.**

### Proline TN2800

Lines at the top of the screen was the complaint with this set. Whenever I get this fault I go straight for the flyback boost capacitor in the field output stage. Sure enough C432 (100 $\mu$ F, 35V) proved to be the culprit. **M.M.**

### Ferguson TX92 Chassis

This dead set, a **Goodmans Model GD2880**, had received attention elsewhere. Its power supply had blown up. When I rebuilt it and switched on it went bang. A call to Ferguson Technical produced some further component replacement suggestions, but the result was once again a bang. To cut a long story short, I eventually found that the BY297 rectifier DP53 for the 22V line, on the secondary side of the power supply, was very leaky. Replacing this and the TDA4605-3 chopper control chip IP01 restored normal operation. **M.M.**

### Sony KVX2532U (AE1B chassis)

This set was dead with the line output transistor short-circuit. I fitted a replacement, but the set still cut out whenever there was any vibration. I then resoldered the usual dry-joints at the regulators and the audio output ICs, but the cause of the problem was dry-joints at the TDA2028B timebase generator chip IC501. Once these had been attended to the set worked reliably. **M.M.**

### Philips G110 Chassis

Why is it that when a set starts to go off intermittently the customer waits until it's well and truly dead? What started off as a dry-joint at chip resistor R3619 in the power supply ended up with the need for a power supply rebuild, with some print repair and a large bill. For a reliable repair, always use the original Philips service kit. **M.M.**

### Mitsubishi CT3701TX

This monster was dead and there was no way I could take it back to the workshop. Fortunately it didn't take long to discover that the HT rectifier D916 was short-circuit. Prior to failure it had been arcing at its dry-joints. A BY399 proved to be a reliable substitute. **M.M.**

### Sony KVE2542U (AE2 series chassis)

Except for the picture-in-picture mode this set produced a monochrome display. Checks in the colour section of the main PCB proved inconclusive, so I replaced the TDA9145 decoder chip IC301, the TDA4660 chroma delay line chip IC304, and crystals X301/2. At switch on I was rewarded with a full colour picture. **M.M.**

### Bush 2857NTXA

This set's owner said that the picture was dull and asked whether I could do anything about tuning drift. Because of low gain during the guarantee period a new tuner had been fitted, but the set had drifted ever since.

First checks revealed that the HT was way too high. The usual causes with this chassis are C910 (47 $\mu$ F) and C908 (10 $\mu$ F). When new 105°C types had been fitted the HT returned to its correct level. The cause of the dull picture turned out to be R433 (180k $\Omega$ ) in the beam limiter circuit. Note that the value of this resistor varies with CRT size.

The tuning drift took rather longer to sort out. A lot of components around the tuner had been checked/replaced, which didn't inspire confidence. But the 33V supply was stable, and the drift increased the longer the set had been on. So attention was turned to the AFC system, which differs with the various models that use this chassis. In this model the tuner's AFC pin is not used, being supplied with a steady 6V instead. AFC is applied to the main microcontroller chip, which carries out tuning. A reference from the IF chip is fed to pin 9 of the microcontroller chip and is then superimposed on the tuning voltage. I'll not list the many components I checked and eliminated from the search to no effect: the fault was actually man-made.

The AFC line passes the tuner's AFC pin on its way to the microcontroller chip. The print is actually cut to isolate the tuner's AFC pin. When the new tuner had been fitted, the print had been reconnected. So AFC was applied to both the tuner and the microcontroller chip. The fault was cured by removing a small section of the print. **P.G.**

### Ferguson TX805 Chassis

The complaint was no results, and I was expecting to find the usual cause - RP44, RP42 or RP41 open-circuit. For a change however the

set was stuck in standby. The front LED glowed, but the set refused to respond to either the front-panel controls or the remote-control unit.

Most of the power supply voltages appeared to be correct, and at first it seemed more like a protection fault. If the set was switched on using the mains switch you could just hear signs that the power supply was trying to start before it died. Before getting too involved I suspected that there might simply be loss of a supply derived from the combined chopper/LOPT. This proved to be correct: DP18 (BA157) and RP68 (0.68 $\Omega$ ) in the 15V supply were short- and open-circuit respectively. **P.G.**

### Samsung CI591

Poor/no picture was the complaint with this set, which had apparently been repaired twice elsewhere for the same fault during the past year. I found that the picture was dark, with pronounced black and white ringing across the screen. A check on the supply to the RGB output stages produced a low reading with a lot of line-frequency ripple instead of a smoothed 175V supply. C560 (2.2 $\mu$ F, 400V) on the CRT base panel had obviously been replaced at least once, and proved to be yet again open-circuit. When it was replaced there was a normal picture. Its value seemed to be too low for a reservoir capacitor however, so I checked back to the source of the supply. This brought me to C410 (220 $\mu$ F, 200V) which was also open-circuit. It was clearly the reservoir capacitor, and its demise had presumably led to the failure of C560. **P.G.**

### Matsui 1498

The complaint was no picture. When I switched the set on a picture appeared briefly then turned into a bright blue raster with fly-back lines. A check at the CRT's blue cathode produced a reading of about 20V: further checks showed that the blue output transistor's 12k $\Omega$  collector load resistor was open-circuit. I fitted a replacement and removed the transistor for tests. It read OK, with no leakage. But when it was replaced and the set was powered the symptoms were the same as before, with the new resistor getting quite hot. Despite testing OK the transistor was faulty, breaking down collector-to-emitter under load. **P.G.**

### Toshiba 285T8B

This set, which refused to start,

came from another dealer. I noticed that the TDA4601 chip, the optocoupler and nearly all the capacitors on the primary side of the power supply had been replaced. Quick voltage checks showed that nothing was obviously wrong and gave the impression that the set was in fact in standby.

A look at the circuit diagram produced a few clues. There's a secondary power supply that runs in standby: it provides 14V for the audio output chip and approximately 12V that's fed to the L78MR05 regulator Q805. This provides 5V for the main board, including a 5V reset line for the microcontroller chip. I found that its output was only 2V, because its input was low at 6.5V. There's not much to check here, and I soon found that C842 (330 $\mu$ F, 25V) was virtually open-circuit. A replacement restored normal operation.

The main power supply had been held in standby because of the absence of a supply to the microcontroller chip. In this chassis the optocoupler is used for standby switching, not regulation. There should be 0.3V across the diode side when the set is running. **P.G.**

### **Panasonic TX25AD2 (Euro 2 chassis)**

The sides of the picture weren't straight: an EW problem affected the top and bottom third of the picture. With the set in the service mode both EW adjustments had some effect, but the EW-2 adjustment didn't provide enough correction. Checks in the EW driver stage showed that there seemed to be an excessive drop in the drive from the BC547B emitter-follower transistor Q593. Once this transistor had been replaced normal EW correction could be obtained.

Note that there's more than one version of the Euro 2 chassis, and different EW correction circuits are used. **D.B.**

### **Sony KVM2151 (BE2A chassis)**

The reported fault was intermittent loss of the picture. It was many days before the symptom showed up: the screen became bright white, with no signs of flyback lines. Checks on the RGB signals showed that they were driving the output stages to maximum between the line sync pulses. The cause of the problem was found when the sandcastle pulses at pin 10 of IC302 were checked: instead of being 9V peak-to-peak with sharp, square

corners they were at only 6V peak-to-peak, with rounded edges.

The line component of the sandcastle pulse is derived from the collector of the line output transistor. There are two coupling capacitors then a 1.8k $\Omega$  surface-mounted resistor. At this point the line-rate spike is clamped by D503 and D504, at 12V and 0V respectively. The result should be squared-off line pulses. They were rounded and at 6V however. D504 read OK when checked with a meter but was leaky in the reverse direction, limiting the pulse amplitude. It's a surface-mounted type, located in the horseshoe of LOPT connections. **D.B.**

### **Panasonic TX28LD1 (Euro 2 chassis)**

We had two of these sets in because they were dead. Both had a blown mains fuse, but no obvious cause was apparent and replacements got them going again. When the degaussing posistor was removed and opened up the inside cover was seen to be coated with a shiny residue that coincided with an eroded section across one of the discs, where it appeared to have fired across. New posistors were fitted. **D.B.**

### **Ferguson A51F (IKC2 chassis)**

The report said that this set was dead. In fact the power supply was working and at switch on there was a very short burst of activity from the line output stage. There was only a brief burst of drive from the line driver transistor TL17 before its collector voltage fell to 0V because of a DC bias at its base. The line oscillator in the TBA8569-CN signal and timebase processing chip IV01 continued to work, the bias coming from DL16 in the protection circuit. Checks in this area revealed that TV01 (BC558) was leaky emitter-to-collector.

Once TV01 had been replaced a possible cause of its failure became apparent. As soon as the line output stage started up there was a loud crack as a spark jumped from the rear of the transformer to the main PCB. I was relieved to find that there were no further problems once the transformer had been replaced. **D.B.**

### **Matsui 1436**

If you get one of these sets with no power though the LED goes off when you switch it out of standby, check the condition of R651 (27 $\Omega$ ,

3W) and R653 (1.5 $\Omega$ , 3W). If they are open-circuit replace them, also C655 (0.47 $\mu$ F, 50V) which goes short-circuit and, to be on the safe side, the STK7348 chopper chip IC650.

One of these sets came in with no line drive because the driver transformer T751 was open-circuit. A replacement got the set working again.

With another one there was field collapse because the 25V supply to the field output chip was missing. R603 (2.2 $\Omega$ , 2W fusible) was open-circuit and the rectifier diode D602 measured short-circuit. When I fitted replacements the new resistor burnt up. The 0.01 $\mu$ F, 400V protection capacitor C603, which is in parallel with D602, was short-circuit. I must remember to check components when they are out of circuit not just when they are still soldered in.

Yet another of these sets would work for a while then the sound would go low and buzz. I went to the IF can first and had a tapping session with my screwdriver. This revealed poor soldering at C268. Resoldering cured the fault.

The same chassis is used in the **Bush Model 2004**. **T.L.**

### **Ferguson B14R (TX80 chassis)**

This set had a very dark picture, almost as if there was a tube fault. When you get this sort of thing it's worth checking the CRT drives. As I went to the base panel to measure voltages etc. the picture flashed up with a perfect display. Wiggling the leads revealed a dry-joint at the Y input of the ribbon cable connector. Resoldering and a good clean up restored reliable operation. **T.L.**

### **Bush 2163NTX**

The customer said this set was smoking then went bang. A visual inspection showed that R809 (0.47 $\Omega$ , fusible) was badly burnt. Further investigation revealed a short to chassis from the chopper transformer. Once these two items had been replaced the set worked normally. **T.L.**

### **JVC C14ET1EK (Onwa chassis)**

This set was stuck in standby. The cause was simply failure of the fusible, 0.68 $\Omega$  1W resistor R403. This removed the HT supply. **T.L.**

### **Onwa K9715**

We seem to have had most of the faults reported with these sets. This

one was unusual however. There was intermittent field collapse, with the output chip very hot when there was no scanning and the supply at pin 6 down a little. Checks on the drive and output waveforms in this state produced strange results. No field waveforms, just some peculiar distorted sinewaves with many ragged pulses, more like what you might find at the collector of a line output transistor when the LOPT is duff. The speed was very high (line speed). Capacitor failure was the cause of the trouble: I had to replace C402, C405, C409 and C414.

With another of these sets the tuning would start to drift. The cause was C106 (0.47µF tantalum) in the tuning voltage integrator network. C.W.

**Hitachi G6P Chassis**

There was only half a picture horizontally – it looked as if it had been torn in half from top to bottom – and the colour in the visible half was going in and out of phase. I found that C795, which is part of a series network in the HT feed to the

line output stage, had a dark patch on its case. A replacement restored normal scanning. The value varies with different models: in this one it was 0.015µF, 400V. C.W.

**Hitachi C2508**

The problem with this set was tuning drift, but only with channels in the upper part of the band. Nevertheless the cause was the ZTK33B 33V stabiliser ZD101. C.W.

**Panasonic TX29AD1DP (Euro 2 chassis)**

Tripping with field collapse was the problem with one of these sets. The chassis has two chopper power supplies and a transformer-type supply. Look no farther than R7000 (180kΩ) and R7005 (150kΩ), which are connected in series to provide a bias supply for the STR10006M chopper chip I7000. R7000 had gone high in value: it's best to replace both resistors – they are on the side panel where the audio output chip lives.

A word of warning. There are two identical plugs near the top of

the panel. If they are connected incorrectly you will get the same tripping effect. Mark or note them, otherwise you may be led a merry dance! D.S.

**Samsung CI5937AN (Z68 chassis)**

One of these sets was dead because the TDA2616A audio output chip IC603 had gone short-circuit, overloading the power supply. A replacement brought the set back to life. D.S.

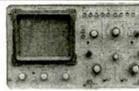
**Sanyo CBP2866**

This set would sometimes trip or produce anything from a plain raster to no field sync. The cause was the 12V regulator IC780, which is type 3122V and is apparently no longer available. To confirm the diagnosis I fitted a 1A 12V regulator: the set behaved itself during a prolonged test, but the regulator ran quite hot. A TIP41 transistor with a 13V zener diode and 27Ω dropper resistor ran at a much lower temperature. It was either this or scrap the set, which produced an excellent picture. D.S.

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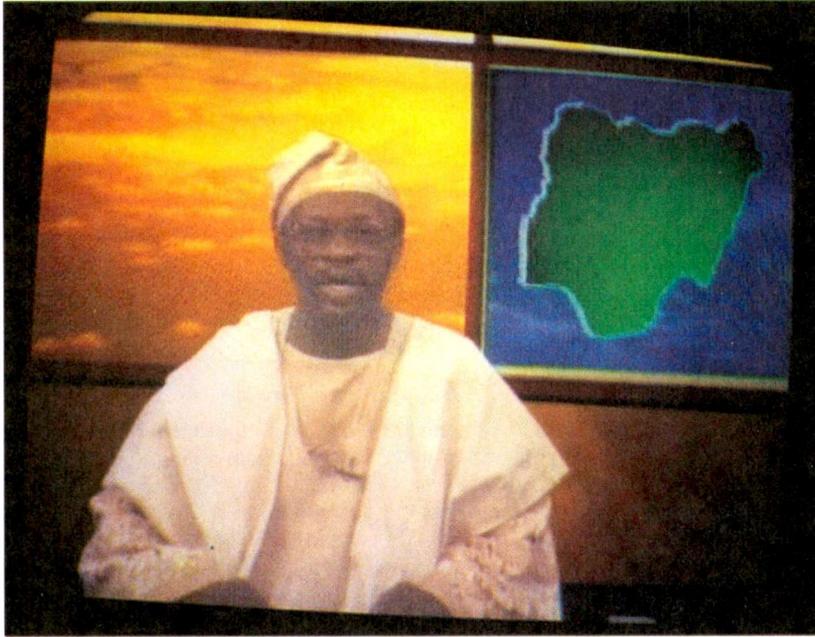
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**Hugh Cocks** provides details of some of the digital TV signals currently available in satellite bands C and Ku, plus notes on receiver operation. A follow-up to last month's introduction to C-band reception techniques

# C-band digital TV reception

In Part 1 last month I described the equipment requirements for digital satellite TV reception in band C, also basic setting up. Some strong signals that are useful for the latter purpose were mentioned. Here are a couple of other strong signals.

**Intelsat 803 at 31.5°W:** In addition to an analogue signal from ORTN (Niger) in secam colour at 3.915GHz RHCP (right-hand circular polarisation) there's a very strong digital AIT (Africa Independent TV) signal at 3.732GHz RHCP, SR 4,350, FEC 3/4. Reception, see Photo 1, should be possible with a 1.5m dish. The analogue signal is often not on air. If you have a spectrum analyser or connect a wideband scanner to the satellite IF you will find, at about 1,210-1,224MHz, a large amount of narrow FM radiotelephone traffic.

**Intelsat 605 at 27.5°W:** Brazilian TV is a strong digital signal, transmitted at 625 lines (terrestrially PAL-M with 525 lines is used). Aim first for Algerian analogue TV at 4.002GHz RHCP, then go to 4.055GHz and enter SR 7,000 and FEC 3/4. TV Record should be found, see Photo 2. This is a good example of Brazilian TV's fast-paced format. From the signals I've received, the sound seems to be a little ahead of the picture, maybe because of standards-conversion to 625 lines prior to transmission. This would introduce a small video output time delay – the sound would normally be delayed to compensate for it.

The following is a list of some other signals worth looking for.

**Panamsat-5 at 58°W:** My dish's polar mount needs modifying to go round this far. Try looking for these signals:

- 3.840GHz H, SR 27,684, FEC 7/8. The Weather Channel Latin America.
- 3.880GHz H, SR 27,684, FEC 7/8. Chinese TV.
- 3.909 and 3.915GHz V, SR 5,632, FEC 3/4. Newsfeeds.
- 3.925 and 3.934GHz V, SR 6,620, FEC 3/4. Newsfeeds.
- 4GHz H, SR 25,700, FEC 7/8. BBC World, Deutsche Welle TV plus newsfeeds.
- 4.040GHz H, SR 26,470, FEC 3/4. NHK Japan.
- 4.064GHz V, SR 3,000, FEC 3/4. Costa Rican TV.
- 4.120GHz V, SR 27,500, FEC 3/4. Arabic Radio and TV (ART).
- 4.134GHz H, SR 6,166, FEC 3/4. Colombian TV.
- 4.146GHz H, 4.156GHz H, 4.160GHz V, 4.164GHz H, 4.174GHz H. Varying SR and FEC values. Newsfeeds.

**Express 2 at 14°W:** This is a Russian satellite. A digital signal worth a try is:

- 3.836GHz RHCP, SR 8,346, FEC 1/2. RTP Africa (Portugal). Minimum dish size 1.8-2.4m. Signal strength varies. See Photo 3.
- Analogue signals to look for are RTP International (Portugal) at 4.025GHz and ORT (Russia) at 4.125GHz, both with RHCP.

**Intelsat 803 at 21.5°W:**

- 4.013GHz RHCP, SR 25,000, FEC 3/4. CNN (includes services not seen in Europe in Ku Band). Minimum dish size 1.5m.

*Photo 1 (top of page): Africa Independent TV via Intelsat 803 at 31.5°W.*

4-082GHz RHCP, SR 6,398, FEC 1/2. BFBS Radio (British Forces – the TV signal is encrypted). Minimum dish size 2-4m.  
 4-093GHz LHCP, SR 3,300, FEC 1/2. Newsfeeds. Minimum dish size 1-8m. See Photo 4.  
 Analogue signals to look for are TV5 at 3-924GHz, CFI Afrique at 3-724GHz and Canal Plus Horizons (France) at 4-060GHz, all with RHCP.

**Intelsat 707 at 1°W:**  
 3-915GHz RHCP, SR 8,022, FEC 3/4. Deutsche Welle TV plus many radio stations.  
 3-990GHz RHCP, SR 5,632, FEC 3/4. Newsfeeds. Dish size 1-8m.  
 Analogue signal to look for, Libyan TV at 4-022GHz LHCP (usually with hum bars on picture!).

**Telecom 2 at 5°W:**  
 3-746GHz RHCP, SR 6,654, FEC 3/4. RFO TV (French Overseas Territory) plus radio stations. Minimum dish size 1-8m.

**Arabsat 2A at 26°E:**  
 4-044GHz LHCP, SR 6,111, FEC 3/4. Dubai Sports TV. Minimum dish size possibly 1-5m or less.

**NSS 806 at 40-5°W:** Dish size 1-5-1-8m.  
 3-640GHz RHCP, SR 19,650, FEC 2/3. Infinito (Argentine documentary channel).  
 3-668GHz RHCP, SR 20,005, FEC 2/3. Telefe (Argentina). See Photo 5.  
 3-878GHz RHCP, SR 11,600, FEC 3/4. Venezuelan TV.  
 3-917GHz RHCP, SR 14,995, FEC 3/4. Bolivian package.  
 3-923GHz LHCP, SR 27,500, FEC 5/6. TV Globo Brazil (mainly scrambled but some feed channels within the package are viewable).  
 4-123GHz RHCP, SR 8,900, FEC 3/4. Worldnet.

Analogue newsfeeds are normally sent via the Intelsat craft at 18-5°W, 24-5°W and 34-5°W on two channels just below 4-2GHz with RHCP. Signal strength is normally quite weak: in general the satellite at 18-5°W provides the strongest feeds.

**Monitoring Digital Signal Strength**

It can be very useful to have an accurate readout of digital signal strength. Fortunately the Nokia receiver I use (Model 9600) can display this on the front panel by going into the 'red' menu. Press radio (music symbol), 99, radio and menu in quick succession. Within a couple of seconds the red main menu should appear. Select 8, Receiver setup menu. Scroll through the options, using the up/down buttons on the remote control unit, until "Select Indicate RS errors?" appears at the top left of the screen. Press OK then press the button to the left of the OK button to return to the main menu. Press TV, radio and TV quickly to get you out of the red menu and back to normal operation. Note that the red menu can be called up with or without a signal being present.

Every signal received will now have a number at the front of the box, updated every second. The weakest resolvable signal gives a reading of 45-50: a very strong Ku-band signal can push the reading to about 150. A dish gain of 1dB seems to equate to approximately 10 units.

When carrying out fine dish adjustments it's very helpful to have a stable number display. The Brazilian signal at 27-5°W or one of the signals at 40-5°W will provide a reasonably stable reference. Some signals can

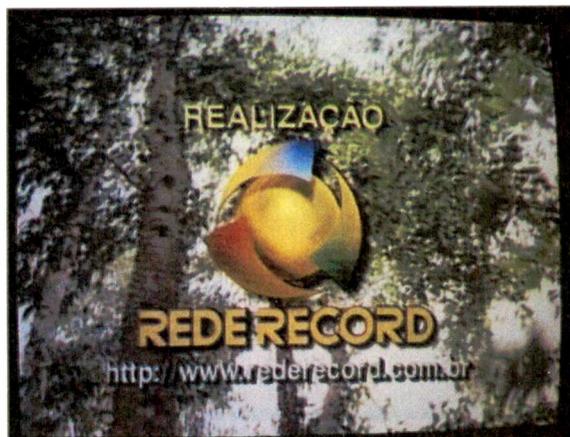


Photo 2: TV Record from Brazil via Intelsat 605 at 27-5°W.



Photo 3: RTP Africa via Express 2 at 14°W.



Photo 4: Comsat feed via Intelsat 803 at 21-5°W.



Photo 5: Telefe (Argentina) via NSS at 40-5°W.



Photo 6: A QPSK return parameters list.

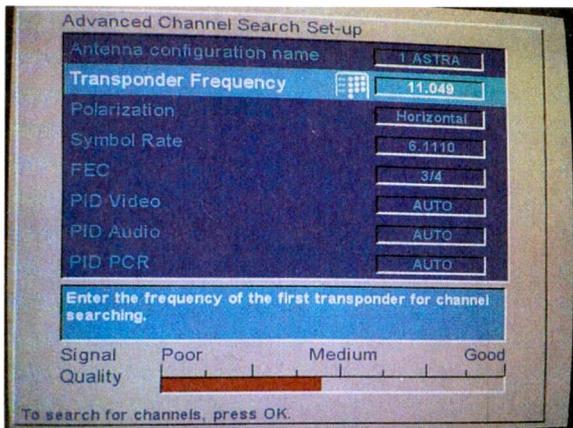


Photo 7: The Advanced Channel Search Set-up menu.

be very strong one day and weak the next, which is not good for dish tweaking!

To return the receiver to normal 'numberless' operation, switch to standby then switch on again.

### Failure to Lock

I sometimes find that the Nokia 9600 receiver will indicate that it's locked to a signal after a search but won't enter a name in the electronic programme guide. This can happen because the channel is already listed in the EPG and the box assumes that you know this! It's a useful feature if you want to rescan a channel package to see if anything has been added, as channels already listed in the EPG are (usually!) ignored.

If the front indicator shows that the QPSK demodulator is locked but there's no EPG listing and you want to know the SR and FEC values, proceed as follows. Enter the red main menu by pressing radio, 99, radio, menu in quick succession. The receiver must still be locked to the unidentified signal – you can enter the red menu straight from the search menu. Care is required, because if you come out of the search menu prior to entering the red menu the receiver will lose the lock of the unidentified signal (when lock is lost, the square at the right-hand side of the front panel display shrinks to a small line).

Select option 5, QPSK menu, then scroll through the options until "Select QPSK Status?" appears. Then press OK on the remote-control unit. A list of numbers, from the QPSK demodulator, will be seen (Photo 6). It looks daunting at first, but in practice reference to only a very few of the numbers is required. When searching for an unidentified signal you won't normally have a picture behind, but the one shown here is useful because it provides details of the digital signal.

The third pair of figures in row two indicates the FEC

value: in this case it's 04 which means 3/4. The code is as follows (number displayed first followed by FEC value): 02 = 1/2; 03 = 2/3; 04 = 3/4; 06 = 5/6; 07 = 7/8.

The symbol rate is displayed in the fourth row. Unfortunately hexadecimal values are used, which complicates matters. 06, as shown here, corresponds to 6 and 1B CE to 1111. Remember that when the first number of the first pair indicates a 1, the decimal value will be 16 (in this instance) plus the second digit value – for example 19 in hexadecimal is 25 in decimal. Fortunately most of the low SR signals investigated won't be much above 8,000, and up to 09 the decimal and hexadecimal numbers match. An approximate scale for the second and third number column pairs is as follows:

Displayed number SR fraction

19 99	0.100
33 33	0.200
4C CC	0.300
66 66	0.400
80 00	0.500
99 99	0.600
B3 33	0.700
CC CC	0.800
E6 66	0.900

With our number 06 1B CE, 1B CE is a little over 0.100, in fact 0.111. You can work out an approximate fit for the SR fraction and try entering this in the advanced search mode.

To return to normal operation, press the left-hand button beside OK. This takes you back to the main red menu. Then press TV, radio, TV quickly.

When the channel is listed in the EPG, the SR, FEC and PID values can be found by entering the channel search or advanced channel search set-up mode (see Photo 7) from that channel.

### Alternative Search Method

When you use a spectrum analyser you come across a lot of signals that look like MPEG-2 but clearly aren't, as the receiver won't lock to them. A quick way to see if the QPSK demodulator will lock is to find and note the IF centre frequency of the unidentified signal then enter the red main menu. Go to the Receiver setup menu and scroll through the options until "Select frequency integer?" appears. Enter a value of 0.000. Then scroll to "Select frequency integer?" and enter the centre IF frequency. A value to four decimal places is possible, though the nearest 1MHz will normally do unless it's a very narrowband signal. Save these parameters (entered as another option) and return to the red main menu.

If you are lucky, the display at the front of the receiver may at this point indicate that the demodulator is already locked (if not it's probably not an MPEG-2 signal). Go back to the QPSK menu (main menu Select 5) and find the SR and FEC values. If you feel bold, these could be entered by going back to menu Select 8 or alternatively coming out of the red menus and going to the normal search menu. Remember to work out the correct satellite frequency to enter (add the Ku-band or subtract the C-band IF from the LNB's local oscillator frequency).

When scrolling through the menus in Select 8 there are several that are best left well alone (select deinterleaver on/off, select Reed Solomon on/off, select QAM rate and select spectral inversion). The acquisition bandwidth option can be left at 6MHz.

### Advanced Channel Search Menu

To find the SR, FEC, PIDs (packet identifiers), frequency and polarisation of a signal from the EPG list, select the channel then go to the Nokia Advanced Channel Search Set-up menu (see Photo 7). A live signal does not have to be present. (In the photograph '1 Astra' is shown alongside Antenna configuration name at the top – the name is not important, it's merely used for DiSEqC aerial switching. C-band selection is done here by storing it as an 'Other 1'. Going to the antenna configuration option in the installation menu gives the C-band option to be selected with Other 1.) The frequency, polarisation, SR and FEC are immediately seen. Move the highlight bar down, using the remote control unit's up/down buttons, until you reach PID Video. Then press the left-hand button (beside OK). Auto for all three PIDs will change to the actual values.

You can use this facility to enter directly the known PIDs of a channel that for some reason cannot be stored with the normal receiver scanning process. When you press search, a listing will immediately appear in the EPG starting with "A" and then a number. When this is selected from the EPG you should get a picture, though the receiver can be a little slow in producing one – and can occasionally crash when this procedure is used!

The final PID value, PCR (Programme Clock Reference), is normally the same as the PID Video value with high-SR MPEG-2 signals in a package. For narrow signals (SR 5,632, FEC 3/4 for example) it's normally set at 8190.

The signal-quality red-bar display at the bottom of the screen is merely an AGC reading. With a fairly wide tuner bandwidth a signal up to 30MHz away will produce a deflection, which doesn't confirm the presence of an MPEG QPSK signal. If a narrow C-band MPEG signal is present, with nothing else nearby, it can produce less than 25 per cent of FSD (full-scale deflection) depending on the length of cable from the dish and the amount of IF splitting in use.

### Interesting Ku-band MPEG Signals

To conclude, here's a list of the digital parameters for a lot of interesting Ku-band signals from various satellites. They make a good starting point when trying out a new digital receiver. The list is by no means comprehensive – for a start I've not included any Astra signals at 19.2°E! Reception should be possible in the UK with a 1.2m or smaller dish.

#### Eutelsat II F3 at 36°E:

11-050GHz H, SR 6,111, FEC 3/4.

#### Eutelsat W2 at 16°E:

11-021GHz H, SR 5,632, FEC 3/4. ABC News Baghdad. Also try 11-012GHz with similar parameters.  
12-507GHz H, SR 5,632, FEC 3/4. European News Exchange.

Try entering various frequencies up to 12-560GHz – other parameters as above.

**Hotbird at 13°E:** There are plenty of well-known channels here. Just set the receiver to do a channel scan. Try however the following:

12-650GHz H, SR 27,500, FEC 3/4. This is the frequency of a package of channels from the Arabic world, linked in via Arabsat.

12-733GHz H, SR 20,000, FEC 2/3. You might be rewarded with a live camera shot looking out of the window at Eutelsat's Paris headquarters!

There are feeds at 12-577GHz and 12-589GHz, both H, SR 5,632, FEC 3/4.

**Eutelsat II F4 at 10°E:** There are occasional newsfeeds at 11-128GHz H, SR 5,632, FEC 3/4.

#### Sirius at 5°E:

12-379GHz H, SR 27,500, FEC 3/4. Includes Chilean TV test transmissions and the American jazz station BET on Jazz.

12-453GHz H, SR 18,060, FEC 3/4. Includes a lottery called The Global Draw.

**Intelsat 707 at 1°W and Thor 1/2/3 at 0-8°W:** This is the Nordic hotspot. I receive only H signals from Intelsat. Try the following:

11-174GHz H, SR 22,500, FEC 2/3. Do a network search.

11-458GHz H, SR 3,150, FEC 3/4. Feed for IRN News, London.

11-592GHz H, SR 17,500, FEC 3/4. Danish TV (soon to be scrambled).

**Telecom at 3°E, 5°W and 8°W:** No signals are receivable here though I gather that many interesting ones can be picked up elsewhere.

#### Intelsat at 18°W:

10-977GHz H, SR 6,000, FEC 3/4. Prima TV from Romania.

**Intelsat K at 21-5°W:** This satellite carries many newsfeeds. Start with:

11-456GHz H, SR 6,100, FEC 3/4.

11-471GHz H, SR 6,100, FEC 3/4.

11-480GHz H, SR 6,100, FEC 3/4.

11-558GHz H, SR 5,632, FEC 3/4.

11-566GHz H, SR 5,632, FEC 3/4.

11-567GHz V, SR 6,100, FEC 3/4.

11-590GHz V, SR 20,145, FEC 3/4.

#### Intelsat 801 at 31-5°W:

10-966GHz V, SR 5,632, FEC 3/4. BT Digital Bridge.

Try various frequencies from 10-957-11-025GHz V, SR 5,632, FEC 3/4.

There are occasional feeds at 11-124-11-140GHz V, SR 5,632, FEC 3/4, also at around 11-600GHz V with varying SRs and FECs.

#### Orion 1 at 37°W:

11-480GHz V, SR 8,750, FEC 7/8. Newsfeeds.

11-536GHz V, SR 25,540, FEC 7/8. Includes BBC Parliament.

11-567GHz V, SR 2,963, FEC 3/4. Newsfeeds.

11-590GHz V, SR 8,750, FEC 7/8. Newsfeeds.

11-622GHz V, SR 18,900, FEC 7/8. Includes Landscape channel.

#### PAS 3R at 43°W:

12-567GHz H, SR 7,030, FEC 3/4. Newsfeeds.

12-580GHz V, SR 25,500, FEC 3/4. Mexican TV package.

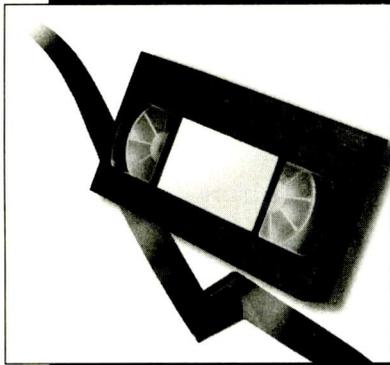
12-600-12-740GHz H/V SRs and FECs various. Newsfeeds.

12-728GHz V, SR 6,617, FEC 3/4, Panamsat feeds.

#### PAS 1 at 45°W:

11-599GHz H, SR 27,330, FEC 5/6. Tests

11-635GHz H, SR 26,460, FEC 3/4. CBS package.



# VCR Clinic

**Reports from**  
**Eugene Trundle**  
**Pete Gurney, LCGI**  
**Michael Maurice**  
**P.J. Roberts**  
**Robert Marshall**  
**Gerald Smith and**  
**Nick Beer**

## **Tatung TVR744N**

Playback and E-E operation were OK with this machine but there was a record fault: when one of the machine's own recordings was played back the sound was as it should be but the screen display consisted of a jumble of noise and patterning. A check on the off-tape envelope signal in this condition revealed that it was at about two and a half times the normal amplitude. The cause of the fault lay within the TA1232N video processing chip IC4001. **E.T.**

## **Ferguson FV77H**

No playback or E-E sound and vision were the symptoms with this machine, and diagnosis was not helped by the shocking layout diagrams in the service manual! It took some time to discover that the switching transistor TX27 was faulty – its collector voltage stayed high even when a turn-on bias was present at its base. **E.T.**

## **Daewoo V235**

There are no details of this machine's power supply in the service manual: when there's a fault you are supposed to replace the module. If the module is of Sony manufacture however and is completely dead, it's worth checking C35 (1 $\mu$ F, 100V) on the primary side. You may well find that it is open-circuit. **E.T.**

## **Hitachi VTF150**

This machine had worked normally

before a mains supply failure. When I powered it the machine appeared to be dead, with no operation and no clock display. But the power supply was running, with all the outputs present. So the search went off elsewhere, only to keep returning to the power supply. It was only when I checked the supply lines with an oscilloscope that the cause of the fault became apparent. Although the DC conditions were all within tolerance, there was a large amount of AC hash on the 15V line. An ESR-meter check on C12, a 470 $\mu$ F, 16V, 105°C low-ESR electrolytic capacitor, produced a resistance reading four times higher than it should have been.

To be on the safe side I replaced all the electrolytics on the secondary side of the power supply. **P.G.**

## **Philips VR422 (Lucy Deck)**

This machine's scart output was OK but there was no RF output. The cause of the problem was simple once it had been found, but it took a time to establish what had happened. Electrically these decks seem to give very little trouble, but the circuit diagram can be a bit difficult to work with. The problem was obviously in the RF amplifier/modulator area, and checks here showed that while the permanent 5V supply was present the supply at pin 4, which should also be at 5V, was missing. It comes via T7761, a surface-mounted component that appears to be present to switch the modulator on and off. T7761 itself was OK, the problem being lack of a switch-on bias from IC7760. This is an interface switching device between the I<sup>2</sup>C bus and a number of peripheral devices.

So the machine seemed to be working correctly but with the modulator switched off. With this model however there's no option to switch off the modulator, either by remote control or the limited con-

trols on the VCR itself. I can only assume that the option is present in some models in the range but not others. I decided that the cause of the trouble was probably memory corruption, and in fact a memory clear restored normal operation. To clear the memory, unplug the VCR, press play, standby and eject simultaneously and, while holding the buttons down, restore power. All presets, time and year data must be re-entered after a reset. **P.G.**

## **Daewoo V435**

This VCR had died overnight. There was now no clock display and the machine refused to accept a tape. The power supply was running, and most of the outputs were correct. Before going any farther I find it advisable to ensure that the supplies are clean. Scope checks showed that there was a large amount of AC ripple on the 5V line. The culprits were the 330 $\mu$ F, 10V reservoir capacitor C822, which was open-circuit, and the associated 100 $\mu$ F, 10V smoothing capacitor C824. Both are 105°C, low-ESR capacitors. **P.G.**

## **Fisher FVHP710**

The complaint with this old machine was no rewind. I straightaway replaced the usual idler – the rubber tyre had virtually parted from the assembly. But the fault was still present. All other functions worked correctly. I suspected a selection fault associated with the keypad. These VCRs use a resistor lattice to generate a voltage depending on the function selected. I've had troubles with this before, but on this occasion the resistor network was blameless. Rewind button S585 had gone high-resistance, producing the same result. A replacement gave the machine a further lease of life. **P.G.**

## **JVC HRD960**

The entry and exit guides didn't locate properly with the drum dur-

ing play/record. The usual cause of this is that the brass bush at the bottom of the guide assembly has worked loose. Not this time however: the cause was a worn plate assembly and take-up loading arm gear. Normal operation was restored once these items, together with the slide encoder, control cam and half-load gear, had been replaced. **M.M.**

### Sanyo VHR495E

This machine came from another dealer who couldn't understand why most of the tapes it played produced only a blue screen and the counter didn't move. The tape that was OK was the James Bond Goldeneye. Another complaint was that the machine creased the top edge of the tape. The cause of the problem seemed to be a worn pinch roller, and in fact the machine worked once this item had been replaced – the blue screen occurs because the video is muted when there are no off-tape control pulses.

A few weeks later however the machine was back with the same fault. On closer investigation I found that the back-tension band was damaged – the felt had parted company with its plastic backing. A replacement restored correct operation. **M.M.**

### Hitachi VTF70

This machine had failed because of a power surge during the night, when the local mains supply had risen to over 300V! There was no playback, and there were noise bars on the E-E video. The fault was cured by replacing the STK5372H power supply chip. I had the same problem with two other Hitachi VCRs. **M.M.**

### Toshiba V705B

This machine went to standby whenever rewind or fast forward was selected. It would be difficult to eject the tape, but it did come out in one piece. If a prerecorded tape was inserted it would play, but when stop was selected the mechanism would do a shuffle then stop. On investigation I found that when the fault occurred the machine would, before going to standby, start to unlatch, leaving the guides in the half-loaded state. Toshiba's technical department suggested that the capstan motor was the cause. In fact the culprit was the supply-reel sensor. A replacement cured the fault. **M.M.**

### Ferguson FV67

This VCR was dead after a power

surge – the mains supply had risen to over 300V. I fitted the repair kit, but the machine remained dead. So I replaced all the small electrolytic capacitors on the primary side of the power supply. This restored normal operation. **M.M.**

### Philips VR285

There was a tape stuck inside and the mechanism was jammed. On investigation I found that the bevel gear on the main shaft and the main cam worm drive gear were both loose and could rotate under heavy load, i.e. when trying to eject a tape. Once these items had been replaced the machine worked correctly. The shaft and worm gear part no. is 4822 310 10657. **P.J.R.**

### Akai VSG21SEK

Error 1 showed in the display as soon as this machine was powered up. There was no further operation. The service manual tells us that this means a short-circuit across the AL supply, but on investigation nothing amiss was found in the power supply. A quick check on the fusible resistors on the main PCB then showed that FR201 was open-circuit – because D201 was short-circuit. Once these components had been replaced and a few dry-joints had been attended to everything worked correctly.

Part nos. D201 ED-396363J; FR201 ER-397385J. **P.J.R.**

### Hitachi VTF860E

There was no operation, and both slow-motion and reverse wind were shown in the display. Checks in the power supply revealed an open-circuit 1µF, 250V capacitor which was replaced, but this made no difference. The cassette was still in the machine, so I removed the front panel with the hinge-down door to gain access to the cassette compartment. This was removed, the cassette extracted, then the housing was refitted. I was about to refit the front panel when I noticed that one of the three wires that connect the control panel to the rest of the machine had snapped.

The front panel can be taken apart and rewired. If a different wire breaks, the channel numbers cycle through the stored channels. **R.M.**

### Panasonic NVSD44

This machine was dormant after lightning had wreaked havoc to the mains supply in our area. The chopper FET is controlled by a TDA4505-3 chip which should receive, at pin 5, a 9.4V start-up

supply that's derived from the mains via three 27kΩ resistors. The voltage at this pin was half what it should have been, though the three resistors were blameless. The cause of the trouble was a leaky diode, D1106, which under normal circumstances produces the running supply voltage for the chip. **R.M.**

### JVC HRJ246

This machine would intermittently revert to standby during record. On test it ran and behaved itself for some time while I monitored the outputs from the power supply and the reel sensor waveforms. All seemed to be OK. But the capstan subsequently played up and tape began to spill out into the mechanism. A new capstan motor cured the fault. **G.S.**

### Sanyo VHR278

The ticket said "no playback sound". While the machine was on test I noticed that after a few seconds there was no servo sync, then the picture would pull in again. I suspected a CTL fault and therefore no sound. Checks showed that there was no CTL output from IC351, though there was input enough across pins 21 and 22. Once IC351 had been replaced the CTL and sound came up. **G.S.**

### JVC HRD860EK

This machine had a very dull display. The cause of this type of fault is rarely the display itself (except in Akai VCRs where the display is overdriven and wears out) or the drive IC. Always check the negative display supply and the AC drive to the first and last pins. In this case the DC supplies were present but the AC drive had excessive ripple and its DC content was low. So I checked C28 (120µF) and found that it was leaky. A replacement restored the display to an acceptable brightness level. **G.S.**

### Panasonic NVJ45B

These machines rarely produce any surprises, but this one was a bit unusual. There was no display or key scan, though the power LED lit for a few seconds after power on while the mechanism shuffled. I found that the 5V supply to the timer board, where the key scan is carried out, was low. It was less than 4.6V at pin 17 of P7501, and was being pulled down by IC7502 (M6M80021P). A replacement restored normal conditions. **N.B.**

# A Baseband Distribution Amplifier

**Baseband distribution amplifiers at an economic price are not generally available. Denis Mott provides details of a practical design that fulfills this requirement**

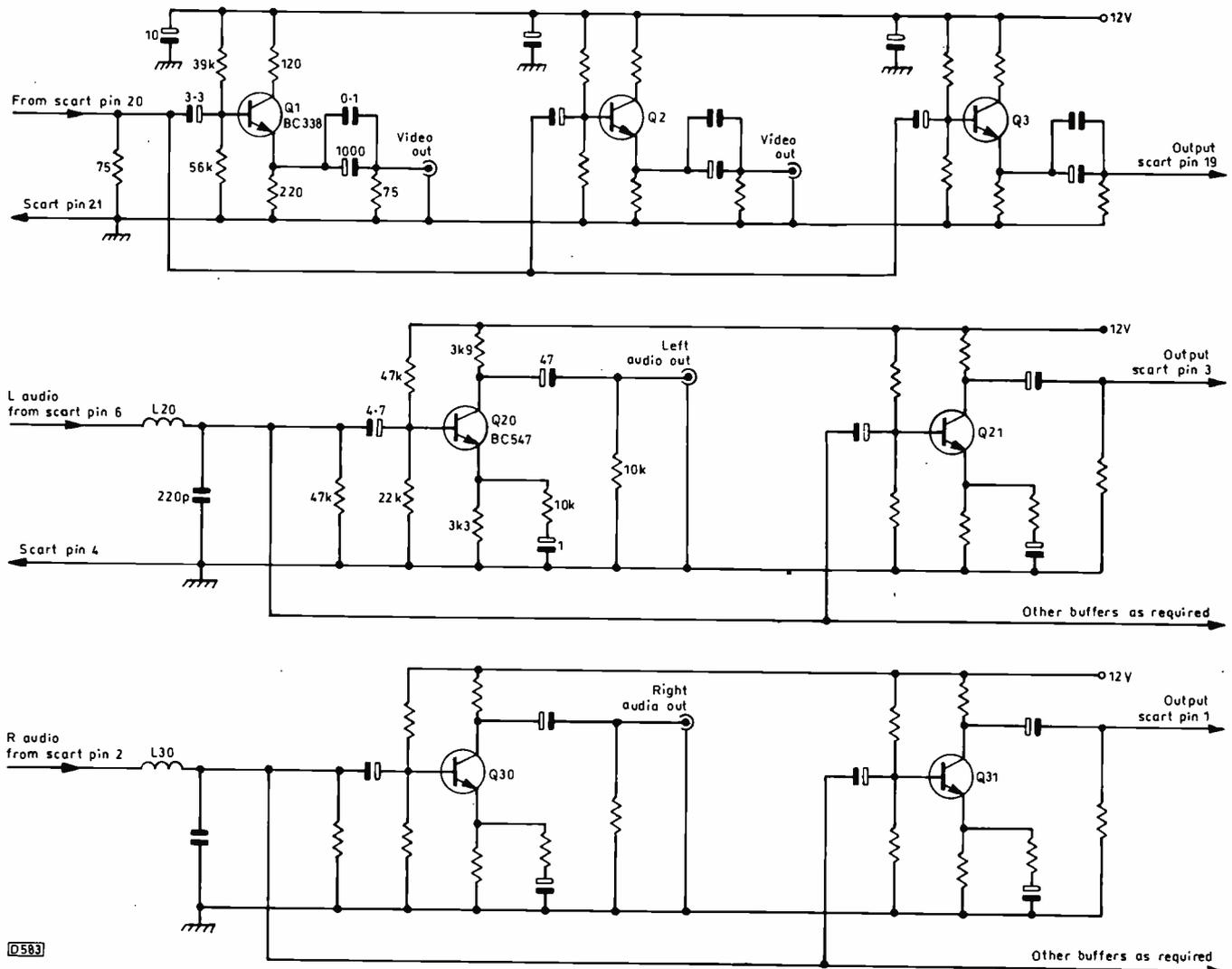
**D**uring my time as an engineer with NEI an annual problem used crop up with exhibitions: how to provide suitable signals for the TV sets on display. Most sets have been well-equipped in recent years – all over 14in. are required to have scart sockets. Then along came surround sound etc., and the methods of supplying signals to TV sets became more complicated.

The problem with distributing baseband video and audio signals is that, unlike the situation at UHF, there are no low-cost distribution amplifiers. So they had to be made up. This article presents suitable circuits: I claim no part in the electrical design. The original prototypes, though functional, were rather untidy, so I decided to design a new PCB to make the units more manageable – and less prone to failure.

## Circuit Description

Fig. 1 shows the circuitry. The input to the video section has a 75Ω terminating resistor that provides the correct impedance matching for most video sources. To minimise loading, each amplifier has a much

**Fig. 1: Circuit details of the baseband distribution amplifier. The component values are the same in each video and audio buffer stage.**



0583

higher input impedance. The transistors used, type BC338, have a good video-frequency response. Each stage consists of an emitter-follower, and thus has a low output impedance. The output coupling consists of 1,000 $\mu$ F and 0.1 $\mu$ F capacitors in parallel to provide a wideband response.

There's no real limit to the number of stages that could be used. Just remember that the power requirements are 12V/340 $\Omega$  times the number of stages.

Audio may or may not be required, depending on the application. Obviously the video path can be used without the audio ones and vice versa. The audio circuitry starts with two low-pass filters, L20/L30 (6.8 $\mu$ H) and the associated 220pF capacitors. They remove RF, the scourge of audio circuits. Although the buffer amplifiers provide a small amount of gain, it's best to get rid of RF at the input.

The stages are again in parallel, with a high input impedance to limit loading. The output impedance is about 10k $\Omega$ .

### Constructional Details

The circuit diagram shows three video buffer stages and two stereo audio buffers. This gives just a flavour of what can be achieved. As mentioned above, it's the power

requirement that limits the number of stages. I use small DC eliminator power supplies such as the Altai multi-voltage type: the output current is limited to approximately 500mA, or 6VA, at 12V.

I have designed a PCB with five video and stereo audio channels. Four video and audio buffers feed single output sockets for video and twin sockets for audio. The fifth channel feeds a scart socket to provide daisy-chaining. The PCB also has provision for a 3mm DC jack socket and a 12V regulator, with adequate decoupling.

Apart from the scart connector the output sockets are all of the phono/RCA type. There are two reasons for this, first cost and secondly that for this application the use of BNC sockets is an excessive nicety. All external connecting cables are also low-cost, i.e. audio-grade screened lead. This is adequate unless long cable runs are envisaged. In a professional application BNC sockets and 75 $\Omega$  coaxial cable should be used.

The PCB size is 240 x 80mm, for which there doesn't seem to be a commercial box. I made mine, so I'm sure you can too!

A PCB and layout is available from Denmo Electronics, 91 Sheepridge Road, Huddersfield HD2 1HF (e-mail denis@denmo.freereserve.co.uk).

# HELP WANTED

*The help wanted column is intended to assist readers who require a part, circuit etc. not generally available. Requests are published at the discretion of the editor. Send them to the editorial department.*

**Wanted:** STK7707ST integrated circuit and a 2SK2341 MOSFET. G. Smith, 83 Avenue Vivian, Fence Houses, Tyne and Wear DH4 6HZ. 07932 650 005.

**Wanted:** Tuning instructions for the Matsui CTV Model 2580 and ITT CTV Model CP3125. Felix Forde, 56 St Helen's Road, Westcliffe-on-Sea, Essex SS0 7LB.

**Wanted:** Remote control units for the Toshiba VCR Models V204B, V210B, V213B and the Aiwa Model HVGX250K. Doug Carson, 89 Holborn Hill, Millom, Cumbria LA18 5BL. 01229 774 749.

**Wanted:** Cassette motor for the Goodmans SCD100 cassette deck. G. Upton, 10 Sycamore Close, Hull HU5 5FD.

**Wanted:** CRT type D13-47GH for a modified Telequipment scope, type S54A, installed in an old Lintott ion implanter. David Dawkins, 25 Clausentum Road, Southampton SO14 6RX. 01703 638 163.

**Wanted:** Line output transformer for the BarcoVision 400 CRT projector. Part no. is 7741215 (9kV). Richard Gifford, c/o 15 Fairfax Gardens, Needham Market, Suffolk IP6 8AZ. Phone 07881 152 7219.

**Wanted:** All panels for the left-hand (signals) door in the B&O 20AX chassis. Also require a TCA530 IC for a Seventies Grundig tuner. David Barfoot, 65 Nortoft Road, Bournemouth BH8 8QB 01202 553 350. E-mail david@einstein.demon.co.uk

**Wanted:** CX523-013P control IC for the

Sony Model KV1412UB, part no. SY8-759-600-89. Contact Justin on 01745 817 103 or Tony on 01745 710 363.

**Wanted:** Large white-sphere colour TV set dating from the Seventies. Anything considered, from an empty cabinet to a complete set. Philip Barry, 6 Cowling Road, Burrill, Bedale, N. Yorkshire DL8 1RN.

**Wanted:** A68EES58X20 tube for the Ferguson Model DSF68NX; A68JYK60X tube for the Sony Model KV2932TU; and a LOPT (type 145-374B) for the GoldStar Model CF28CZZF. Tony Weekes, 28 Tudor Road, Luton, Beds LU3 1RN. Phone/fax 01582 758 885.

**Wanted:** Circuit diagram for the Peterson Guitar Special guitar amplifier Model P100G. Ed Cox, 86 St Johns Road, Hedge End, Southampton SO30 4DF. 01489 782 885.

**Wanted:** Teletext panel for the Grundig CUC5200 CTV chassis. The set concerned is Model P27 649/12, the videotext board reference no. being 29504-108-83. Ken Gill, 27 Seaview Gardens, Sunderland SR6 9PN. 0191 549 1242.

**Wanted:** Service manual or handbook for the Saba portable TV Model 25. Ron White, 29 Nunnery Street, Castle Hedingham, Essex CO9 3ND.

**Free to collector:** Emiscope 3/16 CRT, condition unknown. K. Tweed, 26 Centre Drive, Newmarket CB8 8AN. 01638 668 133 (mornings).

**Wanted:** Wired remote-control unit for the Panasonic NV336B VCR. An elderly customer is in need of this. V. Browning, Swift Radio and TV Service, 142 White Dirt Lane, Catherington, Portsmouth PO8 0TT. 01705 594 952.

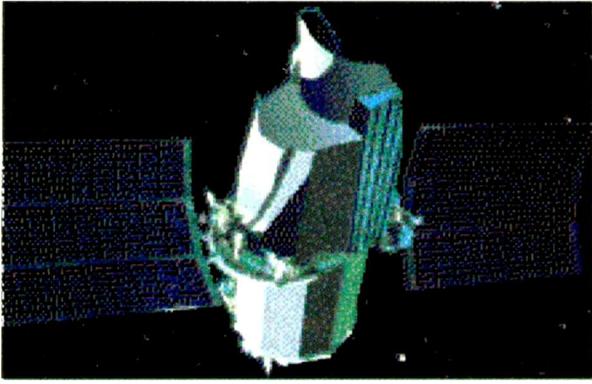
**Wanted:** I have bought an oscilloscope (see photo) but have no instructions for it. Can anyone help with instructions or any information on use? It's a laboratory oscilloscope made by Daystrom Ltd.,



Gloucester. M.J. Croll, 16 Westbourne Grove, Lowfields Est., Teesville, Cleveland TS6 0AE.

**Wanted:** Because of a power supply blow up with a Thomson TE3619PI I need to know the correct transistor types for positions TL44 and TL45 and the diode type for position DL42. A fax of the PSU would be a great help - the PCB is marked ICC3S. Vince Stanley, phone 01954 253 649, fax 01954 253 601 or e-mail Vince.stanley@pigroup.co.uk

**Wanted:** Service manual for the JVC GR-S70E S-VHS camcorder (sale or loan), also a LOPT for the Boots Model CTV1010R. Has anyone a couple of video heads for the Philips Model VR2020 (new or used)? This is a V2000 series VCR. Paul Hardy, 43 Sheridan Avenue, Caversham, Reading RG4 7QB. 0118 947 5869. E-mail paul\_hardy@compuserve.com



# DX and

# Satellite Reception

**Terrestrial DX and satellite TV reception. News from abroad and of satellite developments. More on interference problems and notes on LNB and feeder installation. Roger Bunney reports**

September produced plenty of bad weather in the UK but little by way of terrestrial DX-TV signals. Peter Schubert (Rainham) logged Sporadic E reception from Italy, chs. IA (RAI) and E3 (TVA), on the 2nd, then unidentified Band I signals, mainly programme material, on the 7, 8, 18, 19, 25 and 26th at various times during the day. I've received only Lopik, Holland ch. E4.

The situation seems to have been much the same at the other side of the globe. Robert Copeman (Victoria, Australia) points out that this period is generally the quietest in the southern hemisphere: if

there's to be a good SpE season, conditions usually start to build up in early-mid October.

All is not gloom however. The Leonids meteor shower is due on November 15-20th – the peak should be at about 0400 hours GMT on the 18th – and with the arrival of winter it's time to check for an improvement in F2 layer conditions. During the early morning, at around 0800 hours, reception from deepest Russia is possible. As the sun progresses to the west, the reception path swings to the south. TE (transequatorial) reception is possible in the early evening, with VHF signals up to 1.5 times higher than the daytime maximum usable frequency. Check for distorted, ghosted images from the south in chs. E2 and E3. Conditions will vary over several days, so check each day. Hopefully I'll have more exiting news to report next month.

## Satellite Sightings

As a result of the terrorist explosions that demolished several blocks of flats in various parts of Russia the BBC-Moscow link via Eutelsat II F3 at 36°E became very active during mid-September. It was particularly busy for two days after the largest disaster, on the 13th. Other news groups, such as Reuters-Moscow, shared this digi-

tal link (11.6GHz H, SR 5,632, FEC 3/4). The evening network news included input from eastern parts of Russia: hum bars were very evident on these distant inserts.

On the 15th a Britannia Airways plane skidded off the runway in northern Spain and broke into three sections, fortunately with no loss of life. Remarkable pictures were carried in analogue form via NSS-K (21.5°W) at 0740 BST, courtesy of TV3 – TV De Catalunya (11.497GHz H). Interesting that the same footage was screened by Sky News eighteen hours later. The Reuters digital lease (11.566GHz H, SR 5,632, FEC 3/4) via this satellite carried shots of the progress of Hurricane Floyd along the US Eastern Seaboard.

On the 5th Dean Rogers (London), using a Humax digital receiver, watched Formula 1 power boat racing uplinked by BT via Eutelsat II F4 (10°E) at 11.140GHz H (SR 6,111, FEC 3/4) for an American network. Eutelsat W2 (16°E) is worth checking for European football: matches in Belgium and Portugal regularly appear at 12.517, 12.528 and 12.549 GHz H and in Italy at 11.005GHz H (all with SR 5,632 and FEC 3/4).

The Arabsat digital package via

*After the Norwegian Dream's collision off the east Kent coast it limped to Dover and provided the backdrop for several live news inserts via Eutelsat II F3 at 36°E.*



Hot Bird at 13°E now includes Dubai Sports, with worldwide events. A Hot Bird listing sent in by Roy Carman (Dorking) shows the hundreds of channels now available, both analogue and digital, using a relatively small dish. Those with an interest in Arabic sports channels and a larger dish should check Nilesat-101 at 7°W, where the Abu Dhabi Sports Channel is present at 12GHz H (SR 5,611, FEC 3/4). Incidentally has anyone seen the digital SIS horse-racing feeds via Sirius at 5°E? I've seen reports via internet newsletters that SIS Racing Services uses the 12.3-12.4GHz band (SR 7,700, FEC 3/4) but several checks during weekday afternoons have failed to reveal anything. On one active Sunday (the 19th) the Globecast package via NSS-K (21.5°W) had sports on all three channels: check at 11:590GHz V.

Tim McClellan (Christchurch Bay) uses a 90cm dish and transcoder to view French TV via Telecom at 5°W. He reports that the French International channel TV5 (with teletext) is now available over 24 hours at 12.648GHz V in clear PAL form – this frequency was previously used by Tele Monte Carlo.

Roy Carman questions the stability of the Turksat 1C craft at, nominally, 42°E. He's noted an apparent slotting variation of  $\pm 1^\circ$ . This is an oldish satellite. There's a new Kral-TV package via IC, at 11.468GHz V (SR 22,500, FEC 3/4) – a couple of test cards, KRAL and STAR, and an encrypted channel.

On the 25/26th Arianespace launched the Telstar-7 satellite. All Kourou and some NASA launches are carried in live analogue form by Bayerische Fernsehen's Astra (19.2°E) transponder (11.141GHz H). If you are interested in space matters, it's worth checking the Space Night programme on this channel – after midnight, most nights, in clear analogue form.

### Terrestrial News

**Australia:** According to the Communications Minister terrestrial digital TV is to be launched on January 1st 2001. Regulatory and technical proposals will be announced by spring 2000, together with a suggested analogue close-down date.

**Bangladesh:** The first commercial

TV station, Ekushey Television (ETV), is due to start test transmissions about now. State broadcaster Bangladesh Television provides the only other channel.

**Africa:** Two new terrestrial TV channels are in operation at Nairobi, Kenya, Citizen TV and Family TV. A third new channel, Nation TV, is expected to be on-air by the end of the year. Star Broadcasting has started an MMDS service in Ghana with six scrambled channels: it's available within a 35-mile radius of Kumasi. Botswana TV and Tanzania TV are due to open state-wide networks prior to 2000. The South African ABN group has bought Uganda's commercial TV station Sanyu TV, which will shortly be relaunched as STb.

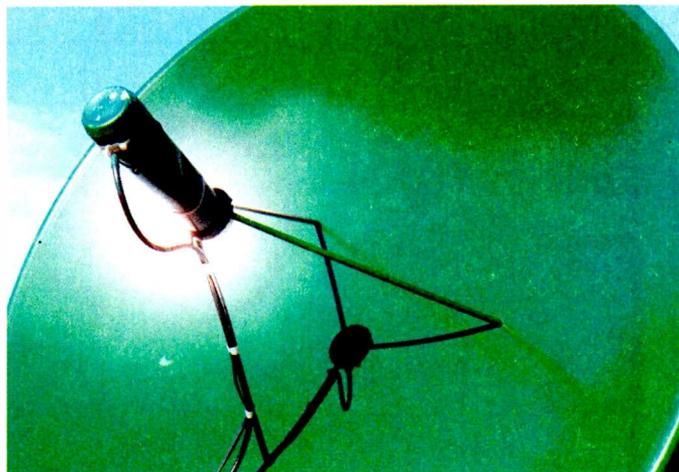
**Finland:** Terrestrial digital TV licences, to run for ten years from September 1st, have been allocated. Seventy per cent of the population should be served by December 2001: the analogue switch off is unlikely before 2006. There are, for digital purposes, four regions, Helsinki, Turku, Pirkanmaa and outer Finland. The present plan is for three multiplexes as follows: Yleis-radio, five national channels including SVT; MTV-Oy, regional channels plus sports; Oy-Ruutunelonen Ab, with eventually six channels including movies, Canal + Finland and educational services.

**Norway:** A new commercial channel opened in September serving the Oslo area initially. Expansion to cover other areas is planned.

**Czech Republic:** The dispute at Nova TV continues, with CME now providing the programming directly. CME has taken legal action against the government.

### Dish Tips

During the twice-a-year equinoxes, usually in early April and October, the sun follows the track of the Clarke satellite belt. Thus a correctly aligned dish will receive radiation from the sun in addition to satellite signals. The effect lasts for only a few minutes but can, with a prime-focus dish, generate enough heat at the focal point to melt the heathorn cap and damage the LNB/polariser. It's sensible therefore to ensure that the dish is not left pointing at a high elevation during the equinoxes. These can however be used to check that the LNB system is correctly



aligned on-axis – the shadow at the centre of the surface of the dish should be an end-on one, see photo above.

I've found that a white polythene Kwik Save washing-up liquid container is ideal for providing an LNB assembly with weather protection. Simply cut off the top and slit the container along one side for about two-thirds of its length to allow the tube to slide

**Roger's prime-focus Ku-band dish with LNB protection provided by a Kwik Save washing-up liquid container sprayed green. During an equinox you can check whether the LNB alignment is, as here, correct – the end-on shadow is at the centre of the dish.**

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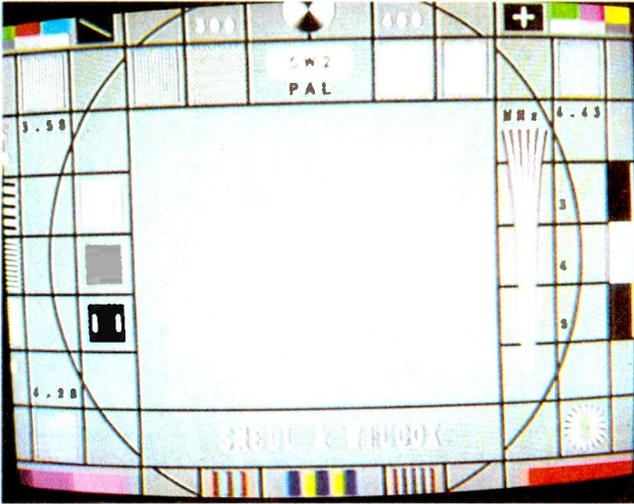
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**A Snell & Wilcox test pattern received via Sirius at 5°E.**

over the LNB and polariser, see the accompanying photograph. Make a hole of about 0.75in. diameter at the end of the slit for the cable: a 90° F elbow from Maplin lets it fall downwards from the tube. It should be looped away and gently secured to the feed support with plastic ties. In addition I wrap the F connector with self-amalgamating tape. The Kwik Save tube is plastic-tied into shape, with the slit underneath.

Being white, the tube reflects sunshine and thus minimises the temperature rise within the LNB in hot weather. The air flow through the slit should help with cooling and also avoid condensation build-up. Rise in temperature increases the noise produced by the LNB, so it'd best to keep it cool. I've used a 2-litre white spirit polythene container in the same way as a 4GHz (C band) LNB housing. These are square in shape and can usually be fitted around the C-band LNB and feed rings.

I always apply a hint of silicone

grease to the thread of the LNB's F socket and, to prevent oxidation and signal loss, apply an even smaller hint of grease to the inner conductor. Avoid using Vaseline as this is a water-based grease.

Do not squeeze or crush the cable when attaching it to the LNB supports or tacking it to a wall. This would upset its characteristic impedance, the result being mismatching, standing waves and signal loss. The plastic tie, tape or staple should just hold the cable. When the cable trails down from the face of a dish I generally take a slack loop to the rear, secure it there then loop it away to the post or wall for fixing. Ensure that there's sufficient slack cable to enable the dish to track from east to west.

### Interference

The October issue of the RSGB's publication *RadCom* contained several important items on possible interference to TV reception. The proposed Power Line Telecommunication system (PLT), which would have used the mains supply to distribute high-speed data, has been dropped. It could have caused widespread interference in the HF/low-VHF spectrum. In his Technical Topics column however Pat Hawker reveals another interference threat, British Telecom's VDSL (Very high-speed Digital Subscriber Line), a higher bit-rate version of ADSL. It's expected to become available next year, supplying data via the normal twisted/balanced-pair lines. 0-4kHz will be reserved for voice communications, with the data in the spectrum above this. According to Pat Hawker it could extend to a maximum at 30MHz.

Dave Lauder's EMC column mentions an interference problem that was caused by a SkyDigital box. The interference was seen only when an indoor UHF aerial was used. The SkyDigital box's modulator had been tuned to channel E30, which had subsequently come to be used by a local digital multiplex (from Ridge Hill). The problem was cured by tuning the modulator to a different channel.

### Satellite News

The German Kirch and Italian Mediaset groups are planning a pan-European expansion of their broadcast services called the European Television Network

(ETN). Initial negotiations have been conducted in Greece, Poland and Portugal, and several French services including Canal+ may be approached. Satellite and cable interests such as SAT-1, Kabel-1 and ProSieben may be involved.

Eutelsat is to create a new 'hot spot' in the European skies, SatEuropa at 7°E. There will be a build up of digital channels which are expected to number twenty by the end of the year with a mixture of news providers, free-to-air programming and multimedia offerings. Costs at 7°E are typically 35 per cent lower than at 13°E. With domestic satellite broadcasting spread from 7°E to 28.5°E, there should be greater demand for tracking-dish installations.

Eutelsat plans to launch a new satellite, W1R, into orbit at 28.5°E in the autumn of 2000. The 24-transponder craft will increase the capacity provided by DFS Kopernikus-2, operating in the bands 11.2-11.45, 11.45-11.7 and 12.5-12.75GHz.

INSAT-2E is to be launched into orbit at 83°E giving coverage across India. At present Indian TV channels are downlinked from several satellites. The aim is to concentrate transmissions at 83°E – some channels have already been moved to this slot – encouraging Indian viewers to install fixed dishes.

Televizija Jugoslavija has started to broadcast via Amos-1 (4°W) at 11.421GHz H (SR 3,440, FEC 3/4). The new service is backed by the Yugoslavian federal government and should eventually transmit terrestrially as well. Also check out the Israeli J-Channel at 11.025GHz from 13°E (Hot Bird), SR 1,807, FEC 3/4. Most receivers won't lock up with this very low symbol rate. I have so far had no reports of reception of either of these two stations. Another Balkans digital TV service is due to start via Hot Bird, Croatian HRT National at about 12.520GHz, probably SR 27,500, FEC 3/4.

According to an EBU release a Pristina station called Radio Television Kosova opened on September 19th, broadcasting between 1900-2100 local time initially in Albanian and Serbo-Croat. It has been reported to be on air as an analogue signal via Eutelsat W2 (16°E) at 11.490GHz H, with audio at 6.6MHz.

**An early morning news insert from Moscow to London after the bombing of residential flats on September 13th.**





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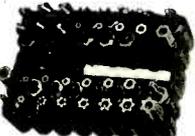
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*We welcome letters from our readers and try to publish as many as we can. You can send them typed, handwritten, or on disc. Address them to the Letters Editor, Room L302, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS.*

### **How many cards?**

In the year 2000 and whatever, when 95 per cent of viewers have digital TV equipment, the analogue terrestrial transmitters will be switched off. I have some questions about this. We have a small-screen TV set in the kitchen, a small portable TV in the bedroom and also a Casio portable TV. Come the switch-off they will all be useless. To replace them, we will need new digital receivers or set-top boxes. As each set-top box currently needs a card, and second cards mean a second subscription, only one TV set at a time can be used per subscription. It might be possible to distribute signals via a 'video sender' linked to the main set-top box, but only one channel at a time could be viewed! I assume that as the technology advances digital VCRs will appear: you will probably need a card that allows you to watch only the channel you are recording.

What will happen in hospitals, where each ward or private room has a TV set? Cards for each TV? I think not.

The answer must be for future digital TV sets and VCRs to be just like analogue ones in that you can plug in an aerial and receive the free-to-air channels such as BBC and ITV without the need for a card, only 'extra' channels requiring a card.

I understand that digital satellite

# Letters

cards are dedicated to one receiver only, so card swapping between receivers is also out of the question.

If only one digital broadcaster survives, which is a possibility, and this is SkyDigital, will the terrestrial transmitters be switched off leaving every TV set and VCR in need of a dish?

*Kevin Davies,  
Haverfordwest, Pembro.*

### **Video Surveillance**

Since my article in the November issue on a microcontroller-chip based security system I have managed to acquire a VCR that's dedicated to this application, the Abex Model ECR770 – Abex is a UK importer. The ECR770 has the following features: a built-in date-time generator; various record-time lengths, from ten seconds after the event trigger to continuous recording after the trigger; and virtually immediate recording.

Although OK, the date-time display is in the wrong place on the screen for my application. So I turned it off and continue to use the generator in my control box. The event timing is set for ten seconds, by software control. This is ten seconds after the trigger contacts in the control box have reopened. It therefore still depends on the PIR timer, plus ten seconds. As the VCR loads the tape initially then goes to sleep, there is a record delay of approximately two seconds from the trigger point.

I am sure that other VCRs will be available with similar functions, i.e. instant recording and wired-triggering of recordings, but have no model details at present.

*Denis Mott,  
Huddersfield.*

### **Weight of TV sets**

I am no longer able to lift and carry TV sets despite being a good few

years from retirement. It seems that as the line on a graph showing my lifting ability has gone downwards, the line showing the weight of the average TV set has gone upwards. As sets have become increasingly complex, and therefore less suited to field repair, more and more jobs have to be done in the workshop. Two people are normally assigned to collection, but it's becoming a struggle for two people to cope with the sets.

Large-screen TV sets do not seem to have been designed for field repair and are certainly not designed to be carried. Has any thought at all been given to those who have to transport these monsters to and from customers' houses? Many of these sets weigh more than 50kg, and most are difficult to hold. Remember also that not all customers live on the ground floor, and many live some distance from a suitable car park.

I don't know what the answer to this problem is. Possibly chassis transplants, but these could cause as many problems as they cure. I feel that the industry must take a long, hard look at the problem if further injuries are to be prevented. *Name and address supplied.*

### **Trade Conditions**

I agree with the views on the profitability of the TV/video repair trade expressed in the September and subsequent issues. One of the chief aggravations as far as I am concerned was that almost every customer would ask "can you let me know how much it will be before you do it?" My response, about two years ago, was to put a notice in my shop window to say that "all work left for repair must be accompanied by an examination fee of £18". I was reluctant to try this, fearing that it would kill most of the repair work I was getting,

but decided to give it a try: I could always drop the idea if it didn't work. We explain that the fee will be deducted from the final repair cost – or from the price of a new TV set or VCR if repair is uneconomical.

The 'examination fee' idea had an unexpected advantage: more customers accepted repair estimates than previously. In some cases I have even been able to charge a little more. Think about it. If I ask you for £30 to carry out a repair, that might seem a lot. But if you've paid £18 up front, you get your TV set or VCR back for only £12. It works – try it!

Yes, one or two people will say "I'm not paying £18 just for a look at it", and I lose their business. That's fine. Snoddys can have them with pleasure! They are the sort who always want something for nothing.

You might say that there's no profit in selling the customer a new TV set or VCR, but I always hold a small stock. My very helpful wholesaler Harris and Russell sends me a monthly price list, so I've even been able to sell things from this list without actually having them in stock. If you are fortunate in being able to make a sale, you will often get a second-hand set that you are able to sell on. Even if I was to turn each item over only once a year, with a 25 per cent mark-up this is still a better return than I can get from a building society.

I don't pretend that any of this is going to save all the ailing businesses in our trade, but it might give you a little more hope. Good luck.

*Denis Foley,  
Leigh on sea, Essex.*

I agree with Michael Maurice (September) and the subsequent letters. Over the past several years I have tried to build up a repair business, starting from home, but even this has now become impossible. Customers really believe that they are being ripped off when you ask £50 to repair a TV set or VCR, despite the fact that two thirds of this will have been the cost of parts. Customers waste my time asking for quotes then won't have the work done. My average repair bill is £40-£60: if the customer is not prepared to spend this amount, I don't want the job.

But customers are in a sense cutting their own throats. Digital set-top boxes won't always be free.

VCRs for under £80 and TVs for under £50? Several years from now this equipment will need repair but there will be no engineers left. What will happen when the simplest of faults occurs and the equipment is just out of guarantee? It will have to be scrapped and a replacement bought. So a dry-joint will end up costing £80 or more.

*Mark Duffy,  
Eccles, Manchester.*

### Not Even a Chance

In mid-August 1999 I received my exam results from City & Guilds. Another distinction, the grade I received for Parts 1 and 2. But what future is there for me in the industry?

I recently had interviews with Comet and Mastercare. The latter involved a seven-hour procedure that included the diagnosis of six faults on a variety of brown goods equipment, a multi-choice questionnaire paper similar to first and second year C&G but at a much higher level, a soul-destroying face-to-face, and a totally humiliating psychoanalytic question and answer thing with an area manager. After this I was put in a waiting room for half an hour then told that, although I had correctly diagnosed all six faults and scored over the 60 per cent required for the multi-choice paper, and obviously possessed good practical fault-finding ability, it was sorry but Mastercare was probably not the right company for me – I wouldn't have the right approach when dealing with a customer face-to-face.

While I have been at college (self-financed) I have been employed in the trade and have spent two years repairing monitors and servicing all varieties of brown goods. This has brought me into contact with all manner of customers, after which I am all too aware of the need for a careful approach.

So there I am. The large companies seem to be more concerned about employing those with the ability to soothe the general public than provide good servicing potential. Over the past two years I have seen only one job within the trade in my area. It called for a fully-experienced engineer able to fault-find without the aid of a circuit diagram, working a five and a half day week for just £10,500 p.a.

I'm beginning to wish I had never taken an interest in the trade. You can earn more stacking shelves in a supermarket. Yet we are intel-

ligent people, proved by completing the 224 syllabus, a far from easy course.

I've now been offered a job as a trainee washing machine and tumble dryer engineer at £13-£14,000 to start, plus car and mobile phone. I won't be turning it down.

In conclusion, a genuinely interested and potentially very good TV engineer has been forced to turn his back on the trade before even getting a chance.

*M.R. Chambers,  
Leighton Buzzard, Bedfordshire.*

### Sharp DV5161H

I read with interest Donald Bullock's note on this model in the August issue. We sold one of these sets new about four years ago and have experienced the same problem, excessive height. I have been out to the set seven or eight times because of this fault. Each time resetting the height has cured the problem for about six months. Obviously the EEPROM gets corrupted, but why? On my last visit the customer mentioned that the fault had occurred after a thunderstorm.

I would be very interested to hear from anyone who can suggest a cure or modification for this annoying problem. We have to make a twelve-mile round trip to put it right, and to show good will feel that we cannot make a charge.

*Michael Dranfield,  
Buxton, Derbyshire.*

### Those Rubber Wedges

In a letter in the September issue Michael Dranfield mentioned the rubber wedges used for static convergence adjustment and the damage they can do to the scan coils. Certain types of rubber are extremely hygroscopic. A good example of 'rubber' that absorbs moisture is silicone RTV, which is commonly used for sealing around baths. Squeeze an inch out of the tube and allow it to cure. Then place it in water for a few hours. You will find that it has swollen. Worse, many types of silicone 'rubber' exude acetic acid when curing. It smells like vinegar and is highly corrosive. Don't use this stuff anywhere near copper wire or metal.

Another troublesome substance is petroleum-based adhesive, of the Evo-Stick variety, that appears mostly in products imported from the Far East. When the equipment in which it is used has been 'cooked' for a year or two the glue

turns black and becomes corrosive. The result is strange faults such as open-circuit resistors.

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

In the September issue Michael Dranfield recounts a corrosion problem encountered with the scan coils in some Matsui sets. I had a similar problem with my brother-in-law's set. Several turns had shorted, overloading the line output stage and the power supply. Attempts to obtain a replacement yoke proved fruitless – one supplier said "if you can find a source, let us know".

As I didn't want to spend much on the set I ended up by removing the coils, cutting out the shorted sections (about ten turns were affected), splicing in new sections of enamelled copper wire and insulating the repaired section. Much to my surprise the set then worked, with only a minimal effect on the picture. My brother-in-law and his wife were happy, as the set was only for occasional use. If the coils and tube had had to be replaced, the set would have ended up on the local tip

as uneconomic to repair – this would have been the case anyway had it not been done for a member of the family.  
*Keith Wevill, Ratby, Leicester.*

With regard to Michael Dranfield's letter (September) on scan coil wedges, although I am by no means a chemist nothing surprises me any longer about the behaviour of rubber!

During summer last year I switched on my Tascam 34, a professional four-track reel-to-reel audio tape machine, loaded a tape and heard a ghastly crunching noise. There was an equally ghastly sticky residue left behind on the tape. The pinch roller had to all intents and purposes melted! It's easy to remove. Being mounted on the top, you only have to unscrew the securing cap. My fingers sank into the sponge-like material that twenty four hours previously had been a solid roller, and removing the black goo from my hands took quite a time. I was able to obtain a replacement from the manufacturer of these machines and was told, as I handed over £12.50, that it was the last of his extensive stock as the same thing had happened with many other machines that same week.

I purchased, as repairable scrap, a pro machine with an even bigger roller, for half-inch tape. When I examined the roller I found a small pinhole on the surface. Liquid goo came out when I squeezed the area around this hole. Following Michael's resistance checks, I decided to carry out some measurements. Incredibly, with no less than one inch between the probes the resistance was 1.5Ω. I was so astounded that I checked this several times and confirmed that it was correct. No, the probes didn't go through to the metal core and, yes, I got covered in goo once again!

This sort of thing never happened with replacement rollers about fifteen years ago. The rollers then could be used until they became so barrel-shaped that the tape rode up clear of its path.

The factors involved in the self-destruction of any rubber product seem to be air flow, temperature and the amount of preservative added during manufacture. Witness what happens to a drive belt with a high rub-

ber content that's been stored in a plastic bag for several years. You have a bag of goo! A product with a higher proportion of preservative added to the chemical mix has a much longer shelf life, at the expense of quality. The consensus amongst those I've spoken to suggests that the greater the purity of the rubber/latex (including that used for various types of clothing) the greater the need for good air flow to enable it to breathe. It is, after all, a natural substance – and being stuck in the back of a hot telly is a wholly unnatural condition!

*Peter Graves, Clapton, London.*

### Over Design?

I know TV receiver designers don't really hate us engineers, but you can get that impression! The reported symptoms with a Sanyo Model CBP2579A that came in recently were "sound goes off after a few minutes, then sometimes the picture goes as well". I soldered the usual dry-joints on the 12V and 5V regulators and hoped for the best, but didn't get it. Then I noticed that between the sound disappearing and the picture going the remote control unit ceased to have any effect.

When the set was put in the service mode, the fault code "error 4" appeared. This generally means a fault on the sound processing board (thanks to Charles Hyde for this information). There are two large flatpack chips here, mostly in parallel, but as there's a large price difference between them I knew which one to replace first! There was no change in the symptoms, but the remote control unit now worked – it was just that there was a two-minute delay, and also that the error message was there even when the fault wasn't. My next step, unfortunately, was to replace the microcontroller chip.

No change. Reach for the Prozac. Another call to Charles Hyde produced the information that the set was constantly auto grey-scaling, which could lock-up the microcontroller chip and result in all sorts of anti-social weirdnesses if the tube was low-emission. The tube appeared to be at least 90 per cent good, but on one occasion when I switched on there was no green for about ten seconds, during which time the microcontroller chip was locked.

So the problem started with no sound and ended up with a new tube being needed. The original tube, though it produced an excellent picture, wasn't good enough for the technology designed to produce the excellent picture. Would the customer be prepared to pay for the work done plus a new tube and a small profit for ourselves? Not on the planet I live on!

*Steve Hague, TransVision, Redruth, West Cornwall.*

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## Answer to Test Case 444

- see page 81 -

Sage has never really figured out why a worn video head can sometimes cause a dip in the off-tape signal some little way into the head scan, whether or not it's accompanied by the more understandable (because of poor head penetration) dip at the beginning of the head's sweep. Nor, by the way, does he comprehend how a head-drum assembly, even a complete top-and-bottom one, can be priced at a spare part level that's about 85 per cent of the net cost of a complete new machine, both excluding VAT. But we've gone off the tangent a bit here!

In the machine in question the original fault was caused by head wear. The second fault, with identical symptoms, was likewise caused by worn heads. This was not because the manufacturer had started to make his head chips from clay, but because the machine had been running for 24 hours a day - the rental customer had been running a cleaning tape through it on a very regular basis! We were unable to discover whether the cleaning tape was of the wet or dry type, or exactly how often it had been through, but there was no doubt that it had been the cause of someone's expenditure of over £200. We're told that video hire shops encourage the use of cleaning tapes. So beware!

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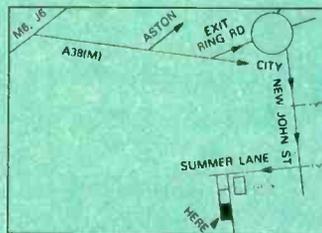
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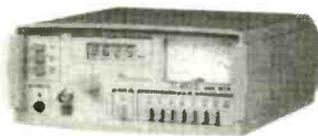
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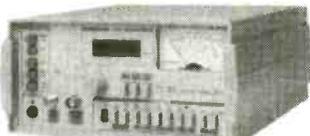
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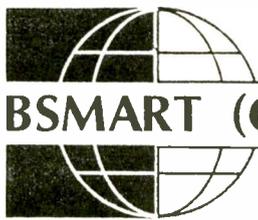
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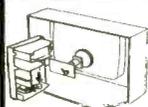
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652 8339**

or Fax on

**0181  
652 3981**

# RECRUITMENT

## ENGINEERING MANAGER

North West

**£25,000-£30,000 plus benefits**

Our client enjoys an enviable reputation as the largest retailer of IT products in the UK. Their vision is challenging and exciting, characterised by growth and a programme of investment in operational improvement and leading edge technologies. Reporting to the Service Centre Manager you will be a key person managing the inward flow of returned goods for repair ensuring delivery of an efficient and effective service.

As a key member of the management team you will lead an 80-strong team with responsibility for the day to day repair activities in the Service Centre Technical Division. Your role will be to ensure the efficient operation of the team, which will encompass planning and scheduling, and performance management. A key challenge will be to deliver performance improvements which exceed customer expectations, ensuring they receive goods back within agreed timescales. You will develop a culture of openness and trust and continue to improve working practices that will optimise quality, cost, reliability, responsiveness and customer service with success measured by the improvement to output, achievement of cost reduction targets and total customer satisfaction.

Ideally technically qualified, you will already have experience in an Engineering management role. This is a demanding role requiring resilience, energy and well established interpersonal skills. A challenging and enthusiastic style, combined with strong leadership skills is essential. Your drive for performance and efficiency improvement will have led to your success to date in a high volume, consumer goods environment.

If you believe you have the ability, skills and energy to work in such a demanding environment, please forward a full CV, stating current remuneration details and quoting reference 91001 to Elizabeth Law at the address below:



S P E I R H E A D

Spearhead Limited, PO Box 576, 10 Kennedy Street, Manchester M60 2NR  
speirhead2@dial.pipex.com Tel: 0161 236 7661 Fax: 0161 236 7690

**Are you urgently looking for:**  
**TECHNICIANS**  
**BENCH**  
**ENGINEERS**  
**FIELD SERVICE**  
**ENGINEERS,**  
**etc.**

**Then why not let**  
**Television**  
**Magazine help you**  
**find the right**  
**person that you are**  
**looking for.**

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To Advertise  
in Television Classified  
Telephone  
Pat Bunce  
on 0181-652 8339  
or Fax on  
0181-652 3981

### Clemtech

Require  
**BENCH REPAIR TECHNICIANS**  
Experience of fault find repair  
to component level  
Good soldering skills essential  
Tel 01705 610885  
Fax 01705 427763  
Mail@clemtech.co.uk (agy)

**EXPERIENCED**  
**TV/VIDEO/HI-FI BENCH**  
**ENGINEER REQUIRED**  
Good salary, part time hours  
SOUTH WEST LONDON  
Tel: 0181 674 9281  
Mobile: 07979 806078

**EXPERIENCED**  
**BENCH AND FIELD**  
**TECHNICIANS**  
**AND TECHNICAL**  
**INSTALLERS**  
**REQUIRED BY**  
**SERVICESPEED**  
**(SLOUGH)**  
**TEL: 01753 524848**

### Crane Telecoms Ltd

## Repair Centre Technician

Crane Telecoms Ltd has a mission:  
"To be the No. 1 Distributor of Telecoms Products in the UK"

Crane Telecoms Ltd is the UK's fastest growing distributor of Telecommunications products with an expected growth this year of over 40% and further expansion coming from activities in Europe.

Crane Repair Centre is a rapidly expanding part of Crane Telecoms Ltd and currently due to expansion we are seeking two new positions within the Repair Centre.

We are seeking applications from candidates wishing to move employment to a fast growing and interesting business. Dedicated in-house training is available for our products.

**The role - To process telecommunications and other electronic equipment for the company.**

The ideal candidate will have a minimum of five years experience within a service/repair background, candidates with hands-on experience in TV/Video, consumer electronics, telecoms products, office equipment, etc will be ideally suited to this role, a sound technical knowledge supported by relevant trade or technical qualifications. You must be experienced in testing and use of workshop test equipment. You'll need good, practical knowledge and ability to work well within a team. The right remuneration is available for the right candidate.

Crane Telecoms Ltd is a fast growing company employing excellent people. We reward success and hard work. In addition to the basic salary the reward package includes profit related bonus scheme, pension and private health care.

If you would like to apply for this position, please send in your CV to:  
**Steve Chimarides, Repair Centre Manager,**  
**Crane Telecoms Ltd,**  
**1 Clayton Manor, Victoria Gardens, Burgess Hill, West Sussex**  
**RH15 9NB. Tel: 01444-872013**

**CLASSIFIED TEL: 0181 652 8339**



**Television reader offer:**  
**x1, x10 switchable**  
**oscilloscope probes,**  
**only £21.74 a pair,**  
**fully inclusive\***

\*Additional pairs as part of the same order, only £19.24 each pair.

Seen on sale for £20 each, these high-quality oscilloscope probe sets comprise:

- two x1, x10 switchable probe bodies
- two insulating tips
- two IC tips and two sprung hooks
- trimming tools

There's also two BNC adaptors for using the cables as 1.5m-long BNC-to-BNC links. Each probe has its own storage wallet.

To order your pair of probes, send the coupon together with £21.74 UK/Europe to Probe Offer, Jackie Lowe, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS.

Readers outside Europe, please add £2.50 to your order.

Please supply the following:

**Probes**

Total \_\_\_\_\_

Name \_\_\_\_\_

Address \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Postcode \_\_\_\_\_ Telephone \_\_\_\_\_

Method of payment (please circle)

**Cheques should be made payable to Reed Business**

**Information**

Access/Mastercard/Visa/Cheque/PO

Credit card no. \_\_\_\_\_

Card expiry date \_\_\_\_\_ Signed \_\_\_\_\_

**Please allow up to 28 days for delivery**

**Specifications**

**Switch position 1**

Bandwidth	DC to 10MHz
Input resistance	1MΩ - i.e. oscilloscope i/p
Input capacitance	40pF+oscilloscope capacitance
Working voltage	600V DC or pk-pk AC

**Switch position 2**

Bandwidth	DC to 150MHz
Rise time	2.4ns
Input resistance	10MΩ ±1% if oscilloscope i/p is 1MΩ
Input capacitance	12pF if oscilloscope i/p is 20pF
Compensation range	10-60pF
Working voltage	600V DC or pk-pk AC

**Switch position 'Ref'**

Probe tip grounded via 9MΩ, scope i/p grounded

# Special Offer Sale - 20 Remote Controls £20.00 (mixed all well known brands)

FERGUSON ICC 7 HAND SET	£3.00
<b>FERGUSON VIDEO</b>	
FV90 LV HAND SET	£3.00
FV80 LV HAND SET	£3.00
FERGUSON	
BATTERY CONVERTER TA616	£15.00
24V DC/240V AC	£15.00
BENCH LAMP FLUORESCENT	
WITH MAGNIFIER P/P £5.00 ea	£50.00
BENCH POWER SUPPLY VARIABLE:	
0-30V 3A-TWIN METERS P/P £5.00 ea	£50.00
BRIDGE RECTIFIERS 10 FOR £1.00	
BURGLAR ALARM KIT full description	£7.00
CAMCORDER-UNIVERSAL BATTERY 9.6V - 1400MA FOR JVC-PANASONIC-PHILIPS	£5.00
CAMCORDER-RIPOD SHOULDER POD	£3.00
CAPACITORS:-	
11N/2K, 2N2/2K, 4N2/4K EACH	15p
5N6/2K, 6N2/2K, 9N1/2K EACH	15p
5N2/2K, 50V 4 7UL SW TROSK EACH	25p
AA BATTERIES 1.5 VOLT	
STC ALKALINE	10p
DESOLDER PUMP	£2.00
DIGITAL CAPACITANCE METER CMC200 20MΩ-20MF	£28.00
FILTERS - 455 & 480 EACH	10p
GAS SOLDER IRON-PORTASOL HOBBY	£10.00
INFRA RED DETECTOR	
WIDE/SHORT ANGLE WITH RELAY	£5.00
INFRA RED RECEIVER-MATSUI MINIATURE	£1.00
MILLI VOLTMETER-ELECTRONIC LEADER	
1MV-100V AC IN-1MV FS £5 P&P	£5.00
1MV-300V CALIBRATED - COST £225.00 £5 P&P	
COLOR TV BATTERY	
CONVERTER IN 24VDC TO 240V OUT	£15.00
MODULATOR-TUNABLE SATELLITE-TV	£1.00
PANEL-1K2-FM2211 STEREO	£5.00
PANEL-CVC80-POWER	£5.00
POSITOR 18 2 PIN	20p
POSITOR-2322 662 98012	50p
POSITOR 3 PIN POS-REPLACES BLACK TYPE	50p
POWER SUPPLY	
12V DC & 24V DC REGULATED	£2.00
POWER SUPPLY-REGULATED 3-12V 500MA	£5.00
PSU AC 12V 500MA	£1.50
PSU AC 9V 1A	£1.50
QUARTZ HALOGEN	
500W 200V FOR OUTDOOR LAMPS	£1.00
R.S. SAFE BLOC	£5.00
RELAYS SUB MINIATURE	25p
SATELLITE TUNER UNIT - 2427611	
BASE BAND/VIDEO OUT	£3.00
SCART TO 4 PHONO LEADS 1.5M	£3.00
SCART TO 6 PHONO LEADS	£3.00
SCART TO "D" PLUG	£1.00
SCART TO SCART LEADS - ALL PINS CONNECTED - 1.5 METRES	£2.00
SOUND 5.5MHZ MPN 1000T	£1.00
SOUND 6.0MHZ MPN 1040	£1.00
TRANSFORMERS ENCAPSULATED MAINS	
0-120V-0-120V PRI 0-9V-0-9V SEC	£1.00
TRIPLER KT3VK30	£4.00
TRIPLER - UNIVERSAL	£5.00
<b>AMSTRAD</b>	
HEAD AND DRUM - 6000	£12.00
HEAD AND DRUM - NICAM	£12.00
PANEL-CL OCK DISPLAY - 8.900	£5.00
PL-ASTIC FRONT WITH PLAP - 8.900	£3.00
POWER SUPPLY V5100-V51100	£5.00
POWER SUPPLY LONG OR SHORT CHASSIS 1991/1992 MODEL	£3.00
POWER SUPPLY - SWITCH MODE DOUBLE DECKER	£5.00
20 OFF MIXED NOKIA IIT	
SALORA INDEX SERVICE MANUAL	£10.00
MAINS ADAPTOR 12V AT 500 MVA	£1.00
NEGATIVE CENTRE	£3.00
NEGATIVE CENTRE	£3.00
POSITOR EQV 98009 - SALE PRICE	25p
<b>FERGUSON</b>	
ADAPTOR VPT-TEXT-VA354	£3.00
AC MAINS & BATTERY-VA365 P/P £3.00 ea	
CAMCORDER BATTERY 6V-1400MA-VA366	£5.00
CAMCORDER BATTERY HIGH CAPACITY 9.6V 1800MA-VA310	£3.00
CAMCORDER BATTERY CHARGER 9.6 VOLTS VA265 EACH	£6.00
CAMCORDER CAR ADAPTOR CHARGER AND BATTERY VA308	£5.00

CAMCORDER LENS 2 OFF - TELE CONVERSION LENS x1.4 & x0.7	£1.00
CARDIOID CAMERA MICROPHONE-VA SUPER 218 TELE ESCOPIC BOOM & STAND	£5.00
CHASSIS TX80-NEW-NO TUNER P/P £5.00 ea	£15.00
CHOKER-MAINS INPUT-TX9-TX10	£4.00
CHROME BOARD-ICCS	
ICs 14647TKF OR HA11498	£6.00
DUCK AND CAPSTAN MOTOR:-	
FV61LV, FV62LV, FV67LV, FV68LV EACH	£30.00
FV70B, FV71LV, FV72LV, FV74LVX EACH	£30.00
FV771V	£12.00
FV31R	
HEAD AND DRUM	
MODULATOR-SATELLITE-T1040-SRD3/4	£2.00
PANEL-10 MIXED FROM TX9 TO ICC5	£20.00
PANEL-DECODER-ICCS	£5.00
PANEL-FRONT-TX100	£4.00
PANEL-IF-TX9, TX10	£4.00
PANEL-REMOTE AND POWER SUPPLY FV31R DISPLAY P/P £2.00 ea	£5.00
PANEL-REMOTE-TX9, TX10 EACH	£5.00
PANEL-REMOTE-TX10-54001	£5.00
PANEL-REMOTE-TX10 WITH BATTERY AND 4 ICs - 1544-033C	£7.00
PANEL-REMOTE TX90 - 139001 ICs M2931B AND MS1000	£10.00
PANEL-REMOTE TX100 IC M2931B-SATA5012	£5.00
PANEL-REMOTE TX100 WITH STAND-BY BATTERY AND ICs	£5.00
PANEL-TI228B TEXT FOR TX89, TX98, TX99, TX100	£6.00
PANEL-TX90 THORN FRONT - 8 BUTTONS 01M4-515-002	£5.00
PANEL-TUBE BASE-ICCS	£5.00
PANEL-TUBE-BASE-TX89, TX98, TX99	£5.00
PANEL-TUNING-15066-TX9, TX10	£5.00
POWER SUPPLY 12V-3A FOR VIDEOSTAR CAMERA PP3	£4.00
PUSH BUTTON UNIT-TX85, TX86 - 8 BUTTONS	£5.00
RECEIVER - INFRA-RED - IC51486-TX100	50p
TRANSFORMERS-SWITCH MODE:-	
TX85, TX86, TX89 EACH	£4.00
TX100	£5.00
473190-00, 40153000 EACH	£5.00
ICCS 3112-338 326842	£4.00

<b>HITACHI</b>	
DECODER-TEI EXTEXT PC232AS - ISSUE 4	£15.00
HEAD AND DRUM - 620E	£12.00
MAINS SWITCH WITH STAND-BY	£50p
MODULATOR No 5587881	£5.00
OSCILLOSCOPE 20MHz DOUBLE BEAM - V212	£188.00
PANEL-TEI EXTEXT G81 - ISSUE 6	£10.00
PANEL-TEI EXTEXT PC315-11 - ISSUE 7	£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
THICK, FILM-HM9204A	£3.50

<b>HOSIDEN</b>	
TUBE BASE - MIXED 10 for	£1.00
AA Batteries made by STC Group of Companies	10p each

<b>ITT</b>	
IF MODULES:-	
5827-01-51, 5827-03-51 EACH	£3.00
5828-04-10, 5829-02-58 EACH	£3.00
5929-03-41 EACH	£3.00
TELETEXT CONVERSION KIT CORE 2 90° IT TEXT PANEL	£3.00

<b>1996/7 MATSUI</b>	
VIDEO DECK COMPLETE P/P £5.00 ea	£16.00

<b>MATSUI - ORION</b>	
DECKS WITH HEADS	
D1096 VXA110 VP 9401	£16.00
HEAD VSR1500 - ORION D2096	£5.00
PANEL-MAIN-VSR 1500 P/P £5.00 ea	£3.00
POWER SUPPLY VSR 1500	£3.00
POWER SUPPLY & REG TYPE STK 5343 VP9501	£8.00
POWER SUPPLY SWITCH MODE-1500	£3.50

<b>PHILIPS</b>	
DECODER-TEXT-K40-KT3	£6.00
IF PANEL FOR CP90-CP110	£5.00

<b>TEXAS</b>	
NICAM BOARDS MK 11	£3.00

<b>BIG SALE</b>	
<b>HITACHI</b>	
VIDEO MAIN BOARDS	
VTM 720E	
VTM 740E	
VTM 752E	
VTM 762E	
VTF 150E	EACH £5.00
VTM 220E	EACH £5.00
VTM 230E	EACH £5.00
VTF 230E	EACH £5.00
VTM 350E	EACH £5.00
VTF 450E	EACH £5.00

<b>L.O.P.T.</b>	
36061, 36162, 36362, 36383, 36481	
36482, 36761, 36831, 36832, 36922	
36943, 36962	
2432211, 2432351, 2432491, 2432511	
2432871, 2432981, 2432984, 2433751	
2433952, 2434002, 2434141, 2434393	
2434451, 2434492, 2434494	
2435011, 2435062	
2435064, 2435085, 2435121	
2435372, 2435701, 2436773	
2436792, 2436795, 2436797, 3216001	
243666, 243663	
3220029, 3714016, 47003481	
AT207678, AT207688, AT207825	
AT207781	
DST81N243472593-00	
DST85B2354732870-0 & 40153200	
DST88N234400086AD, & 47805200L	
DST88N23447320041, & 47317590	
DST186N243473058-00	
TFB3035D, TFB3069D, TFB4023AD	
TFB4039AD, TFB4066AD	

<b>FERGUSON</b>	
TX9	
TX10	
TX85, TX86	
TX98, TX99	
Y260781	
KSTY20482	
LOPT RED SPOT	
LOPT WHITE SPOT & YELLOW SPOT	
<b>PANASONIC</b>	
TC2203, TL1 1456B	
TL1457B, TL17016	
<b>TOSHIBA</b>	
TFB 3035D, TFB 4023AD, TFB 40321D	
TFB 4038AD, TFB 4110AD	
TFB 3089D, TFB 4088AD	

<b>VIDEO DECKS</b>	
AIWA 1500	
MATSUI VXA 1100	
MATSUI 1500	
ORION D1096	
ORION D1096	
ORION D2096 ETC EACH	£20.00
CAPTAIN MOTOR FOR ABOVE DECKS	£15.00
AND HAND SETS	£3.00
4 HEAD DECK FOR 1500	£20.00
20 HIGH VOLTAGE CAPS 1500V - 2000V MIXED	£1.00
VIDEO PATTERN GENERATOR MODEL T9535 240V	£5.00
MAINS SMALL	£5.00
PAL TV ADAPTOR - RGB IN UHF OUT	£5.00
MOTOR 12V	10p

<b>HANDSETS</b>	
AMSTRAD	
4600	£3.00
4700	£5.00
6000	£15.00
6800	£4.00
UNIVERSAL	£3.00
<b>DECCA</b>	
NICAM LCD	£4.00
<b>FERGUSON</b>	
BSB	£1.50
FV41R/3V59	£10.00
FV41R/FV42 - FV51-52	£10.00
ICCS	£7.00
IK2000, IK7000	EACH £4.00
SRD2, SRD3, SRD4	EACH £1.00
T780	£2.00
TV/SATELLITE WITH EST	£3.00

HITACHI	
CP1258 (NO REPLACEMENT)	£5.00
VIDEO RM933E VIDEO PLUS	£30.00
<b>MATSUI</b>	
1500	£5.00
VSR 1500	£4.00
VX300E	£1.00
3000ORION - TV AND VIDEO	£2.00
RC - PACE 900, FERGUSON, SONY, GRUNDIG	£5.00
<b>MITSUBISHI</b>	
RM335 - VIDEO	£5.00

<b>NOKIA</b>	
RC202	£4.00
VP9401	
D1096	
VXA1100	
AND VIDEO PLUS	
<b>ORION</b>	
TV AND VIDEO	
VIDEO WITH LCD - 1992/93 MODELS	£2.00
<b>PANASONIC</b>	
EUR51142	£10.00
TC1632, TC1642, TC2232	EACH £8.00
TX2304, TX2304, TX2300, TX2234	EACH £8.00
TX2244, TX2300, TX2636, TX3300	EACH £8.00
RC201 - TV - REPLACES TNZ1411/2	

<b>PERDIO</b>	
PV 1188	£3.00
<b>PHILIPS</b>	
NEW TYPE UNIVERSAL	£8.00 (3 in 1)
RC4001	
<b>SAMSUNG</b>	
HANDSETS, TV & VIDEO - 12 TYPES EACH	£3.00
<b>SANYO</b>	
UNIVERSAL VIDEO	£3.00
<b>SIEMENS</b>	
TV/VIDEO - 1994 MODEL	£5.00

<b>THORN</b>	
9001, 9600, TX9, TX10, TX100	
TEXT AND NON-TEXT	EACH £10.00
CPT1408T, CPT2176, CPT2178	EACH £5.00
CPT2176, CPT2178	EACH £5.00
TEXT, REPLACES PHILIPS	
KT3, K4, K4 ETC U/V	£8.00
PHILIPS 3 IN 1 HAND SET	£8.00
FERGUSON WITH TEXT IZ	
CHASSIS P/P £5.00	£10.00
TX86 CHASSIS	P/P £4.00
ORION AND MATSU CARRIAGE	
1500 TYPE D1096 ETC	£6.00
SANYO LOPT	P/P £2.00 4 FOR £5.00
240V ADAPTOR 9V AC 1A	£1.00

<b>COMPLETE REPAIR KIT, CLUTCH AND PINCH ROLLER, IDLER D2906</b>	£7.00
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<b>TUNERS</b>	
IF TERC8-022A TBZA 002A-ALPS	£3.00
SATELLITE SXT2302180968	£3.00
SATELLITE	
WITH BASE BAND MIN SXT2302234	£4.00
SMALL UNF/VHF	£3.50
VHF/UHF - TEK64 112A	£4.00
4944	

U321, U341, U342, U343	
U344, U411, U412, U444	£2 EACH
U743, 7744	
<b>AMSTRAD</b>	
UE33 BO1	£3.00
MRI7 7E33	
MATSUI ORION VIDEO TUNER IF	£5.00
<b>FERGUSON</b>	
IF2105 RE	£5.00
MP12011-AP00	£5.00
UHF - ICCS	£5.00
VHF - ICCS	£5.00
TX85, TX86, TX89, TX90	EACH £4.00
TX98, TX9, TX100	EACH £4.00

<b>ORION</b>	
1500 - UE33 BO9	£4.00
<b>PANASONIC</b>	
SMALL UHF/VHF	£3.00
<b>FERGUSON</b>	
DOUBLE SID NICAM	£10
ICCS NICAM SINGLE BOARD ICSS	£10
<b>SHARP</b>	
TUNER AND IF 1810587 PAL UK	£3.00
<b>TATUNG</b>	
UNIVERSAL 205 OR EQUIVALENT WITH AERIAL SOCKET	£3.00

<b>MOTORS</b>	
<b>HITACHI</b>	
CAPTAIN 150E	£3.00
<b>MATSUI</b>	
CAPTAIN IC NO. M56730 ASP	£15.00
2 TYPES 1995 TO 1997 MODELS MATSUI VIDEO DECKS WITH CAPSTAN MOTOR AND HEAD P/P £5.00	£20.00
<b>MITSUBISHI</b>	
MOD MRI7-UF32	£5.00
MOD TMLUG3-103A	£5.00
<b>MITSUBISHI</b>	
CAPTAN-HSE41-IC51M782ASP	£2.00

7805	20p	25D1432	£1.00	BU204	60p	BUT11AF	50p	BYW2950	15p	HD6140425J	50p

# A.R.D. For genuine hassle free service there's only ARD

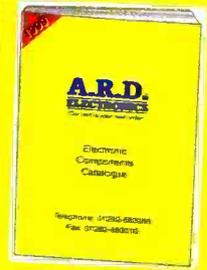
**ELECTRONICS**

'Our aim is your next order'

## NEW 600 PAGE FREE USER FRIENDLY TRADE CATALOGUE

A.R.D.s Trade Catalogue features over 12,000 electronic components and accessories with comprehensive technical information and photographs to help in product identification. All products are clearly and logically presented, to make the items easy to find. We offer the most competitive prices in the industry without sacrificing the quality of our products.

'Our aim is your next order' is not a gimmick. We have a highly trained and caring staff and perfect systems to try and make every contact with A.R.D. Electronics a pleasurable and problem free experience.



### Double Flush Mount Outlet Plate - TV/Satellite

Double flush wall mounting outlet for TV and satellite. Coaxial 9.5mm socket and 'F' type socket. White plastic with screw terminal connections. The face plates have standard fixing centres and are supplied with fixing screws



Order Code 100-00111-11 Offer Price **0.65**

### Satellite Fly Leads, High Quality - 'F' Plug to 'F' Plug

To connect a satellite receiver to an 'F' socket wall plate. 'F' plug to 'F' plug. 75Ω Impedance. Moulded end connectors. Gold plated connectors. RG59 coaxial cable.



Length	Colour	Order Code	Offer Price
1m	White	100-00136-11	<b>0.40</b>
2m	White	100-00138-11	<b>0.55</b>
4m	White	100-00140-11	<b>0.70</b>
10m	White	100-00142-11	<b>1.30</b>
1m	Black	100-00137-11	<b>0.40</b>
2m	Black	100-00139-11	<b>0.55</b>
4m	Black	100-00141-11	<b>0.70</b>
10m	Black	100-00143-11	<b>1.30</b>

### Single Output Universal Astra Digital LNB by GRUNDIG

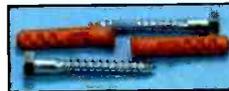


0.7dB Noise Figure

Order Code 340-00071-11 Offer Price **12.70**

### Satellite Fixing Sets by mungo

Satellite fixing set supplied with collared nylon plugs and coach bolt. Available in packs of 2 or 100.



Supplied in packs of 100

Description	Order Code	Offer Price/Pack
8 x 60mm	340-00104-11	<b>8.75</b>
8 x 70mm	340-00105-11	<b>11.75</b>

### F Plugs

F plug. Twist-on type. Nickel Plated.



Supplied in packs of 10

Cable	Order Code	Offer Price/Pack
RG6, CT100	110-00533-11	<b>0.75</b>
RG58, H121	110-00535-11	<b>0.75</b>
RG59, H109	110-00536-11	<b>0.75</b>

### F Adaptors

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