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Editor
John A. Reddihough

Production Editor
Tessa Winford

Consultant Editor
Martin Eccles

Publisher
Mick Elliott

Advertisement Sales Manager
Matthew Harradine
0208 652 3033

Advertisement Sales Executive
Pat Bunce
0208 652 8339
Fax 0208 652 8931

Editorial Office
0208 652 8120
Fax 0208 652 8111

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October issue on sale September 15th.

Next issue, dated November, on sale October 20th.

The Cable Age?

It's strange the tricks that technology can play as it evolves. Cable TV is a remarkable example of this. For years it was an option used only when off-air reception presented difficulties. There was cable distribution as far back as the pre-TV days, when high-power amplifiers fed raw audio to whole residential areas and even towns, the receiving apparatus consisting of a loudspeaker and a switch for programme selection. Inevitably TV was added, using HF carriers initially, then VHF distribution systems came into being. This technology was particularly widely used in rural parts of the USA, where the signal cables are often pole-mounted along with the telephone lines and the electricity supply. The traditional cable distribution technology was rather primitive, with limited bandwidth because of the constraints imposed by the cable, amplifiers and other equipment. Cable characteristics, matching problems, standing waves and so on all introduce limitations. You might have thought that in the world of UHF, SHF and even higher frequency communications cable networks would fade out. Not a bit of it.

There has been much development in cable system technology, and the advent of fibre-optical cables has made a great difference. In addition digital technology, in particular data compression, has had a major impact on cable operations as it has on every other mode of communication. Digitise and compress the signals, add error correction, use the result to phase modulate a carrier and there you are: dozens, in fact hundreds, of channels become possible. The digital cable systems now being introduced offer as many channels, more in fact, than DTH satellite TV can provide from a single orbital position. The bandwidth constraint is less: cable is wideband in comparison with an LNB.

If it was simply a matter of providing viewers with a couple of hundred channels or so, plus radio and some data, there would be little to choose between satellite and cable as distribution systems. But we are coming to expect more to be available. Telephony of course, and internet communication – not only as an information source but as a means of obtaining what has traditionally been made available by recording companies and broadcasters.

I have to admit to being sceptical about broadband cable when, in the early Eighties, it was being hyped as the answer to all our problems – well, some of them anyway. But that was before the latest digital technology came along, and with it the internet. JPEG, MPEG and the rest made digital transmission practical.

With the internet, almost anything is available anywhere – after a wait. Slowness is the problem. Because of this, the internet is not at present feasible as a method of broadcasting One sees references to webcasting, and in fact there is already an internet OB van. It will probably be only a matter of time before the limitations are overcome.

The great advantage of cable as a means of receiving broadcast and other services is its convenience. Everything comes to you via one system. No need for a separate dish, TV aerial and phone/internet connection. The lot can be provided together. If people came to see it this way, it could be that satellite communications will revert to its original role, as a means of distributing programme material to terrestrial networks.

It's interesting to watch the moves of Rupert Murdoch, who is never one to miss a trick when it comes to adopting new technology to his needs. He now seems to be as interested in cable TV as satellites. It has been reported that he is considering of the purchase of Deutsche Telekom's cable TV network, which supplies more than half the German public with some thirty TV channels. It really doesn't matter much, cable or satellite, to a broadcaster: the important point is to be able to sell programmes to the viewer. Rupert is clearly aware of the significance of current developments in cable distribution and communications, and is backing both satellite and cable.

He is also naturally concerned about the impact that digital cable TV could have on SkyDigital broadcasting. Hence the great marketing effort to get customers signed on, with those 'free' digiboxes. He's right to be concerned, and is obviously prepared to do his broadcasting whichever way will earn the best return. Without satellites he would never have got started in Europe, but he doesn't have to stick with them.

On balance it seems that the future lies with cable as the predominant means of broadcasting and communications for domestic purposes. What a change! From a cable connected to a loudspeaker and a knob, to one that brings together TV, your PC and other information items to provide a multimedia package.

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

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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 LNB's with typical current drains, a list of manufacturers and suppliers 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!

Customers, their sets and their quirky ideas. Guidance on the power supply used in the Grundig CUC7301/3 chassis. More on Dylan. Donald Bullock's servicing commentary

As I looked through the shop window the other day I saw this chap in turned-down gumboots spring from his car and hurry towards our door. He came in and stood on the mat, facing me.

I gave him a polite grin. "Can I help you?" I asked.

He gave me a glassy look, jerked his thumb over his shoulder and remained there.

A minute later I tried again. "Do you want to buy anything?" I asked, "or want something repaired?"

Instead of answering, he jerked his thumb over his shoulder again. Perhaps he wants me to get out I thought.

Then I saw a woman struggling to get a huge TV set out of the boot of the car. She managed it, and headed for our door. Gumboots opened it for her, as though he was our doorman.

"Took you long enough" he commented.

The woman tottered towards the counter as I sprang round to help her. The set was a large, heavy Goodmans 25in. model.

"Gosh" I exclaimed, "however did you manage to carry that?"

Gumboots was quick to answer for her. "With 'er 'ands. Telly's dead. Banged. Do 'im if it's cheap, nollif it's dear." He turned his wife round and the two departed.

The Repair

The set was a Goodmans Model 2580. Steven opened it and found a Ferguson TX92 chassis inside. Its 2·5AT mains fuse FP01 had died violently. He checked the mains bridge rectifier diodes and found that two of them, DP07 and DP09, were short-circuit. After replacing them he went on to check the hard-to-get STP6NA60F1 chopper FET TP16 which was also short-circuit. We finally tracked one down at Willow Vale, part no. 20660TR. Steven decided to play safe and order a new TDA4605-3 chopper control chip (IP01) as well.

When they arrived Steven fitted them and, before switching on, carried out a careful visual examination of the chassis to see whether he could spot anything else that might have contributed to the problem. Just as well: there was a nasty dry and arcing joint at one side of CP13, the 1·5nF 1·6kV capacitor in TP16's snubber network. Having dealt with this he switched the set on and was rewarded with an excellent picture.

"Thirty quid" Steven said to Gumboots when he returned.

"Not bad" said Gumboots as he reached for his wallet. Then he tapped his wife's shoulder, pointed to the set and jerked his thumb towards the car. A real gentleman.

Mrs Merret's Toshiba

Our next customer was nice Mrs Merret who lives up the road. Paul gave her a smile.

"It's our telly Paul" she said, "dead as a doornail, and squealing. Only I can't get him to you. He's too big."

"That would be the 28in. Toshiba" Paul replied, "I'll pop along and fetch it."

The set's a fairly recent one, Model 2812DBT. It was squealing all right. The line output transformer, which was running hot, had shorted turns. We fitted an H.R. Diemen replacement, type HR7694, and switched on again. There was now a raster, but other problems were present.

When standby was selected with the remote control unit the sound muted but the picture remained. Paul headed for the standby circuit and found that the 2SC2023 HT switching transistor Q845 was short-circuit collector-to-emitter. Once a replacement had been fitted there was correct standby operation but the set still wasn't right. The width was an inch too narrow, there was reduced height, and the picture geometry was poor.

In the past such adjustments would have been easy, a matter of resetting a few potentiometers. But this chassis uses an electronic screwdriver system for all picture adjustments, including the grey-scale and the first anode voltage.

Using the remote control unit, Paul pressed F and Video Input together to select 'menu', then selected code 1048. After a few seconds a green M appeared at the top right of the screen. He then held button F down while pressing the Picture Menu button to scroll up the menu, or button F and the Sound Control button to scroll down. Width was adjusted by selecting WID, and height by selecting HIT, the Volume +/– buttons being used to adjust the settings as required. Once everything was right the Standby button was pressed to store the settings automatically.

Gone Again

I don't like Mr Searl. He's short and fat and talks quietly on purpose so that you have to stand close and funnel your ear towards him.

"It's the Sanyo again Mr Bullock" he was saying. "When I first brought it here you said it was a good set. So I let you repair it, though it cost eleven pounds. It went again eight months later and you said this was just a coincidence. That was nearly a year ago. Now it's gone again.

If you'd told me it was going to do this at the outset I wouldn't have spent anything on it. Should I throw away the money I've already spent by not having it done, or should I have it done again and throw good money after bad? This is the sort of thing that drives people to rental, isn't it? My wife is *very* upset. *Very* upset."

"Hmm. Pity I'm not clairvoyant" I said.

We checked the set's repair record. The first repair had cost eight pounds, not eleven. And the set had then been all right for fourteen months, not eight. The set had not failed again after almost a year: it had been almost two years. The faults were different, and hadn't cost much to sort out.

We tried the set and found that it was dead because one of the mains lead wires was loose in the plug.

Grundig CUC7301/3 Chassis

Rufus does a few repairs for friends in a distant village. He brought us a set that had been giving him trouble. It was a 20in. Matsui 20V1T, which also comes as the Grundig T55-730 and is designated the CUC7301/3 chassis. The 2·5AT mains fuse S1600 would blow every week or two, usually when the set had been on for quite a time.

The power circuit in this chassis can certainly give trouble. One of the 1N4007 bridge rectifier diodes often develops a slight but measurable leak. Usually D621, but it's best to check them all. Or a diode can go short-circuit, in which case the UC3842AN chopper control chip IC630 will often be found with its side blown out, the chopper transistor T665 being short-circuit. The latter device may be a BUL310P1 or an MJF18004C, but it's best to use a BUT11AF as the replacement.

The ZPD3·6V zener diode D663 can go short-circuit or may become leaky. It's in the chopper transistor's base drive circuit. R661 (220Ω), which is connected between the chopper transistor's base and chassis, can go open-circuit.

Four electrolytic capacitors – C661 (1µF, 63V), C663 (2·2µF, 100V), C656 (2·2µF, 100V) and C667 (100µF, 35V) – in the power supply should always be checked. We replace C663 as a matter of course. It's the chopper transistor's base drive coupling capacitor and is very close to a large, hot resistor.

Steven pointed all this out to Rufus.

"Anything else?" he grinned.

"Only one thing" said Steven. "When you've attended to all these points, start the set up using a variac. If all is well, dispense with the variac, plug the set into the mains supply directly and switch it on. If the fuse blows, you've forgotten to replace D663. Do the whole repair again!

Incidentally there are component variations in this area with different versions of the chassis.

Dylan

My piece last month about an old friend, Dylan, the self-taught TV engineer, caused a little interest. One or two other memories of him came back the other day when Greeneyes and I were talking about him.

He was a confirmed batchelor who made his own daily dinner by heating a well-filled iron hot pot on the fire. Afterwards he'd peel a potato or two, cut up a turnip or a couple of carrots, and pop them in to keep it topped up.

"Good stuff, son" he'd say as he pulled lumps from a loaf and tucked in.

He didn't like banks much, and hid his savings around the place. One night, just as we'd settled with our pints in the Royal Oak, he gave out a strangled cry, leapt up and ran off through the door. He returned a good while later, smiling rather sheepishly.

"Sorry about that, son" he said as he reached for his pint. "Old Harry brought his set in for repair today. I lent him an old Ekco valve set."

"How does that explain your sudden departure" I asked. "People have been giving me funny looks."

"I suddenly remembered that I'd tucked a wad of tenners between the valves in the line output can" he replied.

I didn't ask him what chaos he'd caused at Harry's place.

It was Dylan's view that the gear-change stick in his Morris Minor van was too low. One day I noticed that he had welded a four-inch extension to it.

"Much better, son" he commented as I stood there amazed.

He would tackle the repair of anything electrical or mechanical. Once I mentioned that my automatic wristwatch had stopped.

"I can handle that" he said, reaching out his hand.

As I gave it to him I said "I've given it a rinse out with Radiospares switch cleaner".

Rufus does a few repairs for friends in a distant village

Without a word or a change of expression he tipped it back into my still-outstretched hand and turned to his beer.

He was brief, truthful and unaffected. At the time Greeneyes and I were due to fly to America in a propeller-driven plane. One night in the Royal Oak I confessed to him about our safety worries.

"No need, son" he said. "In your car the pistons are thin little shells, In that plane they're solidly built and this big." He held his hands apart. "The con rods in your car are thin, like this. In the plane they are this thick and made of super-hardened steel."

He continued with his comparisons and finally finished by pointing out that I had done 70,000 miles in my car with no trouble at all.

His low-key assurances increasingly put me at ease and my worries were soon banished.

For good measure I said "so you'd fly to America in that plane then?"

"No." he replied.

His brother was suddenly killed in an accident at work. I accompanied him up country to attend the funeral. On the way Dylan took me into a clothes shop, bought a black tie and handed it to me. After the funeral I spotted him quietly handing a huge wad of notes to the widow's father.

"For her?" the man asked.

Dylan nodded briefly, and a minute later we were away.

Not long afterwards I was to wear that tie again. To Dylan's funeral.

TELETOPICS

BSkyB's success results in loss

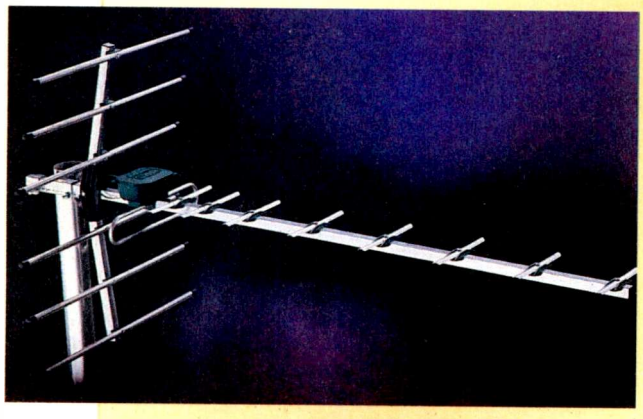
BSkyB reports that its SkyDigital service had signed up 1·21 million subscribers by the end of July, well ahead of the target it had set. 515,000 (43 per cent) were new customers for BSkyB. Since the SkyDigital free set-top box offer started in May, the service has attracted over 600,000 customers, a three-fold increase in new monthly subscriptions. During the period October 1998-May 1999 SkyDigital had signed up 551,000 subscribers, 39 per cent of them new. Set-top boxes were then being sold at £149-£199 each. BSkyB's original target for SkyDigital subscriptions had been a million by October. According to Sky, 54 per cent of its customers in June were new: there was a slight percentage increase in July.

BSkyB's revenues for the year ending June grew by eight per cent to £1·55 billion, but the company reported a pre-tax loss of £388 million compared with a profit of £271 million the previous year. This is largely because the company allocated £450 million to the transfer of its existing 2·5 million analogue customers to the new digital service, the cost of the free set-top box offer and an increase in advertising and marketing expenditures of £48 million. To maintain its dominant position in the pay-TV market BSkyB increased its expenditure on programmes by £100m: there was an eleven per cent increase in expenditure on sports.

The total number of subscribers to BSkyB's services, analogue and digital by satellite and cable, was 7·44 million at the end of the year. The number of satellite subscribers actually fell during the year, but there was an increase in the number taking the programming via cable. The SkyDigital churn (cancellation) rate has so far been extremely low at one per cent.

BSkyB has suggested that ONdigital's subscriber numbers are lower than claimed, 204,000 rather than 247,000 (end June). ONdigital has explained the discrepancy by saying that the difference is largely because a number of subscribers had still to activate their boxes.

On Sunday August 22nd SkyDigital launched its Sky Sports Extra interactive TV system, which enables viewers to select camera angles, replays, on-screen information and statistics. The system works by transmitting parallel information channels that the viewer can select. During August the software in SkyDigital boxes was updated for the forthcoming Open interactive TV service.



With the advent of digital TV, Labgear has re-entered the outdoor aerial market. A comprehensive range called SkyLine has been introduced. The photo above shows the SkyLine Digital 15. There are ten aerials in the range, classified as Contract for analogue reception, Digital, High-gain Digital and Grid Digital for digital/analogue reception. All aerials for digital reception incorporate a balun, which is essential for reliable digital signal reception. Full technical support for the range is available and Labgear is to expand it to include FM and DAB aerials. A comprehensive range of masthead amplifiers and accessories is available to complement the aerials. For full details of the products, call Labgear Ltd. on 01223 366 521.

Video recording formats

NEC is about to launch, in Japan, the world's first digital optical disc video recording system for domestic use. The player, known as the GigaStation, records up to two hours of S-VHS quality video on a 12cm (CD-sized) disc or, alternatively, up to four hours of lower quality video. Each disc, known as an MVDisc (Multimedia Disc), can store up to 5·2Gbytes of data. The discs come in a protective cartridge. Other features include a bookmark function, indexing, high-speed picture search and a system that automatically finds free disc space for one-button recording.

The GigaStation also provides non-linear editing and can be linked to analogue or digital equipment. It will will go on sale at the equivalent of about £1,900. Discs cost about £21. NEC says that the product is mainly aimed at domestic users. It plans to produce 30,000 units during the first year.

A device called the personal video recorder (PVR) has gone on sale in the USA. It looks much like a standard VCR but uses a hard disc instead of tape for storage. Material obtained via cable, a satellite dish or terrestrial transmission is digitised then stored. PVRs cost about £310 upwards and are currently being made by Philips and Matsushita.

Discs

Matsushita is to launch the world's first DVD-Audio players this month in the USA and the following month in Japan. Model DVD-A7 will cost about £655 and Model DVD-A10 about £850. The company has developed a DVD-RAM drive capable of reading and writing discs with a 4·7Mbyte or 9·4Gbyte double-sided capacity. The drive can read older 2·6Gbyte DVD-RAM discs. Optical disc manufacturer Sonopress has developed the DVD-Plus disc. It can be played by both DVD-Video and CD audio machines. One side of the disc contains DVD data, the other side CD audio data. The discs are 0·6mm thicker than a conventional CD or DVD disc but this doesn't affect playability.

Cable News

There has been further consolidation with Telewest, the second largest cable operator in the UK, buying for £428m the fifty per cent share of Cable London it didn't already own. This will bring it some 200,000 subscribers in north London to add to the current million or so.

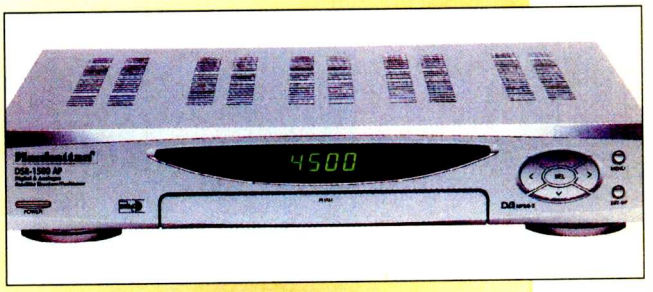
Telewest is to launch a digital cable TV service in the midlands next month. During 2000 it will be expanded to cover the rest of Telewest's franchise areas. There are expected to be some 200 channels, a quarter of which will be reserved for near-video-on-demand services – these are to start in about 18 months' time.

Microsoft and Telewest are to launch a fast internet service. The first phase will see the development of a co-branded narrow-band portal known as Telewest-MSN later this year. In early 2000 it will evolve into a broadband service. The service will provide download speeds that are up to a hundred times faster than those available via a telephone modem. Microsoft owns just under 30 per cent of Telewest.

NTL's internet, telephony and digital TV service has now been launched across the UK. Call charges are between 1-3p per minute with internet access at 1p per minute. A full package of digital TV, TV-internet, interactive services and telephony will cost £15.92 a month when it becomes available this autumn. NTL has begun to roll out its fast-internet service, called HiSpeed Internet. Surrey and Hampshire will be the first areas to receive it.

BT has announced launch plans for an ADSL (Asymmetric Digital Subscriber Line) service that will provide high-speed internet access, interactive operations and video-on-demand programmes. The technology has been under development since 1994, and by next spring some 400 exchanges should be equipped to use it. The system will, via existing copper telephone lines, give access to these services ten-forty times faster than is possible with an existing telephone modem. Operating speeds are 512kbits/sec upstream and 2Mbits/sec downstream. As a 'splitterless' system it can be supplied without needing an engineer to install it.

Video Networks Ltd. (Videonet) plans to launch a broadband video-on-demand service in London this month. The company was formed in 1992 and has 140 employees. It has been running a pilot service and currently has 600 subscribers in North-west London. They can receive films, TV programmes and music videos. The company aims to have three million subscribers by 2005.



The latest Manhattan range of satellite receivers from Eurosat includes two models that provide both analogue and digital reception and incorporate a dish positioner. One of these, Model DSR1500AP, is shown above. The other, Model DSR2500APCI, has in addition a dual common interface. There are three other digital receivers in the range. For further details contact Eurosat Distribution Ltd., 1 Oxgate Centre, Oxgate Lane, London NW2 7JA. Phone 0181 452 6699.

Digital multichannel sound

European pay-TV broadcaster Canal+ and Sony have jointly developed set-top boxes that incorporate Dolby Digital 5.1-channel sound. They will be on show at next month's consumer electronics exhibition in Berlin and will, in addition, provide enhanced web-related services and a number of advanced interactive and multimedia features. Canal+ and Sony say they are convinced that digital multichannel sound will play a major role in the development of digital TV, particularly in Europe. Three other manufacturers have developed Dolby Digital STBs for the European market, Panasonic Europe, Lemon Electronics and Radix.

Video News

JVC has launched a combined MiniDV/S-VHS double deck, Model HR-DVS1. It's features include a digital timebase corrector, digital 3-D luminance and colour noise reduction that's claimed to improve the signal-to-noise ratio by approximately 3dB, and a digital 3R picture system that applies edge correction to the luminance signal. Insert editing, audio dubbing, random assembly editing and an IEEE 1394 (Firewire) digital input/output capability are other features. A T-V Link makes it possible to download TV channel data. The NexTView Link enables a VCR timer to be set via an on-screen electronic programme guide.

Another JVC launch in Japan is the first Data VHS (D-VHS) recorder to feature the LS3 extended-play mode, Model HM-DR10000. At the LS3 data rate of 4·7Mbits/sec up to 24 hours of VHS-quality video can be recorded on a single 480-minute video cassette (at the standard D-VHS data rate, 14·1Mbits/sec, up to eight hours of video can be recorded). The new 480-minute tapes should be available next spring. The machine incorporates a newly-developed MPEG-2 encoder that makes digital recording of analogue NTSC signals possible whether from satellite, cable or terrestrial off-air sources, or from a video source such as a camcorder. The machine's video navigation system stores details of up to 1,300 recorded programmes. Production of these machines, priced at the equivalent of about £1,080, is to be at a rate of 3,000 a month initially. A European version is being developed.

Matsushita has developed what it claims is the world's smallest and lightest MiniDV camcorder, Model NV-C5. It includes a built-in multimedia card slot that can store up to 200 still images on an 8Mbyte memory card.

Sanyo's VHR899E VCR has a digital picture-in-picture function that works in conjunction with a tape library system. The two features enable viewers to freeze-frame up to up to eight prerecorded programmes on a tape.

Business News

South Korean conglomerate Daewoo plans to sell its consumer electronics division Daewoo Electronics to a US investment fund, Walid Alomar & Associates. The move is not expected to have any significant effect on the UK subsidiary, which has been doing very good business.

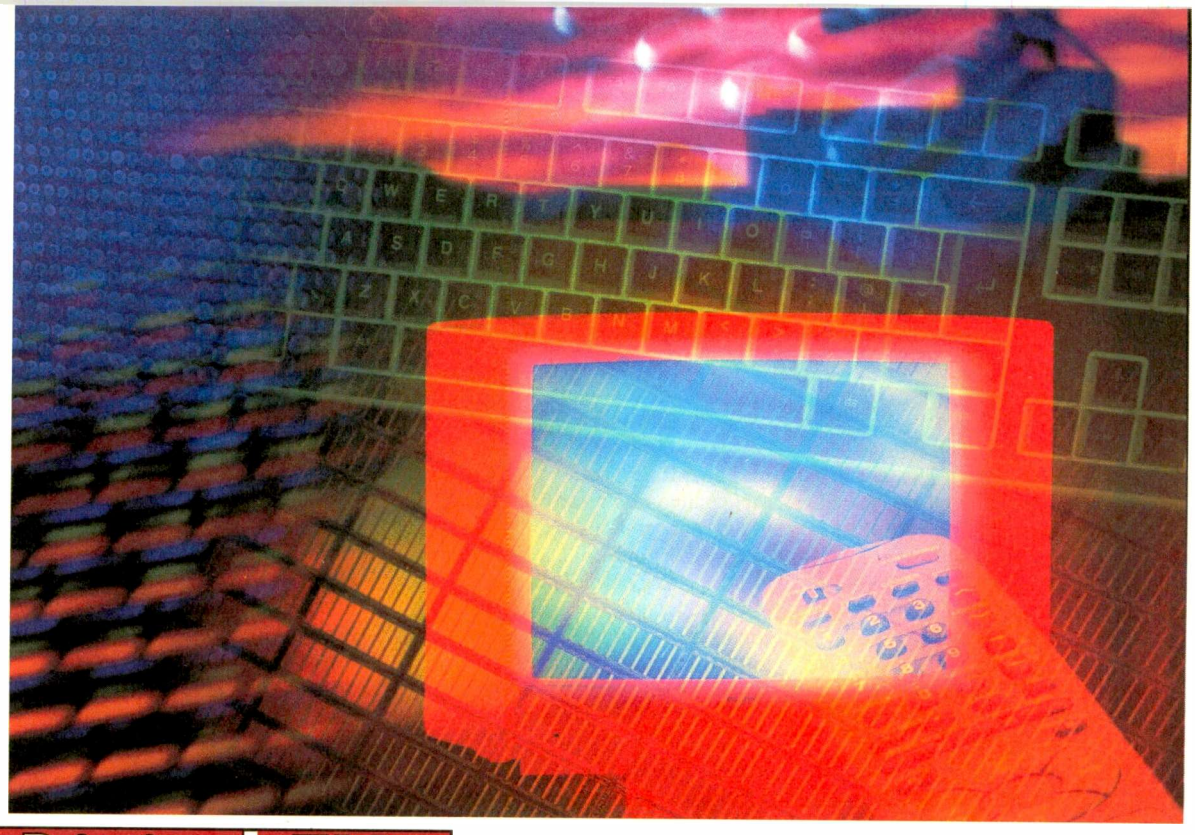
Willow Vale Electronics is to handle, on an exclusive basis, national distribution of Deccacolour sets to the independent retail trade in the UK. WVE is also distributing the full range of Sony products with the exception of car radios.

Remotes Direct's UK operation is now offering a trade service. The company has a database with some 200,000 records and stocks a huge range of original and low-cost replacement remote control units. Phone 0125 681 9913 for details or fax 0125 681 8064.

An agreement has been reached between Safeway and Amstrad. It will enable the supermarket chain to sell a range of Fidelity brand products at prices below those currently available in the high street.

BEAB leaflet

The British Electrotechnical Approvals Board (BEAB) has published a guide to help consumers understand the meaning of the various testing and safety marks in use. Copies are available free of charge – write to BEAB Consumer Guide, The Courtyard, 30 New Oxford Street, London WC1A 1AP. Retailers or manufacturers who require copies for point-of-sale use should phone the BEAB on 01483 455 466.



Digital TV

The Receiver Front End

In this concluding instalment K.F. Ibrahim describes the initial signal processing that has to be undertaken in a digital TV receiver of either the satellite or terrestrial type

The function of the front end of a digital TV set-top box or receiver is to tune in a modulated RF carrier then extract the multiplexed transport stream of data. There are four stages to this process, as shown in Fig. 1: tuning; analogue-to-digital conversion; demodulation of the QPSK satellite signal or QAM/COFDM terrestrial signal; and forward error correction – detecting and correcting errors that arise in the transmission path.

Satellite DTV Front End

The basic arrangement used for satellite DTV reception is shown in block diagram form in Fig. 2. This section of the receiver is sometimes referred to as the channel decoder.

The tuner is a self-contained unit whose input is the first IF signal generated by frequency conversion in the LNB at the dish. This IF signal consists of a number of RF carriers that are each frequency modulated by a signal which is itself a modulated (QPSK) carrier. The tuner uses a frequency-synthesis tuning system to select one of these carriers as a second IF signal. This is followed by coherent demodulation along the 0° (In-phase) and 90° (Quadrature) axes (this is similar to chroma signal demodulation in a PAL decoder). Fig. 3 shows the basic arrangement within the tuner. The result is recovery of the two original QPSK carriers, I and Q, which have the distinctive waveshape shown in Fig. 7 last month. Although they carry digital modulation, they are analogue signals.

These I and Q signals are fed to a dual ADC which converts them to two 6-bit digital I and Q signals. The sampling rate used for conversion is set by a control signal from the QPSK demodulator. It's used to control a built-in voltage-controlled oscillator. Sampling is usually done at twice the symbol, i.e. phase, rate. The symbol rate is set by the broadcaster and has to be established at the receiver before a channel can be selected. If the symbol rate is for example 27,500k symbols per second, the sampling rate will be set at 2 x 27,500k = 55MHz.

Recovery of the original transport stream from the QPSK carriers involves two distinct processes. First phase detection, to identify the carrier phase changes. This is carried out by the QPSK demodulator. Secondly data recovery to recreate the original bit stream. This operation is performed by the FEC decoder.

The QPSK demodulator carries out phase detection of the I and Q modulation, samples the recovered phases and quantises each phase change as a 3-bit coded output. It normally carries out a number of other functions, as follows. It estimates the input signal strength and produces an AGC potential for the tuner. It produces a signal that's used to synchronise the VCO in the tuner. Finally it supplies the sampling rate to the dual ADC, either directly or more commonly via a control input to a built-in voltage- or numeric-controlled oscillator.

The digitised I and Q outputs from the QPSK demodulator are fed to the FEC decoder, which recreates the original transport stream data packets. This process includes carrying out the various error detection and correction processes.

The transport packet contains 204 bytes of information, including a 4-byte header (start and packet identification codes etc.) and a 16-byte checksum for error detection and correction, see Fig. 4. The FEC decoder recovers the data bits and arranges the information in a way that can be presented to its error detection/correction section, see Fig. 5.

The first stage here, the Viterbi decoder, carries out what are known as soft decisions, i.e. whether a received bit that looks like a logic 0 or 1 is actually a 0 or 1. This is followed by de-interleaving, which rearranges the bits in the order they occupied before interleaving was carried out at the transmitter. The final stage is Reed-Solomon decoding, where hard decisions are carried out. These determine whether a packet contains errors. If so, the FEC decoder will try to correct them. Failing that, the FEC decoder will label a packet that contains errors so that it isn't used in subsequent signal processing.

The transport stream that emerges at the end of this process consists of multiplexed packets that belong to up to four or five different TV programmes. The following demultiplexer selects the packets required for the selected channel.

DTV front ends are fully programmable and are under the control of a microprocessor/microcontroller system. The tuner is normally controlled by an I^2C bus as shown. A full address, data and control bus interface may be used with the QPSK demodulator and FEC decoder.

Chips

The number of chips used to build a satellite DTV front end depends on which manufacturer's chip set is selected for the purpose. For some time the QPSK demodulator and FEC decoder have been integrated as a single chip. An example is the 64796 chip used in older Pace decoders.

VLSI's VES1893 chip took integration a stage farther in incorporating the dual ADCs. This chip is fed directly by the tuner and provides output packets suitable for feeding to the demultiplexer stage. The chip is fully programmable via an I^2C bus. The ADCs can be bypassed to allow direct interface with I and Q digitised baseband signals. A pulse-width modulation encoder provides AGC for the tuner.

Terrestrial DTV Front End

The main elements of a DTTV front end are shown in Fig. 6. The tuner receives modulated UHF signals from a terrestrial aerial, selects the appropriate channel and produces a 16-QAM or 64-QAM IF output. Before this signal can be processed, it's down-converted to produce what is known as the low IF. Down-conversion removes the VHF carrier, leaving the baseband modulation. This is digitised by an analogue-to-digital converter, which uses a sampling frequency derived from the following OFDM demodulator. The demodulator retrieves the original modulating bit stream and forwards this to the FEC decoder.

These circuit blocks are all controlled by the host-system microprocessor via an I^2C serial bus. Fig. 7 shows a typical low IF waveform: the first IF waveform has a similar shape but with a higher centre frequency and lower amplitude.

The number of chips used by a setmaker depends on the level of chip-set integration. LSI Logic, in conjunction with the BBC, designed the L64780 OFDM demodulator chip, which incorporates the ADC and uses an

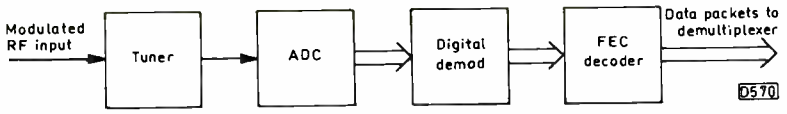


Fig. 1: Basic elements of a DTV receiver front end.

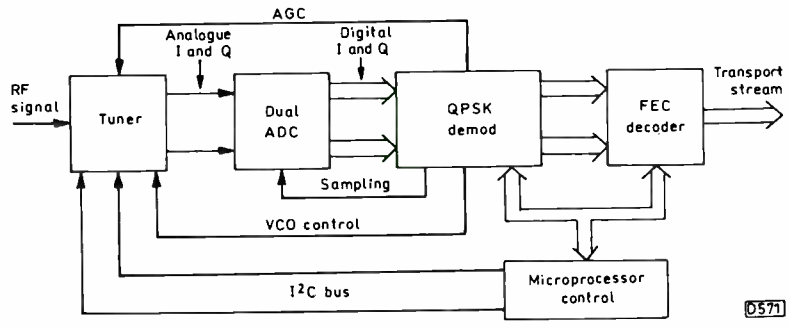


Fig. 2: Block diagram of a satellite DTV front end.

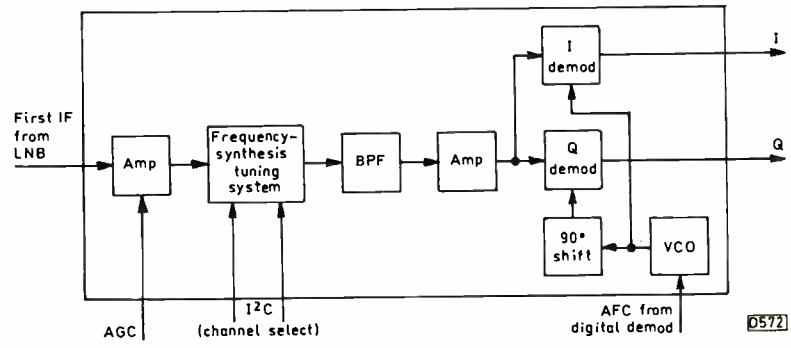


Fig. 3: Block diagram of a satellite DTV tuner.

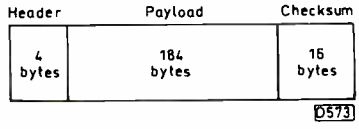


Fig. 4: Composition of a transport packet.

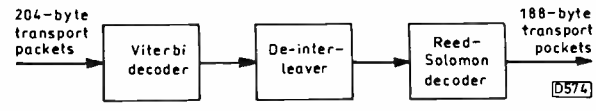


Fig. 5: Processing prior to error correction.

FFT (Fast Fourier Transform) demodulator. Some FEC decoder functions are included.

The basic architecture of the chip is shown in block diagram form in Fig. 8. Its input is a low IF analogue COFDM signal with a centre frequency at 4·75MHz. This signal comes directly from a down-converter, which shifts the signal from VHF to baseband.

The first operation performed by the chip is AD conversion, the sampling rate being four times the signal's centre frequency, i.e. 18·29MHz (4 x 4·75MHz). The next block is labelled real-to-complex. This takes the

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'real' input signal, centred on 4·75MHz, and produces at its output a complex signal centred on 0Hz. The complex signal is fed in parallel to the timing synchronisation block and the FFT processor block.

The timing sync block produces an output to control the VCXO (Voltage-Controlled Crystal Oscillator) that provides the ADC sampling frequency. The FFT block has four modes of operation. It can perform either a 2k or a 4k point transform, and can do this in either direction. Forward FFT is used in a DTV receiver front end: inverse FFT is used in applications where the chip provides OFDM modulation. An output from the FFT section is used for frequency synchronisation – the output from the frequency sync block adjusts the down-converter frequency and also provides AFC for the tuner.

The FFT processor generates the I and Q components of each OFDM carrier and demodulates them, recreating the original modulation symbols. Its output is therefore the original stream of bits used to modulate the OFDM carriers at the transmitter.

This is followed by further processing: phase-error correction and de-interleaving. The former is carried out in the block labelled CPE (Common Phase Error) correction and by Viterbi decoding with CSI (Channel State Information) data. De-interleaving involves symbol and bit rearrangement in that order. Finally, the data from the convolutional de-interleaver is passed out to the following FEC chip.

Single-chip Channel Decoder

Further integration has reduced the chip count by incorporating the OFDM demodulator and the complete FEC decoder in a single chip. An example of this is VLSI Technology's VES9600 single-chip channel decoder, a system-on-a-chip (SoC) device that uses OAK as its core processor. It incorporates an ADC, OFDM demodulator and FEC decoder: 2k/8k FFT is provided and 16-QAM and 64-QAM can be handled. Fig. 9 shows a block diagram of the device.

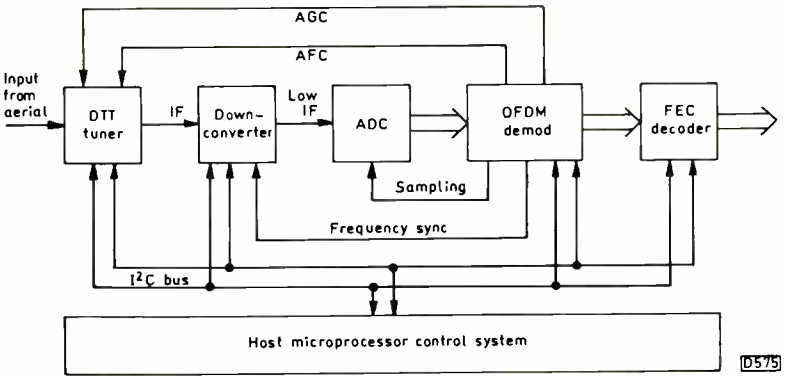


Fig 6: Block diagram of a DTT front end.

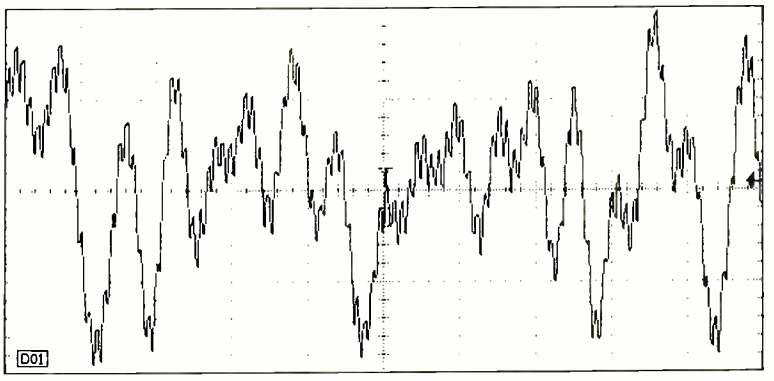


Fig. 7: Typical low-IF waveform. Trace is from a digital storage oscilloscope.

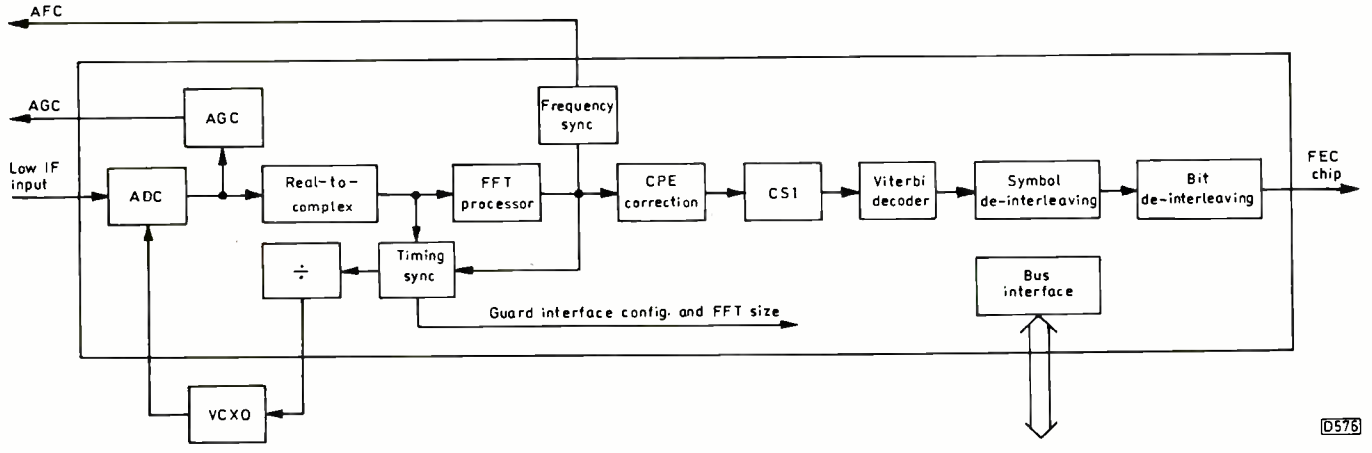


Fig. 8: Block diagram of the L64780 ADC/OFDM demodulator chip.

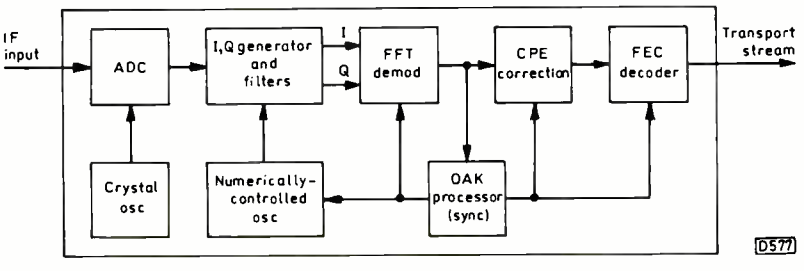
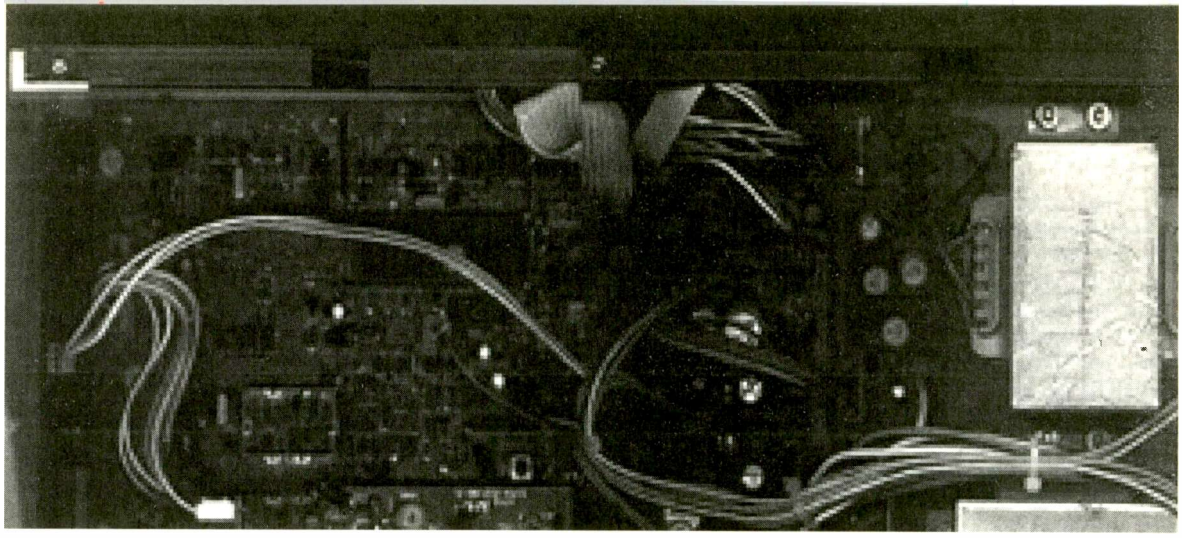


Fig. 9: Block diagram of the VES9600 single-chip channel decoder.

K.F. Ibrahim is a Training Consultant and Senior Lecturer at the College of North West London. This article is an edited extract from the second edition of Mr Ibrahim's book *Television Receivers*, which is published by Longman.



Satellite Notebook

Reports from Christopher Holland and Hugh Cocks

An Inverted Universal LNB

We were having problems with an installation: the high-band signals from Astra 2A at 28·2°E couldn't be found. A spectrum analyser was being used to monitor the signals, and showed that there was a noise output from the LNB. When the dish was moved farther west, low-band Astra 1 (19·2°E) analogue signals suddenly appeared. But the 22kHz tone was switched on: it should be off for low-band reception, on for high-band reception. When I switched the tone off, Astra 1 digital signals appeared. The LNB was clearly faulty and a replacement provided normal operation.

Back in the workshop one evening I tried, as an experiment, connecting the inverted-output LNB to our 28·2°E dish and reprogramming a Sky digibox's LNB menu. It can be set for high-band selection with the 22kHz tone off. When the receiver was powered up from cold it started to find the satellite all right. The familiar "searching for listings, please wait" message appeared, together with the clock. Presence of the clock is a sure indication that the receiver has locked to the satellite when mains power has been applied for the first time. Within seconds however "no satellite signal is being received" appeared on the screen. The only explanation I can think of is that a command in the Sky digital transport stream tells a digibox that the 22kHz tone must be present for high-band reception. If this was tried with a non-Sky digital signal, such as RAI at 13°E, the digibox might work all right! **C.H.**

Table 1: New Astra Digital Channels

Frequency (GHz)	*Pol*	*New channel(s)*
11·895	V	MTV Extra (632), MTV Base (633), MTV Classic (636)
12·110	H	U Direct Films (800-811)
12·207	V	Sky Sports Extra (404)
12·246	V	Eurosport UK (419)

BBC Parliament (508) has moved from 12·148GHz H to 12·129GHz V.

The Open TV promotion at 12·246GHz has closed. Other Open transmissions are at 12·012GHz V. Open TV shopping etc. is at 11·992GHz H.

Sky Sports 1, 2 and 3 (401, 402, 403) at 11·934GHz V are available only with special receivers that are installed in pubs – they are not always on air. The usual Sky Sports programmes continue at 11·758GHz H (1 and 2) and 11·914GHz H (3). 11·934GHz V continues to carry the programmes previously listed plus Playboy/Adult (981).

Remember that the listings are subject to change, being automatically updated in digibox memories.

Astra Digital Channel Update

Some channels have been added since the Astra digital channel list I included in this column in the June issue. These are shown in Table 1, which should be used in conjunction with the previous list. The electronic programme guide numbers are included in brackets.

I have heard of a case where a faulty digibox tuner produced intermittently frozen pictures with certain transponders only. A knowledge of the transponder allocations can help identify a problem of this kind. **C.H.**

Analogue Test Pattern via Astra 2A

After an interlude of a few months a PM5544 test pattern has reappeared via Astra 2A. It's helpful for locating the satellite if you don't have a spectrum analyser to hand. The frequency is 12·324GHz, with vertical polarisation, and there's an analogue stereo sound track on 7·02/7·20MHz subcarriers.

LNB skew is easy to check. Switch the analogue receiver to horizontal polarisation: there should be no test pattern. With a Pace analogue receiver a blue screen with the message "no signal" should appear. To remove this display to check for very weak signs of the test pattern, press button F followed by store in quick succession.

I deliberately misaligned our workshop dish so that some SkyDigital signals were just at the threshold limit and freezing, then took a look at the test pattern. It was very noisy indeed, at least 3-4dB below the FM video threshold. Had programme material been present instead of the test pattern it would not have been watchable. This shows the benefit of digital signals in relation to dish size. **C.H**

Nokia 9600S

One of these digital receivers had been in use for a year or so to receive NRK International (Norwegian TV) from Intelsat 707 at 1°W. The owner then phoned to say that it had suddenly produced the "no signal" display.

The 9600S was being used in parallel with a MAC receiver to pick up other Scandinavian TV signals from this satellite. The fact that the MAC receiver was working well indicated that the LNB was OK.

When I went into the "advanced channel search setup" menu (a sub-menu of the main installation menu) I noticed that there was almost no red-bar display at the bottom of the screen. This is an indication of the receiver's AGC

voltage: normally the Norwegian signal at 11·174GHz horizontal would produce a deflection of at least a half to two thirds.

Because the elderly MAC receiver couldn't tune above 11·5GHz, a 10GHz local oscillator LNB was in use. In northern Europe a universal LNB will give reception of other, high-band signals from the Thor satellites, which are co-located with Intelsat 707, but in southern Europe their signals are barely detectable.

The top line in the Nokia receiver's advanced channel search setup menu is the "antenna configuration name" option, which lists up to eight different satellite/LNB combinations. It said that for the NRK signal the receiver was set to option 8, "other satellite no. 2". The menu that controls this can be found by pressing the remote control unit's green "exit" button at this point, then entering the "antenna configuration" submenu from the main installation menu.

I called up the antenna configuration submenu and found that the receiver thought a universal LNB was in use. So I reset this to 10GHz. When I went back into the search mode the receiver found NRK first time, with a good red-bar AGC deflection. Unfortunately when the receiver was switched to standby then on again it had forgotten that the LNB was a 10GHz type, defaulting to the universal LNB setting!

I decided to try leaving the LNB type set to universal and entering a 250MHz lower channel frequency, 10·924GHz. But digital receivers are too clever for this dodge: the signal is found, then the correct frequency (11·174GHz) is stored in the EPG. So when you select the signal from the EPG it's not there!

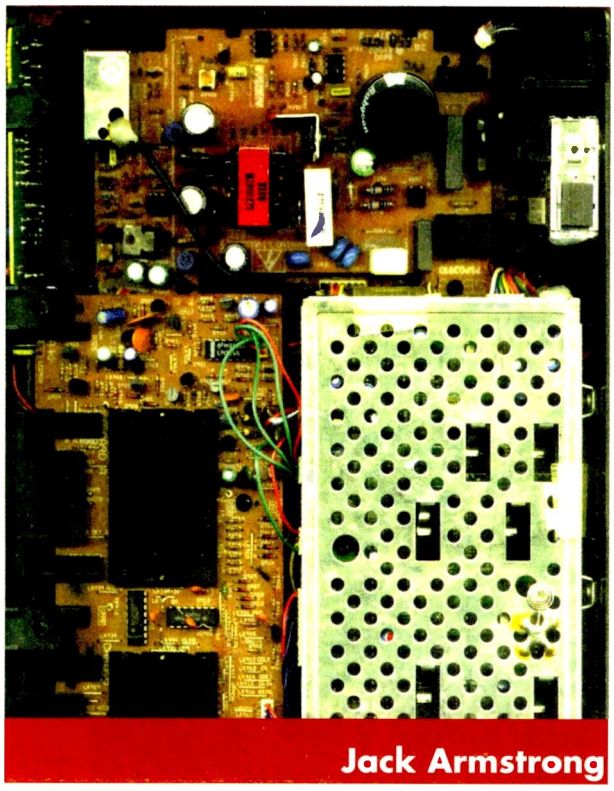
When the Nokia receiver has a conditional access module (CAM), a viewing card is inserted and a coded channel is being picked up, the "reaction time" to remote-control menu commands is much slower than 'normal'. I wondered whether this might be contributing to the problem. So I pulled out the CAM module and tried storing the channel yet again. No difference!

I then decided to try a software upgrade. The software information is carried on the NRK channel, so I carefully restored the 10GHz local oscillator option and went to "receiver upgrade" from the main menu. A new version was available, so this was downloaded. The process takes about seventy minutes, during which time there must be no power or signal interruptions. The results were exactly the same when the new software had been installed!

I eventually managed to persuade the receiver to remember the 10GHz local-oscillator setting by storing this as the LNB type at each of the eight dish options. After repeatedly switching the receiver to standby then on again, and unplugging it from the mains supply several times, NRK came up without fail each time.

It's quite possible that the cause of the trouble was sparking in a nasty three-way, two-pin adaptor into which the owner had plugged a free-standing lamp, the Nokia receiver being connected to the mains via an adjacent socket. However that might be, the receiver has now been behaving impeccably for some time. I hope I don't see it again in the near future! **H.C.**

Satellite WORKSHOP



Jack Armstrong

Pace MSS300

The reported fault was no sound. This turned out to be the case, but in addition the receiver didn't produce any decoder messages and the picture was intermittently scrambled. As a first step I checked the contrast setting, which proved to be correct at 4.

The cause of the no-sound symptom was the MSP3400 audio processor/routing chip U14. This is quite a common fault. It can fail when the nominally 5V supply is high. I checked it and found that the reading was 5·5V – even after replacing the 22µF and 10µF capacitors near the TEA2018A chopper control chip. So I turned the board over and found the 9·1kΩ surface-mounted resistor R56 that trims the output voltages. When this resistor had been changed to 8·2kΩ the supply was at a more reasonable 5·25V. That should improve the reliability.

The cause of the intermittent decoder fault was not obvious, so I replaced the PTV111 sync separator chip U12 and the associated 503kHz ceramic resonator and 1µF capacitor C109 (use a non-polarised type). That almost did the trick, but the video level was on the low side and the picture was still scrambled from time to time.

There was a suspicious burn above a surface-mounted transistor that was towards the rear of the board. It was marked "3B" and was a BC856B. So I replaced it with a BC857C, which has a slightly higher current rating. The receiver then worked correctly.

Nokia SAT1700

This receiver was brought back "under guarantee". It never ceases to amaze me that people will claim "it's the same fault as before" when the symptoms are totally different. Last time the receiver had been dead. It now had a blank screen – apart from the channel identifications.

"Told you so" said the lady, "no picture, same as before."

I didn't bother to argue, even though there were perfect pictures with the German channels. She went off to Sally's Café for a cup of tea while I pushed all the other "urgent" jobs aside to check her receiver.

I fitted a 5V wire link to the decoder, since a bad connection in the ten-pin header is a common fault. When this had no effect I replaced the TEA2029C chip. No better. I was becoming alarmed, and replaced the 4·7µF electrolytic capacitor nearby. I was sure that the cause of the problem was lack of sync pulses. Finally, I realised that I had overlooked the obvious thing and replaced the 503kHz ceramic resonator. Success! This little fellow is very fragile, and can be damaged by knocks.

When the owner returned I presented her with the bill. She fumed and argued and finally announced "Right! I'm ringing Trading Standards."

I'm used to this. I picked up the phone and punched in the number.

"Hello. Trading Standards? Good. Hold, please, I have a call for you." I handed the phone to her and then went out the back to make myself a cup of tea.

When I returned she had gone and the phone was back on the hook. I pressed redial and a familiar voice answered.

"Did you put her right?" I asked. "Good, thanks."

We've had to go through this routine over the years. I picked up the cheque and went back to my workbench.

I think of myself as a benefactor. She would have lost the case had it gone to court.

Pace MSS100

Some bathroom scales weighed heavily on my mind the other day. Well actually it was a Pace MSS100, which looks remarkly like bathroom scales.

Arthur is in charge of the local railway crossing. It's a tedious job, as we see about one goods train a month. There's a heap of scrap iron beneath his cabin, with a cleverly disguised, rusty satellite dish amongst it. A length of rust-coloured coaxial cable carries the signal to his cabin, where an MSS100 produces pictures on a tiny portable TV set. I'm not sure whether the authorities know about this little distraction, and I'm reluctant to ask.

Anyway, Arthur brought me his receiver and explained that all of a sudden the only picture he could see was a blue screen with the words "no signal" on it. He'd had Joe around to check the dish, which was fine.

The MSS100 remained on test all morning without showing the fault symptom. As I then needed the bench space, I dismantled the receiver – using my penknife to release those nasty plastic clips beneath. I resolderd the notorious dry-joint at diode D18, then screwed the unit back together. This should have done the trick.

Unfortunately it hadn't. Arthur was back next day with the same problem. He'd borrowed an Amstrad SRD400, which worked perfectly, but he wanted to watch Channel 5 and the older receiver wouldn't tune low enough. So the MSS100 was now "urgent".

Once more I left the receiver on soak test. It sat there for five hours before the blue screen appeared. I switched off the blue-screen generator by pressing F then store, and was rewarded with a totally blank screen. Use of freezer and the hairdryer failed to bring the picture back, but I could hear normal sound that altered when I changed channels.

It seemed to me that the tuning and audio sections of the receiver were OK, the cause of the trouble being an interruption that affected the video signal path. It was probably a decoder fault, but there might just be a sync separator problem. So I replaced the PTV111 chip, the 1µF electrolytic capacitor and the 503kHz ceramic resonator next to it. These items commonly fail in the MSS100, but I was guessing.

I left the MSS100 on test over night, and Arthur collected it next day. He hasn't been back since, so the repair must have been successful. He'll probably come and pay me one day.

Pace Apollo 120

This model is really an MSS200 without the channel number display, and I suppose you could call both of them cut-down versions of the MSS300 – they share a common PCB. The MSS300 differs in having a twin-input tuner, a vacuum fluorescent display and a different microcontroller chip (two if you count the one on the display panel).

I was less than pleased when Wossname up Church Street turned up with an Apollo board under his arm. It should always be transported in its metal cabinet – to guard against physical damage as well as static electricity.

"No pictures" he said, sorrowfully. "It ain't the tuner, 'cos I've tried two. Anyway, be a good chap and do it cheap. I'll be in the Swan."

We have a sort of love-hate relationship. He winds me up and I take it without hitting him. He loves it and I hate it. But occasionally he pays me cash, so I tolerate it. I just wish he wouldn't attempt to repair things he doesn't understand.

The tuner appeared to be securely soldered in, so I put the receiver on test. The capacitors in the power supply had been replaced – as evidence of this there were vast quantities of brown flux that had apparently been ladled on with a trowel. Where does he buy his solder? There were flickering pictures from the decoder scart socket, but there was no audio at all and no video from any other socket.

I consulted the circuit diagram and narrowed the fault area to a small part of the board. When I carried out a physical examination I saw an obvious brown mark above a transistor that I identified as Q42. It's a BC856B (see previous Pace MSS300 fault note). A BC857C fitted in this position produced a nice, clear picture.

The capacitors seemed to be fine, so I replaced the MSP3400 audio processor/routing chip and was rewarded with good audio as well.

Hope at Last

A month ago I would have said that the analogue satellite receiver repair market is dying. But there are, fortunately, still people willing to pay money to get these receivers going again.

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

jacksat@netcentral.co.uk

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

Test Case 442

"Milky picture before 4.30 Tues PM" the job card said. So at 2 p.m. Doc Colin was there at the doorstep of Snoring Cat Cottage (honestly! – it's next to a house called Green Gore). There were no snoring cats present on this occasion, but there was a rather irate lady and a big rental Tatung TV set. The picture was very flat and lacked contrast, and the contrast control keys on her remote control unit had negligible effect on it.

The Doc tried another zapper, which did no better, then arranged for help from the workshop to get the set on to the van. Being used to a 28in. screen, the rental customer was very unhappy with the loan set's 21in. picture. So this became an urgent job.

The set went straight on to TechnoCrat's bench. Then, because Cathode Ray has much experience of Tatung tellys, it became a sort of joint effort between them. You might think that this would have speeded up the job. It didn't! The set in question was fitted with the Tatung B chassis, and its flat picture was present whichever channel was selected. A check with the service manual showed that an I^2C control bus is used to pass the user's requests from the control processor chip IC701 to the colour decoder chip IC552, which is mounted on its own daughter board.

An I^2C bus is a fine thing indeed, but it's not really possible to analyse the data on it in the workshop. Since all the other functions worked, and because the contrast up/down keys had some slight effect on the picture (best seen with the brightness turned right down), it was surmised that the operation of the control bus was probably OK. Maybe one or other of the two chips just mentioned was faulty? Well, the control chip is on the motherboard while the colour decoder module can be unplugged. There were several ex-rental TV sets lying around in the workshop. The colour decoder module was removed from a known good set and fitted in the patient on the bench. It made no difference, while the suspect panel worked as it should in the good set. So the cause of the trouble was not the colour decoder chip or its peripheral circuitry. This test also eliminated R555, which was ringed in pencil on the circuit diagram with a note to say that it can be the cause of contrast problems.

Where next? The level of the video output from the IF/detector module was checked and found to be within the specification given in the manual – about 1·5V peak-to-peak. So our sleuths didn't try swapping IF modules which, in this chassis, are also pluggable. Another idea struck TechnoCrat, based on previous battles with a variety of TV sets: a fault in the beam limiter circuit. The usual trouble here is change of value of the resistor used to apply a bias to offset the negative voltage at the earthy end of the LOPT's EHT overwinding. The relevant resistor in this chassis is R452 (18kΩ), on the main PCB. But there was nothing wrong with it! So what was causing the trouble? For the solution, turn to page 863.

The RSD Communications ODM300 digital satellite TV receiver

Free-to-air Digital TV Reception

Ian Martin has been trying out an RSD ODM300 digital satellite receiver to obtain free-to-air reception of the many channels that don't require a subscription

The race to gain digital TV customers by offering 'free' receiving equipment may have convinced the viewing public that digital TV is all about taking out a subscription. This is not so: there are plenty of free-to-air digital TV channels that are available from a number of satellites – even trusty old Astra at 19·2°E. All you need to get them is a suitable receiver.

Almost all these free-to-air channels are, admittedly, foreign-language ones – though many of these languages are not foreign to large numbers of those who live in the UK. As an example, there are about twenty free-to-air Italian channels available from Eutelsat's Hot Bird position at 13°E. This is in addition to other European channels and many more from Africa, the Middle East and the Far East.

Equipment Required

What's needed to receive these channels? Generally speaking, most analogue TV signals are present in the frequency range 10·7-11·7GHz while digital signals tend to be in the range 11·7-12·75GHz. A tone-switched universal LNB covers this whole range by using two separate local oscillators: the tone signal from the receiver selects the local oscillator and thus the band required. This technique is used by SkyDigital installations, though no digital channels are currently transmitted in the lower half of the band. If you have an older digital receiver that doesn't provide tone switching, you will require either a 'DBS' band LNB that covers only the top half of the band or a 'tone-inserter' switch that will provide the 22kHz switching signal to control a universal LNB.

Along with a suitable LNB, a satellite dish of say 80cm or larger diameter is required. While it's true that digital signals are more 'robust' than analogue ones, a small dish is not advisable. This is because with a digital signal there is either a picture or not: there is almost no 'graceful failure' margin. If the signal strength is reduced because of weather conditions, the picture will suddenly disappear. So you need to err on the generous side. I've tested a 60cm dish with success in good weather, but I would rather not risk a call-back because of rain.

Lastly a suitable receiver is required. Many models are available from firms such as Nokia, Echostar and Manhattan. I have recently been trying an ODM300 from RSD Communications. It tunes across the entire band, will work with several types of LNB including DiSEqC types, and has a built-in signal-strength meter. It's also equipped with a teletext decoder. The most impressive factor was that at the time I purchased it the price was under £200.

Its sister model ODM300CI is more flexible, having an LNB loop-through for an analogue receiver, improved user software, higher-resolution graphics and fonts, and a conditional-access module (CAM) slot. This slot is similar to a card slot in a PC. It can accept modules for various types of encryption such as

Viaccess and Irdeto. Although, for copyright reasons, these modules are not normally available outside the intended regions, you sometimes find them advertised in satellite magazines. Use of one of them can significantly increase the number of channels it's possible to receive, especially Italian and French ones. Because of its increased flexibility, the ODM300CI will probably replace the ODM300 in due course.

It is very unlikely that a Videoguard CAM will ever be made available to provide SkyDigital reception via a 'free-to-air' receiver. You could however try to use a SkyDigital receiver for free-to-air reception. The problem is that without a subscription the Sky receiver costs almost twice as much as an ODM300. In addition there have been reports that Sky receivers tend to 'forget' the settings of non-Sky channels, and they are apparently limited to signals with symbol rates of 22,000 or 27,000. But it may be worth a try if the customer already owns a Sky system. It would be necessary to provide a second dish and LNB, plus an LNB switch, because Sky Digital receivers have only one LNB input.

Dish Alignment

A digital system is more tricky to set up than an analogue one, because a digital receiver requires some time to acquire the signal, recognise the data stream and decode it to produce a picture. Even a bird momentarily flying in front of the dish can cause loss of the signal for a few seconds as the receiver re-acquires the data stream. You would thus be very unlikely to be able to find a satellite by the 'wave the dish around until you get a picture' approach. But, being professional, we would never try that anyway.

If you don't have access to a digital signal-strength meter you can make use of the fact that most digital channels are transmitted from satellites that also carry at least one analogue service. So you can use an analogue meter and receiver to position the dish, then substitute the digital receiver. If the ultimate owner of the system is a satellite enthusiast he may well want to be able to receive both types of signal, in which case a dual universal LNB can be fitted. I personally use a Grundig universal twin LNB.

It can be helpful to maximise the signal using one of the analogue channels, as these show the onset of noise more readily. I tend to use the Viva analogue service (the German music channel) in the case of reception from 13°E as it's one of the weaker analogue signals. Once the dish has been aligned, weather-proofed and the cable installed, you can move indoors and concentrate on setting up the receiver.

Features of the ODM300

The ODM300's front panel is simple, with only power and channel up/down buttons. A green LED display indicates the channel number being received and, momentarily when power is first applied, the software revision number. A flashing dot at the bottom right of the display indicates loss of signal lock, a static dot indicating signal lock. The rear panel has the usual connections: one F connector for the LNB input; RF loop-through aerial connectors; two scart connectors; and phono audio output sockets. There is also a 9-pin D connector to provide a link with a PC. A remote control unit, batteries, a manual and scart and RF cables are included in the carton.

The ODM300 has teletext and an extensive on-screen menu system. All the set-up and tuning functions are menu-controlled. Menus enable the channel settings to be edited and reorganised, something that's not possible with Sky receivers. Fortunately the name of a digital channel is transmitted as part of the data stream, so any channels tuned in will be identified by name in the menu.

Once everything has been tuned in, the on-screen display provides direct programme access if required. Many channels also transmit 'now and next' information in the form of a simple TV guide that appears when changing channels. It's also possible to call up a 'what's on' guide for several channels, provided the broadcaster transmits such signals.

Tuning

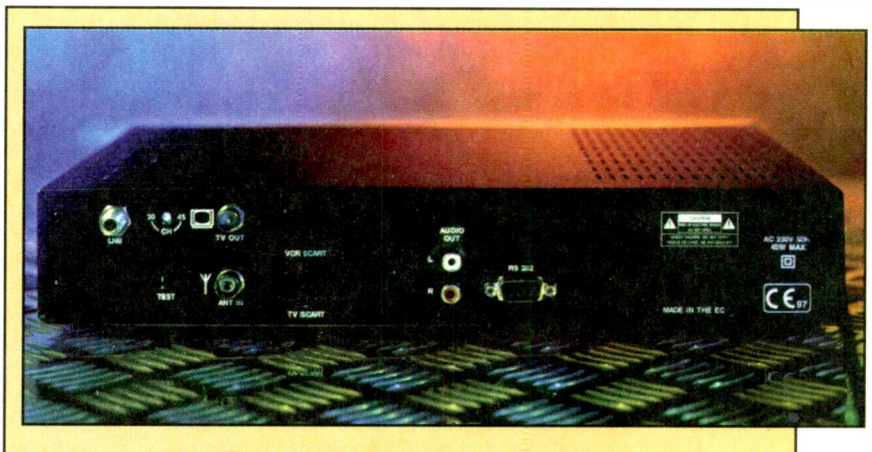
When the receiver is first switched on it displays an LNB set-up menu. This enables the receiver's local oscillator to be matched to the LNB. It works with most common LNBs, including enhanced, universal and C-band types. There's an option for an unpowered LNB: this is useful when running the receiver via an RF tap from an LNB that's powered by another receiver. Other options include DiSEqC and tone switching. Once these settings have been made, the satellite can be selected. This isn't really necessary, but does mean that the correct parameters will probably be set for the satellite being received. I say 'probably' because at present digital channels change even more often than their analogue cousins.

The receiver set-up menu enables you to select the type of video output you require: PAL, NTSC or auto; widescreen or 4:3; RGB or composite etc.

Digital satellite channels consist of multiplexes. The ODM300 automatically makes available all the signals in a multiplex (automatic channel search) as well as linked multiplexes (automatic network search). It needs a starting point however. You therefore need to know the characteristics of one of the required channels, and these must be entered. In addition to frequency and polarisation, there are symbol rate, forward error correction (FEC) and packet identification (PID). Fortunately the receiver searches for the correct video, audio and teletext PIDs, and the symbol rate and FEC can be set to 'auto'.

Table 1 shows some of the free-to-air channels available in the southern part of the UK, using a 1m dish, and the tuning parameters. A larger dish will bring in more signals from other satellites, while a suitable CAM could double the available channels in a particular language.

You may occasionally need to edit the tuning parame-



Rear view of the RSD Communications Model ODM300 digital satellite TV receiver showing the connectors provided.

ters for a channel manually. This can be required if the receiver thinks the signal is encrypted and sets the PIDs to zero. Entering the correct value may result in normal reception. The correct PID values and all other tuning parameters can be obtained from a number of web sites or *What Satellite?* magazine. Manual changes to any of the tuning parameters can be made using the up/down buttons or directly entered – the latter is quicker, given the range of possible values.

Once the parameters have been entered, the receiver looks for the programmes available in the multiplex. After a few seconds it comes back with a message such as "Found 7 TV programmes, 5 radio programmes". The search is usually very rapid compared to some other set-top boxes I've tried, but it depends on signal strength. To provide reassurance, a simple signal-strength meter appears while the box is searching. Once all the programmes in a multiplex have been found, you can select auto update if required. This looks for updated programme directory information on the multiplex (if transmitted) and changes the list as services appear or disappear. Once this step has been completed, you can enter the parameters for the next multiplex.

Tuning in every available channel can be time consuming. Most customers will probably require only a preferred set of channels however. A broadcaster usually puts all his services into one or two multiplexes. Tuning these in is no great hardship. Sometimes only a single service is required: I have installed several systems for reception of Thai TV5 via Hot Bird.

Software Utilities

If you want to program in every possible free-to-air channel, RSD's web site

www.rsd-communications.co.uk

has a few downloads that you might find useful. As well as containing the latest versions of the receiver's firmware and program, the site has a helpful channel editing programme called RSDedit, also data files for various satellites. These can be downloaded from the web on to your PC.

RSDedit is a Windows program that runs on a PC connected to the ODM300 via a 'null-modem' data cable. It enables you to copy the contents of the receiver's memory to your PC for editing, or to download new channel information. This is where the data files come in: they contain the latest channel information for different satellites.

The firmware and program downloads are provided for the convenience of users of earlier receivers with lower software versions. This is a useful way of upgrading a receiver's features without having to remove the cover or return it for service. Full instructions are given on the web site, as this is something you should not attempt to do unless absolutely necessary.

Reception Quality

The picture and sound quality are very good – a match for any of the 'big-name' setmakers. In a direct comparison with an expensive Comstream decoder I found that there was little to choose so far as quality is concerned, but the RSD receiver is much more richly endowed with features. The receiver copes well with detailed, moving images, with little or no 'macro blocking'. This depends on the channel data rate of course, but is typically as good as the better SkyDigital channels and considerably better than the worst.

Digital teletext reception is good. This feature is not yet available with digital terrestrial TV.

Criticisms

The receiver's case is a little basic, and a detachable mains lead would be nice. The remote control handset is a 'generic' design, but no worse than many a 'big-name' handset. Some users with large dishes may miss the provision of magnetic polariser control.

I found that the on-screen menus were a little confusing initially, probably because they differ slightly from those illustrated in the manual. This was no doubt because a new software version was released just after I started this review. While the menu system is clear and functional, a user familiar with the graphical user intefaces with new receivers may be disappointed.

Given the price of the receiver however these economies are understandable.

Problems

Initially there was a slight audio clipping on one TV channel during reception of loud male voices. This went away once the software had been upgraded. A small lip-sync problem can often be seen, but I find that this is a characteristic of digital video generally – it can by seen with SkyDigital, ONdigital and during DVD playback.

I had one periodic problem. The picture would sometimes freeze, then black out with the message "Service encrypted". The receiver would remain in this condition until powered off and on again. RSD told me to upgrade the software, but this made no difference. So the receiver was returned for attention.

After testing it for a few days RSD found no fault, but replaced it anyway. On receipt of the new receiver, it immediately locked up.

To cut a long story short, I found that positioning the receiver away from my ONdigital receiver cured the problem. This remains a puzzle: I had found that the ONdigital receiver wouldn't work on top of an old TX series Ferguson TV set because, I thought, of radiation from the TV set. Now the ONdigital box appeared to affect the RSD receiver, though it didn't affect the Comstream one. If I figure this one out, I'll report on it in a later article.

The only real limitation of the ODM300 is that its UHF modulator has a tuning range of only chs. E30-E45 and appears to generate some out-of-channel interference. With the aerial loop-though in use, I noticed some beat patterning on Channel 5 (E37). This occurred with both the original and the replacement receiver. The interference disappeared when only a scart lead was used.

Conclusion

The ODM300's number of features and quality of reception suggest a rather more expensive receiver. Perhaps the best point for those of us with a stack of set-top boxes is that the ODM300 runs cooler than any of the others in my collection. This suggests good long-term reliability.

For 'channel hoppers' tiring of analogue TV, digital free-to-air adds a new dimension to the hobby. It's a fact that many of these digital channels are a bit rough round the edges, but this adds to the interest. Many of them will probably be short-lived. But new channels and feeds appear all the time.

RSD Communications can be reached on 01786 446 222. The address is RSD Communications Ltd., Springkerse Industrial Estate, Munro Road, Stirling FK7 7RP.

Table 1: Some currently available free-to-air digital TV channels

Satellite and Channel	*Symbol rate*	*FEC*	*Programme*
Orion 37·5°W			
11·596 V	3906	3/4	Asia Net UK (English)
11·662 V	18900	7/8	Landscape Channel (English)
11·672 V	6116	3/4	BET Jazz (English)
Telecom 2B/2D 5°W			
11·676 V	4440	3/4	Euronews (English, French, etc.)
12·543 H	27500	3/4	Eurosport UK (English)
Thor 1°W			
12·456 V	24500	7/8	BBC World, Nickelodeon (English)
Sirius 5°E			
12·245 V	27500	7/8	TV8 and SVTI-2 (Swedish), Eros TV (English)*
12·380 V	27500	3/4	TV Chile (Spanish), BET Jazz (English)
12·453 H	18056	3/4	Telesport (Russian), Global Draw Lottery (English)
Eutelsat II F4 7°E			
12·722 V	1365	3/4	Reuters Financial (English)
Eutelsat II F2 10°E			
11·016 H	5642	7/8	Olay TV (Turkish)
11·026 H	3055	7/8	Pop TV (Turkish)
11·055 H	7912	1/2	NAK (German)
11·124 H	2895	5/6	Discovery (Turkish)
11·131 V	5632	3/4	Kral TV (Turkish)
12·576 V	31000	7/8	TMT (Polish)
Eutelsat Hot Bird 1-5 13°E			
10·719 V	27500	3/4	Krisma, Sardegna Uno, Tirreno Sat, Sicilia Uno, Sicilia International (Italian)
10·892 H	27500	3/4	Polsat, Polsat 2, Nasza TV, Troche Mlodsza (Polish)
10·914 H	3998	1/2	Quantum TV (English/German)
11·054 H	27500	5/6	RTL (German), Sat 1 (Swiss – German), CNN (English), NBC (English/German)
11·205 H	4000	3/4	Canal Horas (Spanish)
11·331 H	6111	3/4	Nasza TV (Polish)
11·338 V	5632	3/4	TV5 Asie (French)
11·766 V	27500	2/3	RAI Uno, Due, Tre, Sport, Mosaic (Italian)
11·804 V	27500	2/3	RAISat/Cultura/Ragazzi/ Encyclopedia/Nettuno, Telepace, Camera dei Deputati, Sat 2000 (Italian)
11·919 V	27500	2/3	Italia 1, Canale 5, Rete 4 (Italian)
12·092 H	27500	3/4	Vacaciones (Spanish/English), Cadena Sur/Solo Tango/Canal 39/Puma TV/TVE International/TV de Galicia (Spanish), Satisfaction (English)*
12·111 V	27500	2/3	TVE International (Spanish), NTV (Turkish?), Euronews (French/Spanish), TV Polonia (Polish), Viva (German)
12·211 H	5632	3/4	TVN Poludnie (Polish)
12·539 H	27500	3/4	TV Bulgaria (English)
12·573 H	5632	3/4	TVN Polnoc (Polish)
12·581 H	5632	3/4	APTN feeds (English)
12·590 H	5632	3/4	APTN Feeds (English)
12·597 V	27500	3/4	Euronews (English, French, etc.)
12·673 V	27500	3/4	TV5 Global Network (Thai), Video Italia, Elefante Telemarket (Italian)
Eutelsat W2 16°E			
10·958 H	5632	3/4	Elefante Telemarket (Italian)
11·043 H	4000	3/4	Fox 8 (English), Fox Kids (Dutch)
11·090 H	6110	3/4	TMC and TMC2 (Italian)
11·108 H	5632	3/4	TVN Poludine (Polish)
11·129 H	3123	3/4	Open Broadcast (Croatian)
11·190 V	3124	3/4	Plymouth University (English)
12·568 H	3255	2/3	SIC (Portuguese)
12·701 H	3012	5/6	P16ALK (test)
Astra 1E-G 19·2°E			
11·837 H	27500	3/4	Astra Promo (English)
12·051 V	27500	3/4	Pro 7 (Austria – German), Pro 7 (Swiss – German), Kabel 1 (Austria – German)
12·480 V	27500	3/4	Pro 7, Kabel 1, Sat 1, DSF (all Swiss – German)
12·363 V	27500	3/4	RTM1 (Moroccan), ESC1 (Egyptian), TV5 Europe (French), TV7 (Tunisian), RAI Uno (Italian), RTP (Portuguese), Deutsche Wella (German/English)
Kopernikus 3 23·5°E			
11·498 H	27500	3/4	ARD, Hessen TV, WDR, N3, Bayerisches TV (German)
11·616 H	27500	3/4	ARD, B1, ORB, MDR, Eins Festival/Muxx/Extra (German)
12·524 V	27500	3/4	Euro D, ATV (Turkish), TV Polonia (Polish)
12·610 V	5998	3/4	Sat 1 (German)
12·692 H	27500	3/4	ORF Sat, Der Kinderkanal, ZDF, ZDF Info Box, 3 Sat, Phoenix, ARTE (German)
Astra 2A 28·2°E			
11·740 V	27500	2/3	TV Travel Shop (English)
11·758 H	27500	2/3	CNE (Chinese)
12·051 V	27500	2/3	CNN, Shop! QVC (English)
12·070 H	27500	2/3	Sky News (English)
Kopernikus 2 28·5°E			
11·506 V	5632	3/4	VT4 (German)
11·622 H	8448	1/2	Sat 1 Austria (German)
11·644 H	8448	1/2	Sat 1 Swiss (German)
11·669 H	8448	1/2	NBC (English)

*Part encrypted.

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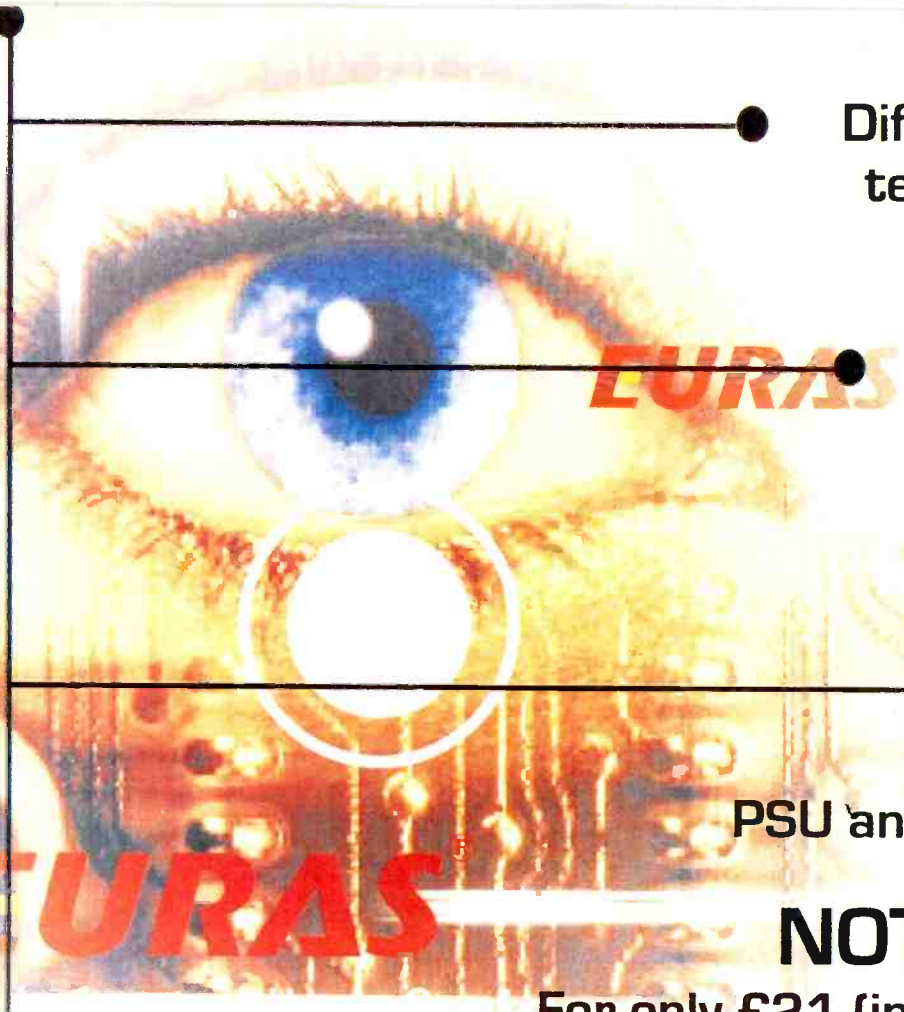

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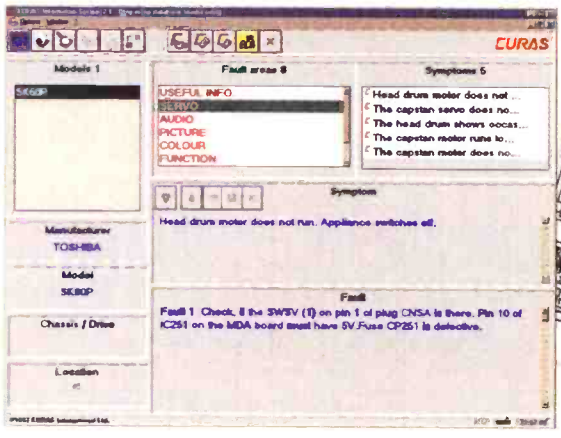

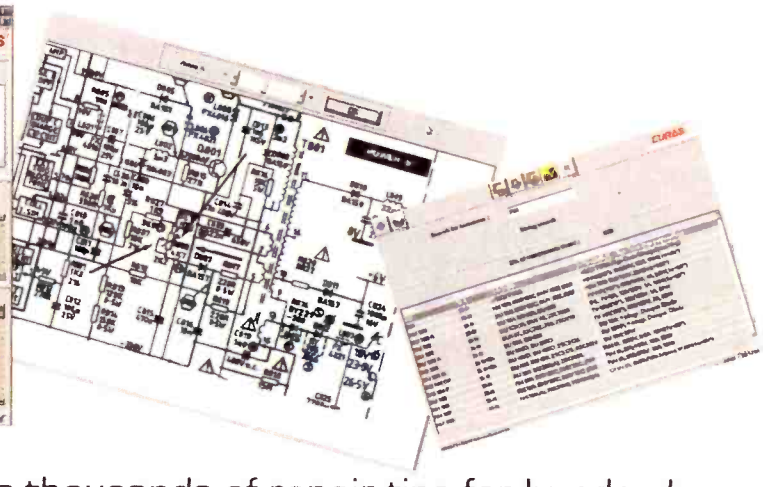

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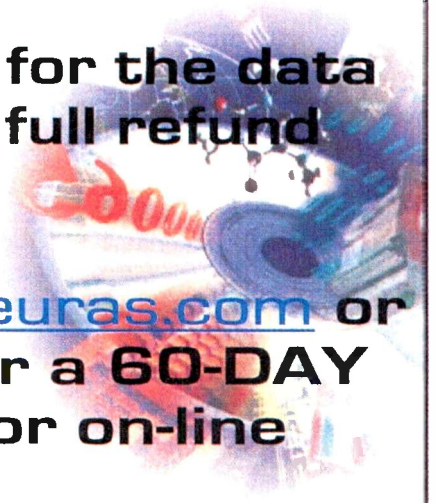

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The conventional varicap tuner has been an established feature of TV receiver design since the early Seventies. This could be about to change, with the advent of an IC tuner. Eugene Trundle describes a significant breakthrough in tuner and IC technology

Tuner in a Chip

Over the last three decades we have watched as the electronics in a TV set have undergone a metamorphosis, from a complex arrangement of discrete circuitry to an array of ICs, some analogue and some digital. The advent of digital TV has left only the picture tube, its drive circuitry and the power supply as users of active discrete devices. Apart, that is, from the tuner.

There are many reasons – technical, physical and economic – why tuners have remained for half a century in fabricated, 'canned' form. But in recent months a complete multiband tuner, which claims to have better performance than a conventional one, has become available in IC form. There's little doubt that it and its successors will rapidly supersede the conventional type of tuner.

The Canned Tuner

The conventional canned tuner unit uses Lecher lines to provide selectivity. It has varicap diodes for tuning. To be able to tune to the top of Band V they require a 33V supply.

The design of such a tuner is of necessity a compromise, especially when it's required to cover the VHF and UHF TV bands, typically from 50MHz to 860MHz, a span of four octaves. The single-conversion system used is not good at rejecting image, adjacent and near-adjacent channels, especially when these carry stronger signals than the wanted one. The dynamic range of the first RF stage is limited, which can result in cross-modulation. There can be excessive radiation, even via the aerial and the feeder cable. In addition such tuners are fussy and difficult to make, using a number of discrete devices and an expensive fabrication system.

When something new comes along, the promoters find it easy to rubbish the concept and performance of what had previously served us well enough: manufacturers do it all the time in their advertising copy! Today's canned tuner is a very highly-developed and honed product. But its development in discrete, single-conversion and cheap form has reached the end of the road. This is particularly relevant now that the traditional taboos and care in the use of the TV broadcast bands have been thrown to the winds in the interests of commercial gain. The situation is the same in Europe and the Americas: the airwaves are becoming crammed with carriers, analogue and digital, strong and weak.

In cable-distribution systems as well more and more channels are being delivered in closer and more tightly packed form – to the point where set-top boxes, particularly in cable-minded N. America, have had to adopt dual-conversion front-ends, conventionally constructed, to achieve the required selectivity and out-of-band signal rejection. This technique increases the cost, complexity and potential for spurious radiation, and tends to have poorer phase-jitter and noise performance and a worse dynamic range than a conventional tuner. While the latter parameter is not usually significant with a well set-up cable outlet, phase jitter and noise are real problems with reception of the burgeoning digital TV services, all of which rely on some form of phase modulation.

Tuner shortcomings can cause patterning, noise and instability with analogue reception. With digital signals the result can be image pixellation, freezing or complete loss of the picture.

Service people know that conventional tuners, because of their critical performance requirements, method of construction and the large number of soldered joints, are a less reliable section of a TV set or VCR than most other circuit blocks. Nor are such tuners cheap, especially when the IF/demodulator system is incorporated along with the entire tuning arrangement under bus control. Very often tuner failure can mean the demise of a TV set or VCR, though those of us in the UK have the benefit of MCES!

Enter the Tuner IC

Tuner ICs have been talked about for many years. Their advent has been held back by several factors, especially difficulty in containing radiation and interference: this is

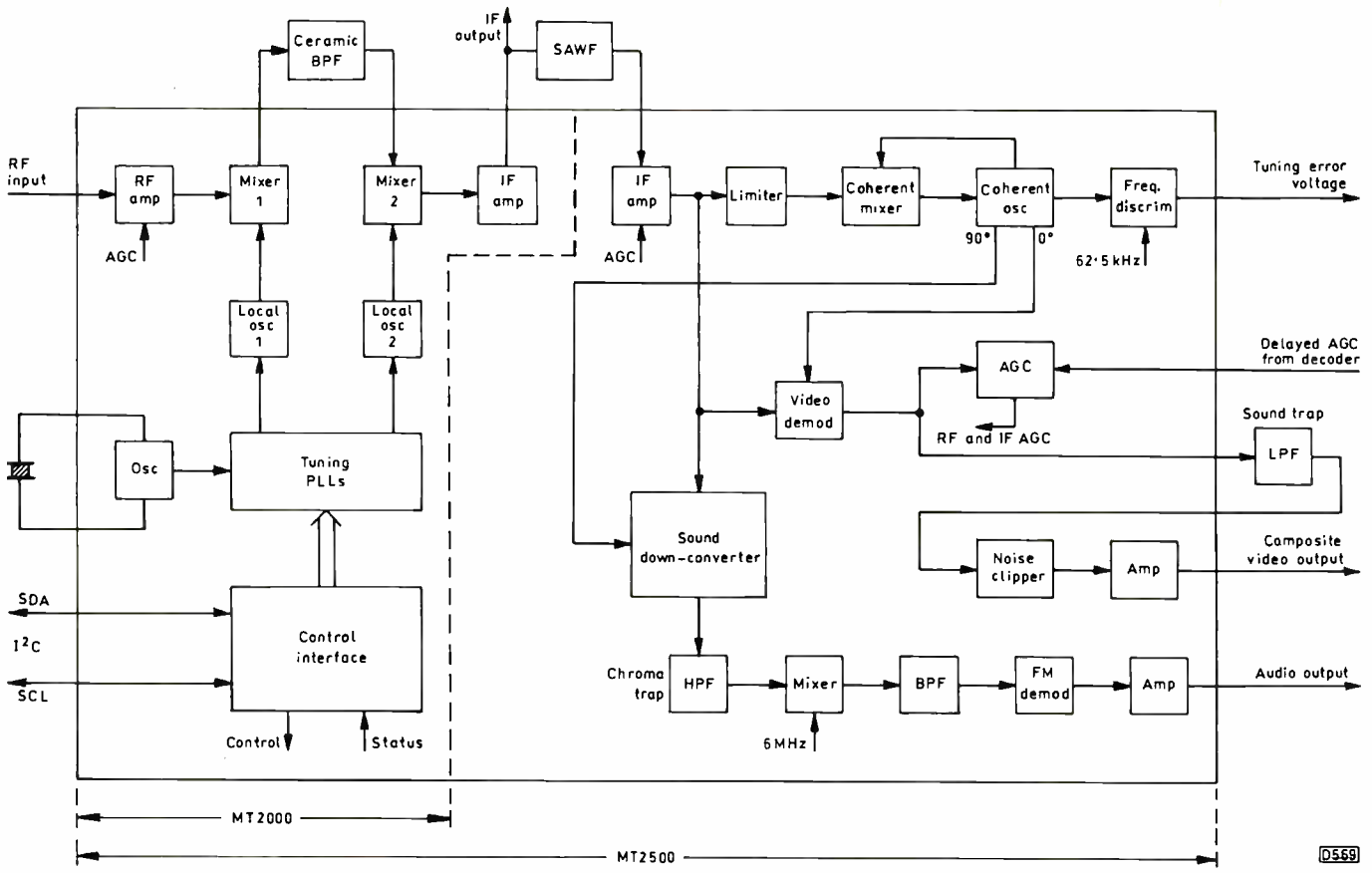


Fig. 1: Simplified block diagram of the MT2000/MT2500 TV tuner chips.

essential to keep low-level signals 'pure' and to comply with current and future EMC leakage requirements.

These challenges have now been overcome with the advent of a BiCMOS surface-mounted, fingernail-sized 80-pin IC package that has the following 'headline' specification: coverage 50-860MHz; noise figure 8dB maximum; image rejection >–57dB with 100 channels at >5mV input; cross-modulation 1 per cent at 30mV input; and phase noise at –85dB with 10kHz offset. There is also compatibility with I^2C bus control, and only one low operating voltage is required.

The tuner chip is available in PAL, NTSC and dual-standard versions, in two forms – the MT2000 tuner only and the TDA2500 complete receiver version. The cost, at the factory gate, is £12.75 and £27.25 respectively each – as long as you buy ten thousand at a time!

Architecture

The internal arrangement ('architecture') of these chips is shown in simplified block diagram form in Fig. 1. Basically the MT2000 has an RF input and provides a second IF output. It's optimised for TV receiver, set-top box and cable modem use. Type MT2500 extends the functions to include RF and IF processing, demodulation and baseband processing. Both chips are suitable for digital TV reception, when the IF output is fed to whichever type of phase/amplitude demodulator matches the transmission standard.

Both chips cover 50-860MHz. They incorporate a variable-gain, low-noise RF amplifier, first and second mixer stages, and frequency-synthesis tuning. The MT2500 adds video demodulation and FM sound demodulation, fully-synchronous demodulation with carrier regeneration, AFT, AGC, and a separate sound channel that includes an IF limiter and FM detector.

The first stage, a wideband low-noise amplifier, is gain controlled and has a wide dynamic range. This enables it to be used with both aerial and cable input signals. The following first mixer provides up-conversion, the IF being well in excess of 1GHz. This is fed to an external filter that consists of a simple, inexpensive two-pole ceramic resonator. With a bandwidth of 15MHz, its primary functions are image rejection and initial passband definition. See the accompanying box for 'image' information. In conjunction with the on-chip image-rejecting mixer design, image-signal suppression of –65dB is achieved across the entire tuning range. The signal then undergoes a second, down-conversion in mixer two, whose associated local oscillator runs at a frequency that yields a second IF of about 40MHz, the standard vision IF with a conventional tuner. The second mixer stage is again a special image-rejecting type, providing suppression of the image signal produced in the first mixer stage by –65dB.

The two local oscillators are fully integrated on to the chip. They generate the required frequencies in conjunction with a single external crystal – resolution is 62·5kHz. The system uses a complex frequency-synthesis circuit whose voltage-controlled oscillators, including varactors, charge pumps, phase-frequency detectors and programmable dividers, are all on the chip. Tuning commands come via the I^2C bus.

The second IF amplifier is gain controlled. Application of RF and IF gain control follows the same principle as with a conventional tuner/IF strip, optimising the noise performance and minimising cross-modulation when large input signals are present. The MicroTuner has an AGC range of 96dB.

The Superhet Principle

All receivers use the superhet principle for tuning. This involves mixing the incoming signal with the output from a local oscillator to generate sum and difference frequencies. The difference frequency, which retains the phase and amplitude characteristics of the original signal, is called the IF (intermediate frequency) signal. This can be selected by a filter and passed on for amplification and demodulation.

The problem is that two input frequencies, one above and one below the local oscillator frequency, can give rise to an IF signal. The unwanted one is called the image frequency, and is 79MHz away (channel n + 10) in the UK. It must be well suppressed upstream from the mixer stage.

The sound carrier of channel n + 4 and the vision carrier of channel n – 4 can give rise to spurious beat signals 1·5MHz away from the wanted IF. They must be suppressed by at least –55dB in the pre-mixer stage.

In a dual-conversion system such as that used in this tuner chip the second heterodyne process gives rise to further image components. They are eliminated by careful choice of frequencies and rejection circuits.

IF/demodulator Section

Further processing is carried out in the MT2500 MicroTuner. Demodulation is a complex system that involves a phase-locked loop (coherent oscillator and mixer) which locks to the incoming vision carrier and generates in-phase (0°) and quadrature (90°) carriers. These are used to demodulate the video signal and down-convert the sound signal respectively.

The demodulated video signal is passed through an external trap to remove the sound signal. This is followed by a noise clipper to minimise the effect of any impulse interference. The video demodulator's output is also gated and amplitude sampled to provide the AGC voltages.

The down-converted intercarrier sound (frequency varies with broadcast standard, being 6MHz for UK operation) is fed to chroma trap then an integrated self-tuned filter on its way to the FM demodulator. This is followed by baseband filtering and de-emphasis.

The MicroTuner chip is controlled via a standard serial bus interface that's I^2C compatible. It allows interrogation and read-out of the contents of all the status registers in the chip, and enables device programming to be carried out. Registers in the tuning PLLs are loaded to tune in a specific channel.

Interference Suppression

The MicroTuner uses several oscillators and mixers, with large signals present on a common substrate. This has to be done without creating the spurious signals that commonly arise when multiple oscillators are present in one chip – remember those early satellite receivers? Unwanted signals arise as harmonics, intermodulation products and parasitic emissions: they are exacerbated when there is unwanted electronic coupling between circuit sections.

The patented architecture, circuitry and construction of the MicroTuner overcome these potential problems, minimising the generation of spurious signals and maximising the rejection of any that do arise. The frequencies chosen ensure that by-products are out-of-band so far as the downstream processors are concerned.

Applications

We have seen that these tuner chips perform better than canned tuners in today's crowded broadcast bands, and that a single IC tuner can handle both analogue and digital TV signals – and indeed any other data that accompanies the latter. The IC tuner can thus help with the transition from analogue to digital TV, and act as a gateway into the home or office for high-definition video, high-end audio and high-speed data.

The chip's small size and low power consumption open up many other possibilities. Wrist-watch TVs and TVs built into spectacles for example, though the problem with these is the need for some form of physically aligned and electrically-tuned aerial. The same constraint applies with palm- and laptop computers, which could easily and cheaply be given TV capability with this chip.

The manufacturer of the MicroTuner also envisages its use in a compact, low-power web receiver capable of intercepting data streams in subchannels embedded in the new broadband digital TV signals. This data, for use by a portable computer or personal digital assistant (PDA), could provide messages, news, financial and general information. Developments like this have become commercially and physically feasible only with the advent of digital broadcast systems – and this type of integrated tuner.

Acknowledgement

My thanks to the designer and producer of the MicroTuner, Microtune Inc., 2540 East Plano Parkway, Suite 188, Plano, Texas 75074 for the provision of information on which this article is based. Microtune's telephone number is (+) 972 673 1600.

Book Reviews

Build and Upgrade Your Own PC by Ian Sinclair, published by Newnes (Butterworth-Heinemann) at £19.99. ISBN 0 7506 4267 X. 206 pages 155 x 232mm, soft covers.

The electronics and computing disciplines are not as closely related as one might expect. Those knowledgeable about computers are mainly software orientated and seem to have little concern about the electronics that make it all possible. On the other hand those with an electronics background can find themselves confused by some of the messages that comes up on the computer screen, many of which are highly ambiguous. Bill Gates himself is on record as complaining about the clarity of many messages and the logic behind what's explained and what's left to the user to puzzle out. The two subjects have evolved quite different terminologies, which makes it difficult for the electronics technician to get to grips with computer matters. What we need is a book on PCs by someone with an electronics background. Here it is!

Whether you actually want to build or upgrade (to Pentium 2 and Pentium MMX systems) a PC or just feel that you would like to know what's inside a PC and what the various modules do, this book can be highly recommended. The preface and introductory chapter provide an excellent guide to the development of the PC, which has evolved as data processing power has increased and memory has become cheaper. Thereafter the book deals effectively with the innards and the various ancillary items – disk drives, monitors, graphics cards, ports, printers, modems etc. Setting up and Windows basics are clearly explained.

This book will make life a lot easier for the electronics technician who wants to get involved with PCs at a practical level. It's a handy reference source as well. **J.A.R.**

Electronics for Service Engineers by Joe Cieszynski and David Fox, published by Newnes (Butterworth-Heinemann) at £14.99. ISBN 0 7506 3476 6. 288 pages 155 x 232mm, soft covers.

This textbook has been devised to meet the needs of those preparing for NVQs in electronics and electrical servicing. To this end it provides basic information relevant to the wide range of brown and white goods covered by the NVQ framework. As NVQs are based on an assessment of competence gained by experience rather than a college course followed by an exam, the text has been written with a view to independent study, bearing in mind the difficulties that those going for an NVQ face.

Much of the information in the book is very basic – mathematical calculations, electricity, magnetism, fuses, how to connect a 13A plug, resistors, capacitors, semiconductor device operation and so on. There can be no complaints about the treatment of these subjects. Descriptions of most basic electronic circuits, electronic systems at block diagram level, and logic circuit arrangements follow. The book ends with a chapter on the use of test equipment, mainly the multimeter and oscilloscope. Since the coverage is supposed to include electrical products, one might have expected to find something on motors and motor control. You'll have to look elsewhere for this however.

The basic 'underpinning' knowledge of electronics needed for successful servicing is covered in detail, and there are chapters on safety in the workplace and the organisation of the servicing industry. **J.A.R.**

Both books can be ordered from Heinemann Publishers Oxford, PO Box 382, Halley Court, Jordan Hill, Oxford OX2 8RU. Phone 01865 888 180, fax 01865 314 091.

The König Club

From left to right: Andrew Richardson, Joint Managing Director of SEME Ltd.; John Hyde, Managing Director of Charles Hyde & Sons Ltd.; Herbert Bunk, Joint Managing Director of König Electronic; Alan Teece, Chairman TW Electronics; David Page, Managing Director Willow Vale Electronics Ltd.; Peter Davis, Head of Purchasing CPC plc.

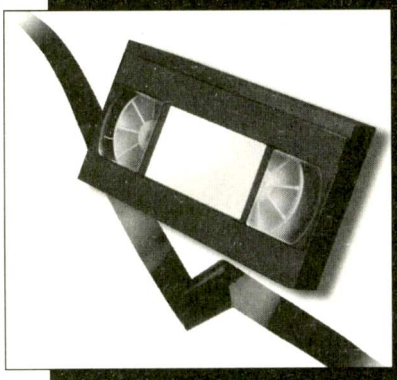
TW Electronics (Newbury) Ltd. has set up the König Club, which brings together the four largest brown goods spares and accessories distributors in the UK – CPC, Charles Hyde and Son, SEME and Willow Vale Electronics – to meet the need of independent dealers for competitively-priced, quality spare parts by stocking a wide range of König components. Leading figures from the four Founder Members came together at a hotel in Derby to launch the Club (see photograph).

The main benefits of the Club, which was launched on September 1st, are increased König product availability and information, increasing the ability of retailers to carry out efficient, high-quality repairs and to supply quality remote-control handsets.

König products are highly regarded in the industry as offering excellent value-for-money spare parts that reach or exceed the safety requirements of the original equipment manufacturer (OEM) at a market price significantly less than that charged by the OEM.

König remote control units are designed on the layout of the handsets they replace. This gives the dealer a strong selling point, while the consumer is offered a competitively-priced alternative. TW Electronics will continue to develop the König range of remote-control units to provide independent retailers with more opportunities to boost sales and profits. König Club members will be stocking and promoting a new range of manufacturer-specific remote control units as they become available during the autumn/winter months.

The aim of the König Club is to enable independent electrical retailers to obtain a wide range of guaranteed-quality replacement spare parts quickly and at the right price.



VCR Clinic

Reports from
Chris Watton
Michael Dranfield
Graham M. Colebourn
Bob McClenning
Jim Kirkman
Gerald Smith
Ronnie Boag
Colin J. Guy and
Adrian Spriddell

Philips VR7225

The problem with this machine was poor power supply starting. There were odd noises as the mechanism twitched. A load on the power supply was suspected, but was not the case – a check with a 12V bulb across C2114 and the supply disconnected from the rest of the machine showed that it still would not start. All the components on the secondary side of the supply were OK, there was 320V across the output from the mains bridge rectifier and 9·3V at pin 6 of IC7105. C2114 tested OK.

After about half an hour the lamp started to pulse. It turned out that the 100µF, 400V mains bridge rectifier's reservoir capacitor had failed. When checked it read only 1µF. I had discounted this possibility to start with as 320V was present across the capacitor and the charge remained for a short time after mains disconnection. Oh well, fooled again! **C.W.**

Goodmans VN6000

This machine appeared to be dead though the power supply had output voltages. The cause of the trouble was C823 (3,300µF, 10V). **C.W.**

Alba VCR7130

This machine had a display fault. Instead of showing the clock and channel number it displayed YCEO and, for the channel, E6.

Unplugging the machine didn't change things so, after looking for a back-up cell and not finding one – and also without a manual – I looked around and noticed a point on the PCB labelled reset. In a fit of recklessness I decided to short it to chassis. The clock went off and there was a twitch from the power supply. Oh no! I thought. But when I opened my eyes the clock had returned and could be set. Well, we all deserve a bit of luck sometimes, don't we?! **C.W.**

GoldStar GHV1290

There were hum bars on the picture. The cause was traced to C712 in the IF pack – it decouples the IF AGC voltage. With care you can lift off the can without removing the module from the main PCB. **C.W.**

Philips VR165

This VCR was a pig. It's hard enough to repair these mid-mount decks, but surface-mounted devices are there to add insult to injury.

The problem was loss of the control track pulses during playback. Transistor 7469 (BC848) turned out to be the cause. It's in section DE of the circuit diagram and is close to IC7460. Why can I get only two-three from a pack of five? The others disappear as I open it! **C.W.**

Ferguson FV37H

This Nicam machine's E-E and playback sound was very low. In addition the hi-fi level meters did not work. The cause was a faulty circuit protector on the hi-fi PCB. It's labelled L2. **M.Dr.**

Goodmans VN6000

When this newish machine was plugged in it was dead. After a few minutes the clock display appeared and the reel idler started to twitch backwards and forwards. Checks in the power supply showed that the 5·8V output was low at 5V. The cause was C822 (330µF, 10V) which had dried up, probably because of heating produced by a high ripple current. I fitted a physically larger replacement capacitor – as we do with the **Samsung VIK326** which suffers from the same problem. **M.Dr.**

Mitsubishi HSB82

This S-VHS machine puzzled its owner by failing to produce a clear picture with his own TV set though it did so with two others. I suspected the tuning, but the fault was present via the scart as well as the RF output. It affected both playback and E-E operation, the result being barely discernible pictures or no picture at all. The sound was not affected.

The cause of the trouble was traced to a surface-mounted electrolytic capacitor, C232, in the video signal path. It had dried up. To improve reliability I fitted a 10µF, 63V wire-ended type. I also replaced C210 nearby (47µF, 63V surface-mounted). Both capacitors are at the rear right corner of the machine. **G.M.C.**

Aiwa VXT1420

The complaint with this 14in. TV-VCR unit was no playback or E-E colour. Someone had already replaced the TA8867AN chroma chip and the colour crystal – then managed to mislay most of the screws and the deck screening plate.

Although the on-screen display showed that the colour was set to maximum, the control voltage at pin 29 of the chroma chip was too low at only 1·55V (for normal colour it should be at least 2V). But the PWM colour control output at pin 16 of IC101 was normal. Further checks brought me to the smoothing capacitor C117 (4·7µF,

50V), which was very low in value (about 2nF). This allowed the PWM waveform through to the following diode biasing network. As a result, the mean DC level was altered.

C117 is in parallel with and fitted into the same board position as zener diode D637, which seems to be marked D635 on the PCB. It's location is a little way in front of the TA8867AN chip.

To complete the job I had to make a new deck screen by hand – it's not available as a spare part. **G.M.C.**

Panasonic NVG18

This machine seemed to be completely dead. Checks showed that there was excessive ripple on the unregulated 45V line. C1104 (100µF,63V), which is on the transformer board, had deteriorated. **G.M.C.**

Panasonic NVL20

The capstan didn't rotate and a cassette couldn't be loaded. The cause of the trouble was the 5V regulator transistor Q2002. **B.McC.**

Samsung VK310/320/350

The digitron display was poor. When you get this check the heater supply reservoir capacitor C120 (100µF, 16V) in the power supply – it goes low. **B.McC.**

Akai VSG735EKN

"Eating tapes" was the complaint. There was no wind, rewind or play operation. As the separate loading motor worked normally, I investigated the supply to the capstan motor and found that FR402 (0·12Ω) was open-circuit. When a replacement had been fitted the motor ran reluctantly but refused to reverse. There isn't much left to go wrong in these modern machines, so I ordered a new capstan motor (SCV0602A) from CHS. That fixed it – phew! **J.K.**

Amstrad DD8900

The top deck was inoperative and only part of the multi-display was illuminated. The supplies to the syscon processor IC501 were present and there was a reset pulse. I spent too long trying to prove that the cause of the problem was something else. In the end replacing IC501 cured the fault. **J.K.**

JVC HRD860

This machine wouldn't fast wind. Otherwise it was OK. These clever machines count the reel pulses and do a sum to determine the tape size and position on the reel. Check the output from the supply and take-up reel sensors for reliable operation (PS1 and PS2 on the deck terminal below the mechanism). I've come across several whose pulse output has been intermittent, cured by replacement. Note that sub-sized prerecorded tapes can confuse the machine's arithmetic – with the same results! **J.K.**

JVC HRJ645

There was intermittent crackle on the mono and Nicam sound. It would get worse, with picture tearing as well. As the sound and vision via the scart connector were OK, I fitted a replacement tuner/modulator. But the fault was still present. Scope checks on the supply lines then showed that the switched 5V supply was very noisy. The cure was to replace C962, which is a surface-mounted capacitor. **G.S.**

Aiwa FX2800

There would be no front display after about twelve hours, though the machine worked all right otherwise. The voltage between pins 1 and 26 of the fluorescent display should be 2·5V DC, with a little half-wave AC ripple. If the DC level or the AC ripple change, the display is lost. The cause of the problem was C517 in the power supply. It changed value when heated.

I also replaced D513 as a precaution as I've had this diode go open-circuit in the past. **G.S.**

JVC HRJ610

This machine was dead with no clock display and no functions. The power supply wasn't running: in fact it wasn't even starting or pulsing. The cause of the problem was the 2·2µF, 50V start-up capacitor C12. Once it had been replaced the machine started up and worked perfectly. **G.S.**

Panasonic NVHD630

There was no E-E or playback sound, but recordings made by the machine produced sound when played back by another machine. Conditions weren't right when I checked around the BH7803K sound processing chip IC4501. A replacement restored normal operation. **G.S.**

Tatung TVR935V

There was no tuning and no playback picture. Voltage checks showed that the 32V supply was missing. The cause was R529 (100Ω) which was open-circuit. **R.B.**

Daewoo V435

The playback picture would break into lines, and there was no colour. The cause was crystal X402 in the video circuit. **R.B.**

Sony SLVE25V

This machine would cut off after a few seconds in play, with the drum not turning fast enough. A replacement drum motor cured the fault. **R.B.**

JVC HRD860

This machine wouldn't accept tapes. The loading motor proved to be faulty. **R.B.**

Grundig GV201-1

The fault with this machine was present in the LP record mode only: it wouldn't erase the old audio. To cure it we had to replace the microcontroller and EEPROM chips IC7410 and IC7412. **R.B.**

Aiwa HVFX2800

The carriage would try to load at switch on when no tape was inserted. When a tape was inserted the machine worked normally. The cause of the problem was the mode switch, which was one tooth out of alignment. **C.J.G.**

JVC HRDX22

The complaint with this machine was intermittent stopping. Its cause was traced to dry-joints at connector CN601 on the top PCB – particularly at pin 5 which carries the reel FG pulses. **C.J.G.**

Panasonic NVSD200

Because the loading motor coupling was cracked, there was no loading when the machine was hot. We had to order the coupling. By the time it was delivered and then fitted the power supply refused to start from cold. The power supply unit was removed and the two 47µF capacitors on the primary side were replaced. When the power supply had been refitted the machine worked, but not for long. There was no E-E operation and a strong smell of burning.

Be warned! There are two earthing clips attached to the plastic chassis. One of them, near the power supply flexi-connector, is easily detached. It had lodged under the main PCB and wiped out Q1003. **A.S.**

Servicing

the Panasonic NVSD200/400/450/HD600/650

ATP (Automatic Tuning Procedure) and menu-driven operation were features added with these models. Brian Storm describes the technology and provides service know-how

Just when most service engineers believed they could repair Panasonic VCRs quickly and easily, along came ATP. This is an acronym for Automatic Tuning Procedure. Let me explain.

The large electrical retailers were starting to demand VCRs that could be quickly and easily set up in a customer's home. The easier they were to set up, the less demand there would be for after-sales service. Ideally, it should be possible to plug in a VCR which should then set itself up with minimal prompting from its new owner. This was the basis of these 1995 models, which continued to use the K deck.

They have a new on-screen display system with the following features: automatic search tuning; automatic channel naming; automatic channel sorting; automatic clock and calendar setting; on-screen customer assistance warnings; and VideoPlus with PDC timer recording. When a machine is first switched on, the setting- up operations are carried out automatically. The VCR can be reset to its 'shipping condition' however: this is done by selection via the menu system.

A considerable amount of extra circuitry is required to carry out these laudable new functions. Most previous Panasonic VCRs used a timer microcontroller chip (IC7501) and a syscon microcontroller chip (IC6001). These, along with possibly a few other minor slave processors, formed the heart of a machine. The 1995 range have, in addition, an on-screen display microcontroller (IC7706), an EEPROM (IC7701), a text processor (IC7708) and, if a coloured menu system is required, a PAL encoder (IC7705). This latter chip converts the RGB output from the teletext processor to a line-level video signal to mix with the standard VCR video content. See Fig. 1.

New Service Procedure

A new service procedure called "channel memory re-initialisation" was introduced. All new machines had OSD languages and functions for the whole of Europe stored in EEPROM (IC7701). The non-volatile memory (EAROM) chip IC7704 has a number stored in it to select the country and model identity: the higher the number, the more features or functions the machine has. The relevant codes for British (B) models are 41 for the NVSD200B, 73 for the NVSD400B, 105 for the NVSD450B, 137 for the NVHD600B and 169 for the NVHD650B. These codes are shown in the relevant service manual.

To rewrite an identity code, resolder the cut link on the drive board at the back of the machine (on the head amplifier pack in the NVSD200B) then press 'eject', 'FF' and 'rewind' together ('eject' and 'cue forward' with Models NVSD450B and NVHD650B). After doing this you will see zeros on the front panel display and, via the monitor, a menu screen with a number on it. If there's no menu display, check that the shorting link is a good connection.

You can now, using the VCR's remote control unit, rewrite the identity number. Then cut the soldered link again. The machine should power down. Unplug it from the mains supply then reconnect it. The VCR should now have a British identity and start to tune itself in.

It's important to know this procedure. Otherwise the unsuspecting technician could embark on a wild goose chase of the highest order. I have spoken to technicians engaged in looking for the cause of a missing LP function, a sound fault or no colour. The usual clue is that language selection is available on the menus. This is not normal with a British machine. If a lower British identity number is selected however this would not be the case. Lack of certain higher model features might be the only clue.

Menu-driven Features

The introduction of OSD menus introduces menu-driven features. A VCR can have simple keys on the front panel for essential operations: OSD menus then add features according to the programming of IC7701. Thus the EEPROM becomes the only difference between a basic machine and a complex one.

IC7701 defines the machine, with the memory re-initialisation procedure defining the country in which it is to be used and the level of features incorporated in the particular model.

The OSD Circuitry

The heart of this menu-driven system is the OSD processor chip IC7706 (see Fig. 1). It does all the real-time processing for the system, communicating with the timer processor IC7501, the system-control processor IC6001 and the non-volatile memory chip or EAROM (Electrically Alterable Read Only Memory) IC7704.

All the command and address data for the OSD processor and its associated operations are stored in IC7701. The OSD processor has access to all this data, using it to control the teletext processor. In this way it generates the relevant displays and reads the appropriate teletext data. This data includes the CNI (Country Network Identification) codes in packet 8/30 of the teletext service, where a sixteen-bit word contains the name of the broadcaster. The PDC data and clock/calendar data are also required.

Problems

One of the first problems that occurred with these machines related to the introduction of the PDC (Programmable Delivery Code) system. Changes in the teletext data structure to accommodate PDC left the earlier models NVSD200, NVSD400 and NVHD600 unable to read the BBC1 and BBC2 CNI codes. The channel names could still be edited in by the user of the machine, but it seemed to be unfair to leave people in this situation. So new EEPROMs were produced to correct the problem.

While the machines were under guarantee, a complete plug-in OSD board, part no. VEP03669T, was supplied for Models NVSD400B and NVHD600B. Once outside the warranty period, the EEPROM IC7701 was made available (part no. M27C512MBMA) as a cheaper alternative to the board.

For Model NVSD200B, of which there were two versions, part no. SD200OSDKIT was supplied. It contained two EEPROMs one of which, depending on the model version, would cure the problem. The later version of the NVSD200B has a different drum and head drive circuitry. This is all described in a supplementary service manual. The later drum motor assembly is part no. VEG1360: the drum is part no. VEH0832.

The timer IC was also slightly reprogrammed to change the clock update times. For all these models the part no. is M37507V4CJ.

Intermittent freezing or loss of the NVSD200B's menu system was a problem in certain areas where the mains supply is noisy or intermittent. This can be rectified by adding a small kit, part no. VSX0875KIT.

Fault Notes

The TDA4605-based chopper power supply could sometimes fail dramatically, leaving a number of damaged and distressed components. Panasonic soon supplied kits of parts for the repair of such power supplies. Part numbers are as follows:

Models NVSD200, NVSD260 and NVSD410: Part no. VUE4124KIT.

Models NVSD400, NVSD450, NVHD600 and NVSD650: Part no. VUE4123KIT.

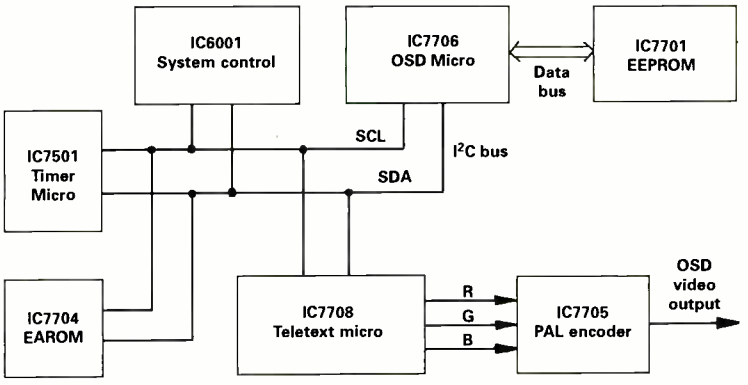


Fig. 1: Block diagram of the revised chip arrangement used with the OSD menu-driven system.

Models NVHD605, NVHD610 and NVHD660: Part no. VUE4125KIT.

An additional 10Ω resistor (R1118) is included in the kits. It provides surge limitation by being fitted in series with the gate of the chopper FET Q1101. There is DC connection between Q1101's gate and pin 5 of the TDA4605-3 chip IC1101.

If you still have a problem after fitting one of these kits, replace C1115 (47μF, 35V) and C1117 (0·1μF). These capacitors often become leaky when under stress.

Here are some electronic faults we've had with these machines:

No record colour (NVSD200B): C3038 leaky.

Records wrong colours (NVSD200B): C3043 leaky.

No menus or capstan operation (NVSD200B): Q1006 faulty.

No video or reel detection (NVSD200B): Q1003 faulty.

No or poor loading operation (NVSD200B): C6003 leaky.

Bad colour on menus (NVHD600B): Check for leaky capacitors around IC7705.

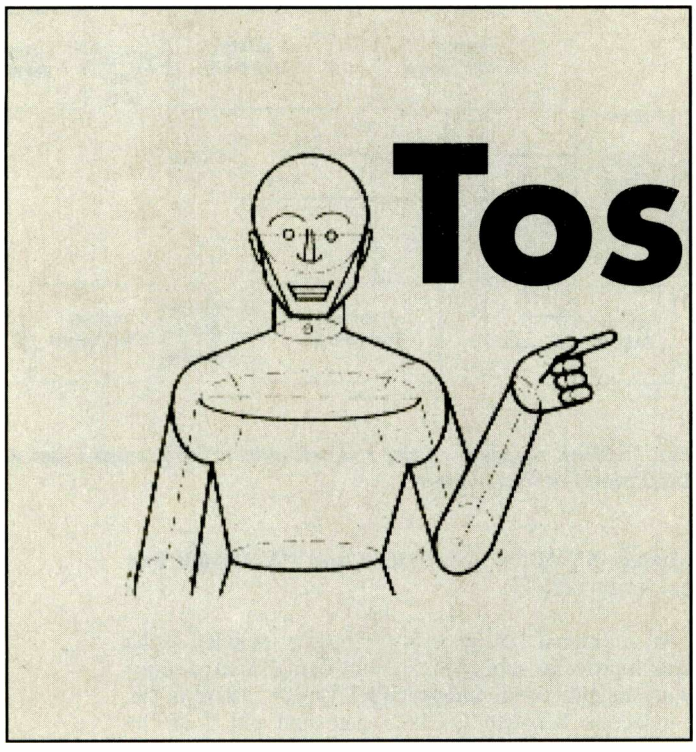
No auto-tuning, manual tuning OK (NVHD600B): C7708 associated with the text processor leaky.

Intermittent sound on recordings (NVHD650B): Change IC7503 to type MN155402VZFA.

Problems with Macrovision (NVHD650B): Fit kit part no. VEDMACRO.

Deck Problems

These models are almost identical to their predecessors mechanically, so the usual K mechanism faults can occur. With the introduction of an overhead drum motor stator with the later version of Model NVSD200B, we have sometimes had an intermittent or permanent H01 fault code. The cause has usually been the magnetic resistor on this overhead drum stator PCB. It's part no. is HW-300A-CF.



Toshiba Service Briefs

More know-how from Toshiba, based on Technical Bulletins AH75, AH76 and AH77

TV Sets

Model 259D9B

Sound is slow to come on after replacement of the audio output chip Q606, which may be overheating: The cause is excessive ripple on Q606's supply. Replace the electrolytic capacitors C866 and C869 (both 10µF, 50V) in the power supply.

Model 2173DB (C7S chassis)

Brightness gradually decreases over a period of time: The CRT's first anode voltage is being gradually reduced because C902 develops leakage. Replace C902 (1,000pF, 2kV).

A 1mm-wide vertical line is present down the left-hand side of the screen: This is caused by an internal fault in the video processing chip IC501. Fit a replacement, part no. B0102070.

No colour and very bad video smearing: The 0·1µF video coupling capacitor C514 between pins 31 and 37 of IC501 has gone very low in value or open-circuit.

Models 2857DB and 3357DB

No picture or sound but the on-screen display and service mode are accessible. When the self-diagnosis system (service mode) is entered SDA1 = GND and QA02 N/G are displayed: These sets have a primary I^2C bus that communicates with the memory IC even with the secondary bus earthed. When a set is switched on, items connected to the secondary bus are checked in the following order: H001, Q501, H002, QV01, Q302, ICD01, ICD03, QZ01, QT01. If this secondary bus is out of action because of an earthed SDA line, the set will display the circuit reference number of the item checked prior to the faulty one. In this case QA02 (memory) N/G because H001 (the tuner) has grounded the secondary bus. So replace H001, part no. 23321196.

Model 2863DB (C6SR chassis)

No sound at switch-on from cold: This fault is very temperature-sensitive, the sound returning gradually on some channels before others. The cause is the 2SC1815Y sync amplifier transistor QB11 having low gain when cold. As a result it produces a low sync output to the microcontroller chip and there's a temporary sound mute. Replace QB11, part no. A6317440.

Models 2987DB, 3387DB, 3787DB, 28W8DB and 32W8DB

No OSD menus and no teletext: Check for a dry-joint at the 27MHz crystal XF01 on the teletext module U907. Resoldering should cure.

Models 28MW7DB and 32MW7DB (C7SS chassis)

Hiss from rear surround speakers: An improved Dolby Digital module (part no. TSN01467) was introduced to deal with this problem (see *Television* April 1999, page 378). It has been used in production for some time. Before trying a replacement

Dolby Digital module, check whether one has already been fitted. Modified sets can be identified by the taller Dolby Digital module. Alternatively, check whether the set's serial number starts with the two digits listed below – only sets whose serial number begins with these digits will benefit from a change of module.

Model 28MW7TB: 10, 16, 38, 47, 54, 66, 80, 85, 86, 92, 93, 94, 95.

Model 32MW7DB: 10, 16, 38, 47, 54, 66, 68, 80, 85, 86, 92, 93, 94, 95.

After fitting the TSN01467 module some customers have noticed a very slight hum/buzz. This can be reduced to a far more acceptable level by carrying out the following modification.

(1) Cut from the Dolby Digital module the fixing lugs farthest from the IF/Nicam connector, see Fig. 1. This will isolate the earth pattern near Q670.

(2) A five-wire cable loom (four blue wires and one white) on the top side of the signals PCB connects sockets MS03A and MS03B, see Fig. 2. Cut out the wires that connect AB to AB and AC to AC. Transfer these wires to the underside of the PCB to link the same points, see Fig. 3. It is important that the wires are left long enough to enable them to be passed through the slot in the plastic chassis, as shown.

(3) Add extra wire (14cm supplied) between pin 3 of PD30A and the earthy side of C630 (see Fig. 3). This wire may already be fitted in some later production sets.

Finally, fit/refit cable ties around the Dolby module and around the Dolby/IF module combined. These prevent audio resonances.

Customers should be advised to install the rear speakers above their normal viewing position, i.e. near the ceiling and not close to their heads. This will reproduce the cinema effect.

Model 28W8DB (C7SS chassis)

About 6in. of the picture is blanked out at the right-hand side: The waveform at pin 6 (flyback blanking pulse input) of IC501 is incorrect because of a fault in the microcontroller chip QA01 (pin 26). Disconnecting pin 26 of QA01 temporarily cures the symptom. Replace QA01, part no. 23906725.

No picture via the RF or external inputs and no on-screen display: Check the supply at pin 8 of IC501. If it has risen to 8·6V the 4·7V zener diode D403 has gone open-circuit. Replace D403, part no. 23316667.

Projection TV

In order to speed repair and to avoid transit damage when a unit is returned to the workshop, special repair kits containing a complete set of PCBs have been introduced for Models 40PW8DB and

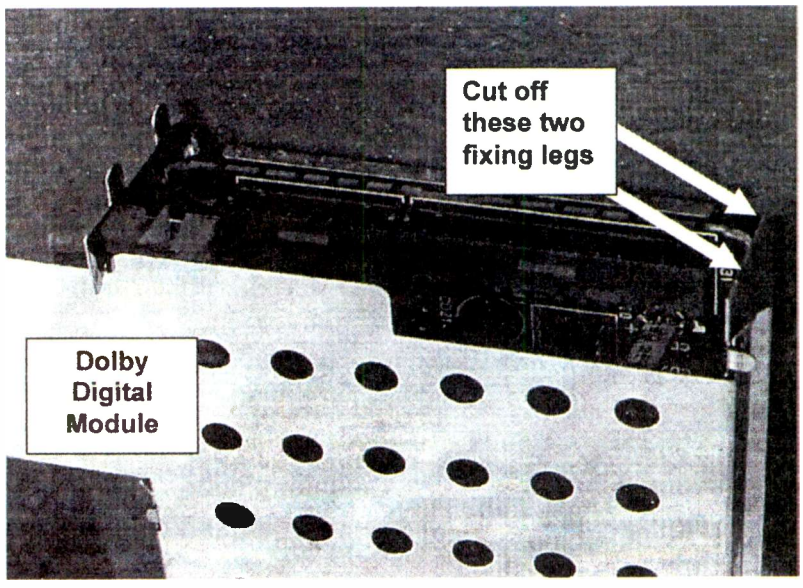


Fig. 1: Lugs to be cut from the Dolby Digital module.

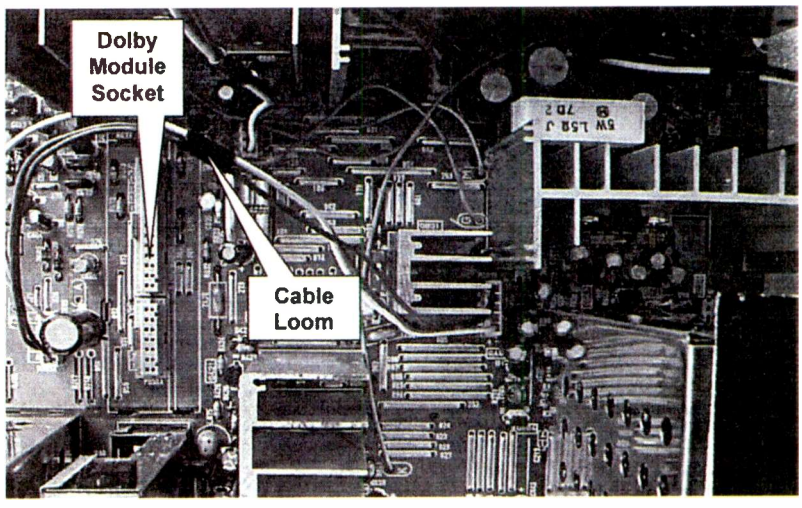


Fig. 2: Position of the five-wire cable loom on the component side of the signals PCB.

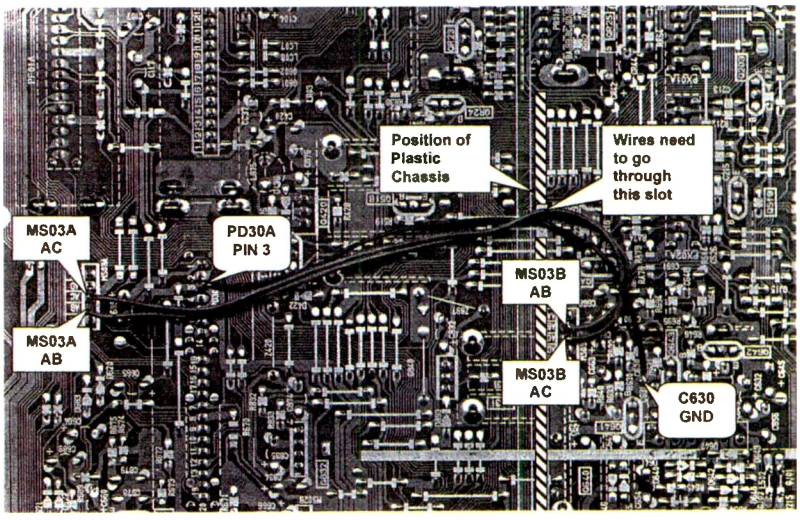


Fig. 3: New lead arrangement on the underside of the signals PCB.

56PW8DB. They are available to account holders from Toshiba's European Service Centre (phone 01276 62 222) as part nos. 40PW8DBKIT and 56PW8DBKIT. Each kit contains a service manual and a quick repair guide.

Models 40PW8DB and 56PW8DB (C8SS chassis)

Very dark or no picture: Can be caused by the 2SC1815Y blanking transistor Q915 which is mounted on the green CRT's base PCB. The transistor's part no. is A6317440.

Models 48PJ6DB, 48PJ6DG, 55PJ6DB and 55PJ6DG (C5SS chassis)

Screen blanks out for up to 30 seconds during a channel change (normal channel-change blanking period is up to three seconds): This symptom can be cured by fitting a service kit, part no. TSN01457 for the DB version, TSN01458 for the DG version.

VCRs

Models V218B, V228B and V428B

Noisy playback chroma: The CCD delay line chip IV100 is probably faulty. Check by replacement. Its part no. is 70012843.

Models V228B and V428B

RF modulator auto-set problem: The auto set-up operation with these models sets the RF modulator's output to a spare channel in the UHF band once the incoming signals have been stored in the correct positions. The RF output channel number is stored in a volatile memory location however. Thus if the power to the VCR is interrupted, the position is lost and is either reset to ch. 60 or the modulator output is switched off. As a result of this, should the customer be using RF connection the video channel will have been lost when the VCR is next used, leading to the assumption that the VCR is faulty. The cure is to replace the old microcontroller chip with the new type TMP90CS74EDF, part no. 70012944. This type is now automatically supplied when orders for the original type are received.

Models V726B, V856B and V857B

Horizontal white flashes similar to tape dropout are present. Symptom seems to be eliminated when the top cover is removed: CP051 (1µF) goes low in value or open-circuit. As a result, the –30V supply is poorly decoupled.

Model V727B

No capstan drive: If the capstan Vcc supply is missing at pin 1 of connector BT001 the 1N4001 diode DT015 has gone open-circuit. Its part no. is 70012342.

Model V728B

Unit is completely dead with no outputs from the power supply: A quick check point in this situation is the cathode of diode DP061, where a reading of 20V should be obtained. If the reading is zero, check the drain pin of the STP3NA90N chopper FET TP020, where the voltage should be about 300V. If this voltage is OK, TP020 is probably faulty. Its part no. is 70012897.

Widescreen sets picture geometry adjustment

Models 28MW7DB, 28W8DB, 32MW7DB and 32W8DB

An increasing number of viewers seem to be using Region 1 (American) NTSC DVD discs. If geometry complaints are received, try to establish whether such discs are being used. The geometry set-up procedure for these models is as follows.

Refer to page 6 of the relevant service manual for details of how to enter the service mode.

Page 7 of the manual shows how to obtain the built-in test patterns. The first 14 patterns are for an NTSC display, the last 14 for a PAL system display. The SCART button takes you through the patterns. It's best to use the black cross dot pattern (beam current approximately 50 per cent).

Refer to page 19 of the manual (Models 28MW7DB and 32MW7DB) or page 14 (Models 28W8DB and 32W8DB). There are three entries for each geometry parameter. The first entry for each should have the word WIDE next to it.

The sequence of adjustment should be WIDE then SUPERLIVE then CINEMA. To change between the screen size modes, press CALL on the remote-control unit, select the size required from the 16:9 or SIZE button, wait for the graphic to disappear, then press MENU on the TV set.

The geometry should be adjusted in both the NTSC and PAL modes, as each is different.

Parameters are changed by using the programme up/down buttons and adjusted by using the volume up/down buttons. Remember where you started, as each change is stored automatically.

Exit the service mode by switching off or returning to standby.

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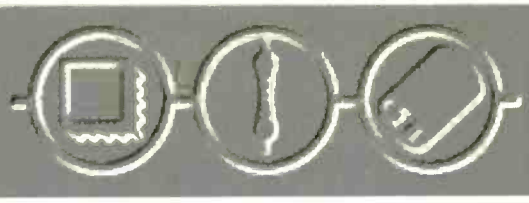

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2433891H	LOT23	1400p
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3122 138 37620	LOT90	1200p
3139 128 30400	LOT90	1200p
4812 140 10369	LOT90	1200p
4812 140 10421	LOT90	1200p
4822 140 10274	LOT123	1450p
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AT 2076 / 10	LOT57	1100p

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ST5 , ST-12	SATPSU20

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PACE	
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MSS500 , MSS1000 MRD920 , SS9000 , SS9010 ,	SATPSU10
SS9200 , SS9210 , SS9220	SATP-SU2
MSS100 , PRIMA	SATPSU8
APOLLO , MSS200 , MS290 , MSS300	SATPSU9
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TU-SD250	SATPSU9

MAKE & MODEL	CODE
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STU350	SATPSU9
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SAT301	SATPSU10
THOMSON	
SRD11 , SRD 14	SATPSU1
SRD7/8 , SRS3 , SRS4	SATPSU2
THORN	
SAT99 , SAT120	SATPSU1
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SAT99 , TU-SD200	SATPSU1
TS540	SATPSU10

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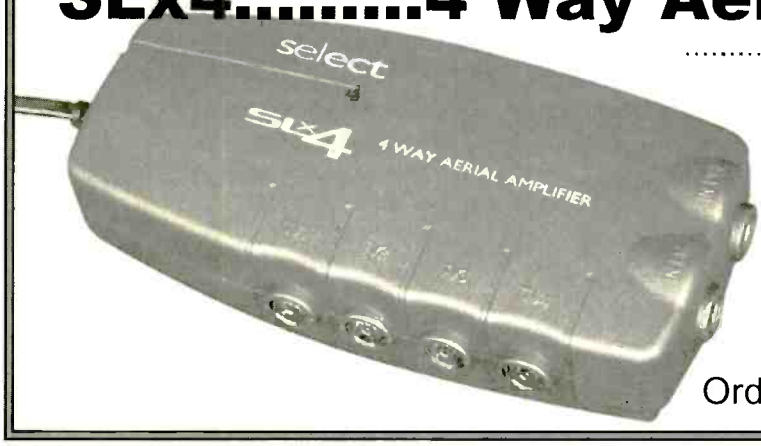

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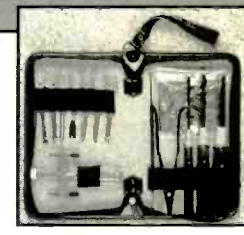

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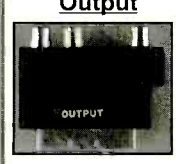

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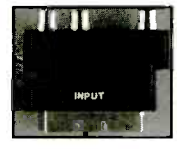

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BU2508D	130p	BUZ80	135p	MJ15016	350p	TIP33C	60p	LM339	35p	STR4211	315p	TDA1175	175p	TEA2262	275p	UC3845AN	80p
BU2508DF	120p	BUZ80AF	200p	MJ15022	400p	TIP34C	60p	LM393	45p	STR440	800p	TDA1180	120p	TEA5101A	175p	UPC1188H	350p
BU2520AF	170p	BUZ90A	180p	MJ15023	400p	TIP35C	65p	LM723	40p	STR441	950p	TDA1518BBQ	240p	TEA5101B	175p	UPC1488H	115p
BU2520DF	225p	BUZ90AF	280p	MJ15024	400p	TIP36C	65p	SAA1293	550p	STR44115	475p	TDA1557Q	300p	TEA5170	200p		
BU2525A	325p	BUZ91A	260p	MJ2501	100p	TIP41A	20p	SAB3035	275p	STR451	800p	TDA1555Q	300p	UC3842N	60p		
BU2525AF	220p	IRF510	70p	MJ2955	55p	TIP41C	22p	STK4131	480p	STR4512	400p	TDA2004	150p	UC3842AN	80p		
BU2525D	240p	IRF520	75p	MJE13007	100p	TIP42C	22p	STK4141 II	420p	STR50103A	260p	TDA2005	150p	UC3843	80p		
BU2527AF	400p	IRF530	75p	MJE13009	100p	TIPL791A	80p	STK4142	530p	STR54041	320p	TDA2030	80p				
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BU508APH	60p	IRF610	80p	MJF18004	175p	AN5601K	750p	STK4152	650p	STR59041	300p	TDA3562A	260p				
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BUH1215	450p	IRF720	85p	S2000A3	175p	HA13152	800p	STK5331	300p	STRD1806	360p	TDA4600	200p				
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BUH315D	175p	IRF740	90p	S2000N	150p	HA13155	920p	STK5333	650p	STRD4420	550p	TDA4601	120p				
BUH515	200p	IRF820	90p	S2055A	175p	HA13157	950p	STK5337	550p	STRD6108	450p	TDA4605	190p				
BUH515D	250p	IRF830	85p	S2055F	175p	LA4440	200p	STK5481	470p	STRS6707	1000p	TDA4950	100p				
BUH517	275p	IRF840	85p	S2055N	150p	LA4445	200p	STK5482	285p	STRS6708	575p	TDA8170	170p				
BUH517D	175p	IRF9610	95p	TIP121	35p	LA4460	120p	STK73410	350p	STRS6709	600p	TDA8171	230p				
BUH715	425p	IRF9620	85p	TIP122	30p	LA4461	120p	STK73410 II	500p	STV9379	400p	TDA8172	200p				
BUT11A	35p	IRFBC30	120p	TIP125	30p	LA4705	400p	STK7348	400p	TA8207K	175p	TDA8350Q	275p				
BUT1AF	35p	IRFBC40	210p	TIP127	35p	LA7830	90p	STK73605	375p	TA8215	300p	TDA8362N3	1200p				
BUT12A	80p	IRFZ44	160p	TIP2955	50p	LA7851	200p	STK73907	700p	TA8221AH	600p	TEA1039	150p				
BUT12AF	90p	MJ11015	250p	TIP29A	22p	LM1207N	450p	STK7406	650p	TA8227	250p	TEA2018A	80p				
BUT18A	80p	MJ11016	300p	TIP3055	50p	LM2405T	625p	STK7563F	650p	TA8251AH	700p	TEA2037	200p				

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HELP WANTED

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

Wanted: Circuit diagram for the Avo 8 Mk 3, or help with the following fault: the high-resistance setting doesn't work though a new battery has been fitted. Please phone or fax Eric Chapman on 01522 688 307 or e-mail erich@btinternet.com

Wanted: EHT multiplier/splitter assembly for the Sanyo projection Model CVP9111T. New preferred but a used part would do. A service manual would be helpful – we could photocopy and return if necessary. Please phone Russell J. Fletcher or Martin Batsford on 01209 612 260.

Wanted: Instructions for a Technics programmable remote control transmitter type SH-R500. Photocopy OK. Robert Crooks, 42 Edenderry Village, Shaws Bridge, Belfast BT8 8LG.

Wanted: *VCR Troubleshooting and Repair Guide* by R. Brenner, published by Sams Press. No. ISBN0-672-22507-7. Peter Hills, 50 St. Augustine's Avenue, Wembley, Middx HA9 7NX. 0181 904 5955.

Wanted: Circuit diagram for the electronics control board in the Toshiba microwave oven Model ER5720E/EW. The PCB is type EDT517T. A.R. Pond, 71 Rochford Road, Southend-on-sea, Essex SS2 6SR. Phone 01702 330 839.

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Wanted: Service manual or circuit diagram for the Panasonic CTV Model TC2255UR (UK type). Photocopy OK. Will buy. Peter A. Zulu, PO Box RW640X, Lusaka, Zambia.

Wanted: Circuit diagram for the Alba monochrome TV Model PTV9C. P. Guarini, 31 Alderson Avenue, Rawmarsh, Rotherham, South Yorkshire S62 7DE. Phone 01709 523 599.

Wanted: Chopper transformer for the Matsui CTV Model 2095T. The circuit reference no. is TR100 and the part no. 602800003820. M.L. Biddlecombe, Avondale, New Road, Porchfield, Isle of Wight PO30 4LT. Phone 01983 525 555, mobile 0966 361 798.

For disposal: Barco Repso 67 projection monitor. Requires one tube and an EHT board. Available for spares or repair. Contact Frank Moscatiello, 21 Crowson Way, Deeping St James, Cambs PE6 8EY. Phone 01778 344 030.

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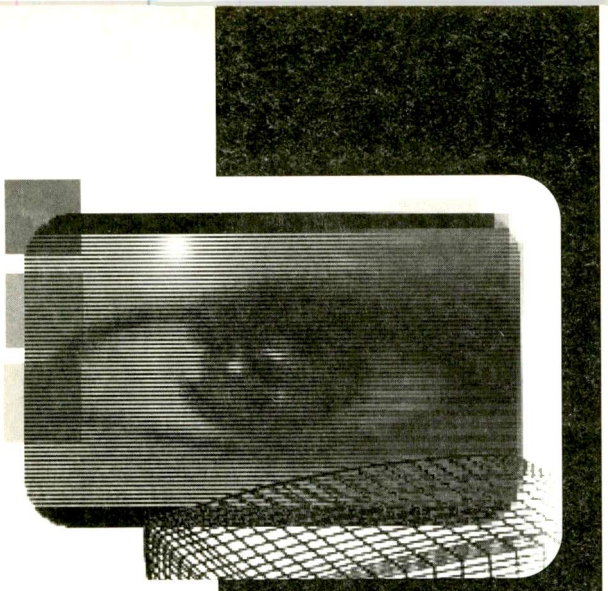
Wanted: Circuit diagram or service information for the Philips PM5508 colour-bar generator. Fault is no colour! Michael O'Sullivan, 13 Rivervalley View, Swords, Co. Dublin. Phone 00 353 1 840 3093 or e-mail tva@ tinet.ie

Wanted: Scrap Akai VS75 VCR for salvaging lower drum assembly. A.G. Chamberlain, 62 St. Lukes Road, Bournemouth BH3 7LU. Phone 01202 521 990.



TV Fault Finding

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Terry Lamoon

Panasonic TX21MD1B (Euro 2L chassis)

There were two faults with this set, 'hooking' when prerecorded tapes were being played back and intermittent reversion to standby. The latter would occur three or four times a night, but use of the remote control unit would switch the set back on. It was while curing the first fault that I discovered the cause of the second one.

The 'hooking' was caused by the fact that the video was tuned in on programme position 6 instead of position 0 (AV). While I was tuning the video in and the screen was displaying a bright snowy raster the set went to standby. The only way in which I could keep the set on for long enough to tune in the video was to turn the brightness and contrast down.

This indicated a beam limiter problem. In his article in the June 1999 issue Brian Storm mentioned R558 (120kΩ) as a possibility. But it was OK. So a manual was obtained. When I examined the circuit diagram I found that the beam limiter circuitry is quite complex. Beam current is sensed in the usual way, at the earthy end of the diode-split LOPT winding. One feed goes to Q552, which conducts to reduce the first anode voltage when the beam current is excessive. The other feed is taken to Q504, whose collector voltage goes high when the beam current is excessive. It's connected to pin 27 of the microcontroller chip IC1201. This connection was not shown in the circuit diagram – I had to carry out ohmic checks to find it. Thus IC1201 senses excessive beam current and tells the colour decoder IC, via the I^2C bus, to reduce the contrast. Only this wasn't happening.

It was beginning to look like a software problem. A new EEPROM (part no. X27C16P-F1) was bought, copied and fitted. This cured the fault. All the stored settings – tuning, picture geometry, grey-scale etc. – had to be reset before the receiver could be returned to the customer.

The EEPROM reader I bought for my PC from Crownhill Associates (01353 666 709), called the Smartie, is turning out to be invaluable. I will be able to program the EEPROM myself next time I see a TX21MD1. **P.B.**

Matsui 20V1T (Grundig CUC7301/3 chassis)

A dry-joint at C669 caused havoc with this set. The MJF18004C chopper transistor T665 had gone short-circuit collector-to-base, damaging the following components: IC630 (UC3842N/AN); D621-4 (4 x 1N4007); R661 (220Ω); D663 (3·6V zener diode, part no. 8309-720-036); and CD651 (ZD18V, part no. 8309-455-181). Once these items had been replaced the set worked for ten minutes. Then the power supply began to trip, followed by the 'dead' set with the front LED flashing symptom. D667 (BA157) was the cause – it had become leaky.

Note that there are component changes in the power supply if the set is fitted with a 155X01 21in. Philips CRT. **P.B.**

JVC AV21TS2EK

We've had two unusual faults with this model recently: in both cases the cause was the same, the TB1227AN jungle chip IC101. The symptom with the first set was very disturbed field sync. When channels were changed the field would lock at some very strange parts of the screen. There was no rolling, just abnormal picture lock. The second set had a very faint green line down the right-hand side of the picture, about 6cm away from the edge. In this case scope checks took us to IC101. **K.J.G.**

Ferguson T14R (TX805 chassis)

This set was stuck in standby. As usual, protection zener diode DP50 (BZX85C150) was short-circuit because of dry-joints at the unmarked wire link next to the LOPT's earth pin. Note that the wire link is covered by the LOPT and cannot be seen. This has the effect of removing reservoir capacitor CP17 from the 103V line which the diode is there to protect (against overvoltage). Presumably the resulting ripple takes the supply above 150V. **G.M.**

Goodmans C1402

This rather scruffy portable was dead. I found that its mains fuse had blown because one of the mains bridge rectifier diodes, D613, was short-circuit. All four diodes (D611-614) looked stressed and were replaced. They are unmarked, but BY133 diodes are suitable as replacements.

The set then came on but was stuck in standby. Checks in the start-up circuit section of the main power supply revealed that opto-isolator IC612 didn't switch on when the PWR command line went high. A replacement opto-isolator cured this. It's also an unmarked

device. Fortunately it is not used for feedback and is not too critical. Many four-leg devices should work, such as the Sony SHF617G2 that I used. **G.M.**

Daewoo T512 and T514 (CP330 and CP365 chassis)

If the set powers up and switches in and out of standby but there's no picture, check for line drive at pin 37 of the TDA8362B jungle chip I701. During normal operation this chip is powered by a LOPT-derived supply, so a start-up voltage is required. This 8·2V supply, at pin 36, is obtained from the 103V line via R401, R402 and D401. If it's present, replace the IC. The fault seems to be quite common with both these chassis.

If the picture has a heavy magenta cast when I701 has been replaced, the TDA4661 chroma delay line chip I501 should be replaced. It can be damaged when I701 fails. **G.M.**

Ferguson B59F (ICC7 chassis)

If one of these sets comes in with low sound, replace C514 (1µF, 63V miniature axial electrolytic) which hides inside the IF can.

If the picture is smeary with poor colour, giving the impression that the CRT is flat, check the 39kΩ, 1W resistors RT24, RT44 and RT64 on the CRT base panel: they tend to go high in value. If one or more of these resistors goes open-circuit the result is loss of the relevant colour(s). This latter fault can also be caused by failure of the TEA5101A RGB output chip. **G.M.**

Philips 41GR8841 (G110-PTV chassis)

Excessive width was the problem with this massive projection TV set. Luckily it's an early model, of the three-CRT type, and thus shares much of its technology with a conventional TV set. The cause of the trouble was a reversible electrolytic capacitor, C2549 (10µF, 50V), in the EW correction circuit. It had dried up and fallen in value. **G.M.**

Sanyo C28WN1 (WB2B chassis)

This smart, widescreen set appeared to be stuck in standby. The separate standby power supply was running, but the main chopper power supply had blown up. Chopper transistor Q634 (2SC4429), its driver transistor Q633 (2SC3807), and the surge limiter resistor R902A (3·9Ω, 10W) had all failed. When these items had been replaced the set powered up but there was no sound or teletext!

Sound was restored by replacing the TA8200H audio amplifier chip IC001. It had been overheating. The cause of the teletext problem was the 27MHz clock crystal X2901. **G.M.**

Daewoo T512 (CP330 chassis)

Many of these sets come in with teletext problems, i.e. no text, garbled text, intermittent text, and maybe other erratic remote/front panel control operations. The cause is likely to be the 27MHz teletext clock crystal XT01. It seems to be rather unreliable. **G.M.**

Philips 25PT4521 (Midi 1.1 chassis)

If the sound is OK but there's no picture, check whether fuse 1463 (630mA) is open-circuit. Also check the tesla module which is present in some sets but is not shown on the circuit diagram. Its part no. is 4822 212 32363. On a couple of occasions I've found that transistor 7400 (BC327) and diode 6400 (1N4148) on this panel have been the cause of the fuse failure. **D.F.**

Matsui 1482

If the power supply attempts to start up then shuts down, don't try isolating the line output stage or using a dummy load. It won't work. To maintain power supply operation the line output stage has to be running. Use a variac instead: an input of 160V seems to be about right.

Check for a hairline crack in the print from pin 1 of the LOPT to the collector of Q702. The print here seems to break easily. **D.F.**

Philips 25PT4521 (Midi 1.1 chassis)

There was no sound or picture, with the power supply cycling. I could just hear the EHT come up, then there was nothing except the sound of the power supply trying to start at intervals. When the set was switched off there was still EHT at the CRT's final anode connector, indicating that the line output stage had worked briefly. So I disconnected the supplies on the secondary side of the LOPT in turn, and was rewarded with a healthy buzz from the field scan coils when the 13V supply was disconnected. This enabled me to trace the cause of the problem to transistor 7450 (BC558B) in the protection circuit. I'm glad I didn't follow my first instinct, which had been to replace the LOPT. **D.F.**

Matsui 1436/1436XA

The line hold was off frequency. When I adjusted it (R481) I found that the control was very sensitive, and that when a locked picture was obtained it was displaced to the left. The Channel 5 on-screen logo was useful in showing this displacement.

I replaced the TA7698AP jungle chip but this made no difference. The fault was cured by replacing C490 (0·47µF, 63V), after which the line hold could be set correctly and the picture centred with the line phase control R482.

This fault could also occur with the **Alba Model CTV100** and the **Bush Model 2004**. **D.F.**

Hitachi CPT2508

This set was tripping erratically. The cure is usually to replace C910 and C916 (both 33µF, 10V), C919 (4·7nF, 2kV) and C927 (2·2nF, 2kV); change C914 to 10µF; and check C909 (150µF, 400V), R919, R920, R931 and R932. In this case the tripping then stopped but the set wouldn't come on. To help matters, the field scan coupling capacitor C610 (100µF, 25V) then exploded! There was a lowish resistance across the 152V line: it disappeared when the scan coil plug was disconnected. Unusually, there was a short between the line and field scan coils. A salvaged yoke brought the set back to life. **G.D.**

GoldStar CIT9172 (PC11A chassis)

Intermittent operation has been the trouble with several of these sets. Resoldering the TDA8214 timebase generator/field output chip IC401 usually helps, but for a lasting repair the chip should be replaced. A word of warning: the screening cover over this area must be soldered back firmly – otherwise the IF stage won't work! **G.D.**

Toshiba 1400TB

The symptoms with one of these sets were a vastly expanded field scan and no height control. With this and similar models the cause is usually the two 2·2µF capacitors in the field feedback circuitry – they are usually dark red or brown in colour. In this case both of these capacitors were leaky but the main

cause of the problem was the 7·5V clamp zener diode D315 being leaky. **G.D.**

Samsung CI6230

There was no sound. The AF stages were happy, proved by feeding an input to the scart socket, but there was no Nicam or FM sound. Scope checks at IC601 (TDA8415) showed that there was plenty of input but no output. Either the IC was faulty or, as in this case, the oscillator had stopped. A new 10MHz crystal cured the fault. **G.D.**

Ferguson A51F (IKC2 chassis)

We were told that this set would go into standby after a lengthy period of operation then not come on again. It was a while before the fault put in an appearance in the workshop: it was caused by the trip operating once, putting the set into the standby mode. The cure was to replace transistors TV01 (BC558C) and TV02 (BC548C). **G.D.**

Grundig GT1402 (G1000 chassis)

This set wouldn't come out of standby. I found that there was no line drive because feed resistor R314 (6·8kΩ, 2W) in the line driver stage had gone open-circuit. **M.Dr.**

Matsui 1440

If there's no sound at all, replace R354 (47kΩ, 0·5W). It provides bias for the base of the lower transistor (Q352) in the audio output stage. **M.Dr.**

Tatung T21TD50 (D series chassis)

There was no line drive and R427 (22Ω) in the supply to the line driver stage was burning. No shorts could be found however, and a replacement driver transistor made no difference. The cause of the trouble turned out to be the 4·7Ω safety resistor R822 in the 8V regulator circuit. Because it had gone high in value, the 8V supply was low. **C.J.G.**

Philips 22CS5740 (System 4 chassis)

The picture would blank out for a second or so at random intervals. I was eventually able to ascertain that the cause of this was momentary field collapse. The culprit was the field flyback boost diode D6107, which was going open-circuit intermittently. **C.J.G.**

Sony KVM2151 (BE2A chassis)

This set had a blank raster with normal sound. When I looked at the PCB I saw that three of the large ICs had been replaced, and that the soldering was none too tidy. It seems that the customer had taken the set elsewhere and, after considerable delay, was not prepared to leave it there any longer. In view of this I assumed that the ICs were not to blame and set to work. A check on the sandcastle pulse soon showed where the cause of the trouble lay. The top of the pulse was of low amplitude and rounded. The step was also rounded. Only a small number of components are involved in forming the pulse. I found that the DAN202 surface-mounted diode D504 was leaky. **C.J.G.**

Sony KV21T1U (BE4A chassis)

This set had a narrow, unfocused raster with normal sound. I'd had the same symptoms recently with a set fitted with the **Grundig G1000** chassis. This provided a clue. Both sets use the MC44007 jungle chip. Bearing this in mind I looked in the microcontroller area and found a 24C02 EEPROM. An empty replacement produced a normal raster. Tuning in the channels, then going into the service mode to set up the geometry and drive values, restored normal operation.

To get into the service mode with this chassis, use the remote control unit to switch to standby then press, in the following order, OSD, 5, vol+ and TV. The set will come on with "TT" displayed at the top of the picture. Press menu to display the adjustments, which are self-explanatory. **C.J.G.**

Ferguson C51F (ICC6 chassis)

There was horizontal jitter on the picture. Turning the horizontal phase control PV76 to one end of its travel cured the jitter but left the picture displaced. The cause of the fault was the BC858 chip transistor TV71 which was leaky. **C.J.G.**

Pioneer SD28AV1 (Nokia Compact chassis DE)

There was excessive width but no EW error. The customer had found and tried to adjust the width control, breaking it in the process. Once a replacement had been fitted there was still excessive width at its minimum setting. The HT was correct. The cause of the trouble turned out to be a dry-joint at one side of C513, which is one of the two parallel-connected 0·18µF scan-correction capacitors. **C.J.G.**

Sony KVM2130U (BE1 chassis)

The complaint with this set was "intermittent no picture, usually at switch on from cold". When the fault eventually put in an appearance the symptom turned out to be loss of sync. Scope checks around the timebase generator chip IC551 showed that in the fault condition there was no video signal at the sync separator input pin 5. This input comes from the teletext panel – pin 2 of plug CND44.

There is little on the teletext panel. Video enters IC02 (type SAA5231 or SDA5231A) at pin 27 and leaves at pin 1, going to the buffer transistor Q04. IC02 had an input waveform but there was no output. Voltage checks seemed to be inconclusive. The IC had a 5V supply, but neither of its timing crystals was doing anything. After replacing the chip to no effect I consulted the circuit diagram. All then became clear. Most of the circuitry on the teletext panel runs at 5V, but IC02 requires a 12V supply which is obtained from the on-board surface-mounted transistor Q02 (2SC2873-Y). This had failed: it was actually producing an output of exactly 5V instead of 12V. A replacement put an end to the trouble. **P.G.**

Sharp C1421

The complaint with this portable was "lines on the picture". They were flyback lines which were on a background of varying brightness. Voltage checks on the CRT base panel showed that the HT supply for the RGB output stages was low at 72V instead of about 180V. The cause of this low voltage was the reservoir capacitor C620 (4·7µF, 250V), which had dried up, and the associated safety resistor R620 (22Ω) which had gone high in value. Replacements cured the fault. **P.G.**

Mitsubishi CT25M1TX

This set seemed to be dead though the power supply was working. The cause of the trouble was traced to a hairline crack at the collector pin of the line output transistor. Re-soldering this restored normal operation.

Before I return one of these sets I normally replace the chopper tran-

sistor's troublesome base coupling capacitor C906 (47µF) as a matter of course. I also find that C905 (470µF) tends to leak electrolyte. Before you replace either of these two capacitors check that the mains rectifier's reservoir capacitor is discharged: it can bite even after a day or so. **P.G.**

Goodmans 2875

This set would intermittently die, usually after working for several hours. When it worked normally there was an intermittent crackle on the sound. With these sets it's always worthwhile carrying out a check for dry-joints around the chopper transformer. Sure enough there was a good crop of hairline cracks around the pins. Resoldering cured the problems. **P.G.**

Philips 52KV2525/05 (G90 chassis)

The complaint was that channels disappeared at random and frequently had to be retuned. The usual cause of this is the main microcontroller chip. Replacements come with a tinplate screen to prevent static affecting it and the associated EEPROM. I fitted a replacement and put the set on soak test, but the fault was still present. There's not much else that could cause the problem. The X2402 EEPROM proved to be the culprit – it was intermittent. I've had more than a few of these devices fail in other chassis. This is the first time I've had the fault with a G90. **P.G.**

Sony KV1462

This set produced a negative picture. A bit of light tapping showed that the problem was to do with module IF201. When it was stripped down several dry-joints were seen. After a thorough resoldering of all joints the set worked perfectly. **T.L.**

Matsui 1455

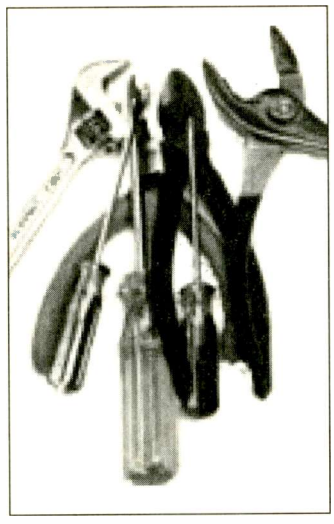
A nasty picture flutter was caused by HT instability. When I disconnected the feed to the line output stage the HT supply settled down, but as soon as a load was connected the problem came back. I noticed that the standby switching transistors Q605/6 were getting very hot. They are known to cause problems, though the symptom is usually to do with standby operation. Anyway, I disconnected and checked them and found that Q605 was leaky. As a precaution I replaced them both, then reset the HT voltage. Q605 is type 2SA1013, Q606 type 2SC2335. **T.L.**

Grundig CUC7350 Chassis

This set didn't do anything because the 8V supply (+E) was missing. It's used by the TDA8374 'jungle' chip IC34015, which amongst other things produces the line and field drive waveforms. The cause of the trouble was the 15Ω safety resistor R61021 in the 8V regulator stage – it had gone open-circuit. **T.L.**

Matsui 2092T

The complaint with this 20in. set was intermittent line foldover and tearing. When I tapped and probed around in the line timebase I discovered a dry-joint at the line driver transformer T401. Once this had been resoldered the set worked perfectly. **T.L.**



John Edwards' Casebook

Aiko CT18

I'd never heard of this brand before. Despite the model number, the screen size was about 15in. The customer said that the fault had developed about three years ago: the set had then been consigned to the attic. But new family members had arrived, and to help keep them occupied and apart it was decided to bring the set back into use. After being dusted down it was sent to me, and was now on the bench.

When I switched the set on, the on-screen display said channel one. But there was no sound or picture, not even snow. When they were selected, all the usual viewer commands appeared on screen against a lifeless, blank raster. I removed the back and surveyed the innards, which were quite straightforward with standard ICs. The only part that could prove troublesome should it be faulty was the oversized tuner module, which had no markings or type number.

I was thinking of carrying out scope checks at the pins of the TA7681AP IF chip IC101 for signs of signal activity when I spotted, between the IC's pins, a crusty green substance. "Bet they've got a cat" I thought. On closer inspection I saw that all the pins of the IC were joined by this greeny-brown, corrosive mess. After desoldering it, with the aid of a solder mop, I gently prized the IC from the board. A few of its pins parted company and remained in their holes.

I didn't have a replacement chip in stock. After ordering one I decided to investigate further. With the IC removed more of the board was exposed and a lot more crud was evident. A wire link beneath the IC had corroded away, and the bodies of two resistors (R116 and R117) had parted company from their legs. There was slight contamination at the base of the tuning transformer T114 and, when it was removed and turned upside down, it was found to be full of green corrosion: the lower part of the outer casing was brown with rust. I used a pin to break up the crustation very gently, and tweezers to remove the debris. I then resoldered the fine wires to their terminals. The last item that had clearly been attacked was the SAW filter casing, which was brown with rust. I removed it and found that the gundge covered and surrounded the pins. Again, careful scraping and cleaning was required.

After extracting the remains of the two resistors I scraped away at the board with a small screwdriver. Once the crud had been removed I sprayed the affected area with switch cleaner then gave it a good scrub with a toothbrush. The board looked much healthier after this.

The colour-code stripes on the corroded resistors had rotted away, so I traced out the print path at either side of the two resistors and made a sketch of the circuit. I then looked through some manuals for a circuit diagram that includeded a TA7681AP chip. I eventually came across one and found that position R116 was occupied by a 1·5kΩ resistor and position R117 by a 220Ω resistor. Replacements with these values were fitted.

The new IC arrived next day. I fitted it, drew a deep breath and switched on. To my surprise and relief, the sound blasted out and the screen, though very dark with no luminance content, displayed some movement in chroma. I looked around wondering what to do next. Then automatically, without conscious thought, I changed the position of the slider switch on the tube base panel. A perfect picture appeared. All that remained was to decide how much to charge!

Sanyo CBP2580 (EB1 chassis)

When I switched this set on all I got was a brief crackle of EHT. It then shut down to standby. Some voltage checks showed that the power supply was working, but the 12V and 5V regulators on the secondary side of the chopper transformer were switched off by a standby command from pin 7 of the microcontroller chip. This in turn meant no supplies to the timebase generator and other circuits. I desoldered pin 7 of the microcontroller chip, thereby removing the standby command. This enabled the regulators to do their job. Line drive was restored, and the output stage came into operation. The screen then displayed field collapse. Feeling good at how clever I'd been, I next confirmed that there was a 27V supply for the TDA8170 field output chip. The chip was cold to touch, so a few minutes later a replacement had been fitted. All eyes were focused on the screen. Yep! You guessed it – no difference. Time to admit that I wasn't so clever after all and to get down to proper fault-finding.

The 1V peak-to-peak field drive pulse was missing at pin 1 of the TDA8170 chip. It should come from pins 26 and 27 of the DPU2553 processor chip on the plug-in video board. The supplies etc. were present, so it seemed likely that a new chip would cure the fault. There are a few other digital chips on the board, but what really put me off was the double-sided print, with tracks soldered to the chip's pins above and below the board. My good friends at Chas Hyde offered a board repair service at £50 plus VAT, which meant that there would be no profit as far as I was concerned – plus the possibility that something else could be wrong.

I keep scrap PCBs and chassis in a shed, in case I need a hard to get or a special part. I just hate throwing things

Continued on page 862

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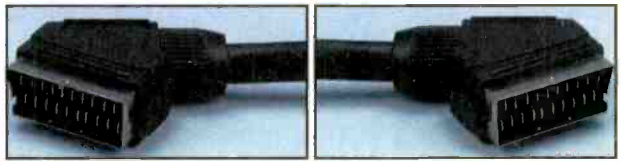

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WebTV brings the internet and TV services together, along with features such as home shopping and banking. George Cole describes the origin of the system and the current state of the technology

Microsoft's WebTV

During a visit to Microsoft's headquarters in Seattle I was able to catch up on the company's WebTV Networks system, which combines TV, telephony and the internet. Trials have recently been run in the UK and Germany, with WebTV set-top boxes produced by Pace.

The basic idea behind WebTV is to make internet access simple and relatively inexpensive. The usual device used for access to internet material is of course the personal computer. Though PC prices have fallen substantially, a significant number of people are still unable to afford them. Many others find them difficult to operate. Fifty per cent of homes in the USA have access to a PC: in the UK the figure is about 25 per cent. So the potential market for WebTV as an alternative would appear to be large. It's interesting that while the average age of internet users in the USA is 25, the figure for WebTV users is 45 years.

WebTV aims to offer the best of both television and the internet. TV offers fast response (press a channel button and it appears), is a moving medium with sound and is a social device, usually watched by a small group of people. On the downside, TV provides limited content (in terms of channels) and is essentially a one-way medium, though new digital and interactive services are changing this. In comparison the internet is an on-demand system that offers almost unlimited content and is by nature interactive. The snags are that the internet can be slow, has little audio content (though more and more sites are offering sound files) and is designed for individual use.

Microsoft is keen to stress that WebTV is not a replacement for the PC. The latter can be used for a varitey of purposes, including word processing and access to databases. WebTV is a low-cost internet device designed for use with TV. It has been launched in the USA, Canada and Japan as a stand-alone service. There are at present some 800,000 subscribers.

Background

WebTV was founded in 1995 by three US technology workers who saw potential in a device that would provide internet content on a TV screen – a vision shared by NTL, which has launched TV-Internet in the UK.

One of the problems is that Web content is designed for display on a PC monitor that provides higher resolution and a faster frame refresh rate than TV. While monitors use progressive, i.e. non-interlaced, scanning nearly all TV sets can provide only an interlaced display. To overcome this limitation, the WebTV founders developed ways of reformatting Web content for TV. A WebTV display does not look as sharp as that provided by a PC monitor, but the quality is nevertheless impressive. The first WebTV products were launched in 1997 and simply offered internet access via a TV set. The system has been refined since then, and there are now third-generation products.

In 1997 WebTV was acquired by Microsoft for $425m (some £285m). It's now a division of the software giant. Although Microsoft is best known as a software company, with products such as the Windows operating system and the Word word-processing package, the company has been keen to expand into other areas. These include broadcasting. Microsoft has stakes in a number of cable TV companies, for example NTL and Telewest in the UK. It has developed products such as Windows

CE, an operating system for various devices that include set-top boxes, and TVPack, an interactive TV system. Microsoft is a member of the Advanced Television Enhancement Forum (ATVEF), whose aim is to establish a standard content format that broadcasters can use to develop enhanced TV programming. Pace was the first European member of ATVEF.

Using WebTV

WebTV has been designed so that it can be installed and used as a consumer electronics product, which is good news for anyone who has ever had to install a PC! The hardware consists of a set-top box that plugs into a TV set, using RF and/or composite or S-video connections, a telephone socket and a power source. When the WebTV box has been connected up it automatically installs the appropriate software and presents the user with an on-screen electronic registration form. Once this has been filled in and submitted, the WebTV box is ready for use.

The WebTV box is operated via an infra-red kaypad – there's also an optional wireless-linked keypad, which is more convenient for e-mail. The WebTV box shares the same telephone line as the home phone – if someone calls while the internet is being used, the session pauses so that the call can be taken. At the end of the call the WebTV box takes the user back to the last web page or site in use.

Services and Hardware

Three WebTV services are currently available: WebTV Classic, WebTV Plus and WebTV Plus for Satellite. WebTV Classic provides the user with internet access, including a site known as the WebTV Centres which offers a range of specially-produced content. This includes news, travel and weather information. Users also get up to six e-mail accounts, a home shopping area and a facility for creating personal pages for publishing on the internet. The WebTV Classic service costs $20 (£13) a month for existing subscribers, $22 (£15) a month for new subscribers or $10 (£7) if the user already subscribes to an internet service.

WebTV hardware is made by Sony and, under the Philips-Magnavox brand name, Philips. Early versions of the WebTV Classic box had relatively little memory (2MB each of RAM, ROM and flash) and used a 112MHz R4640 processor. An internal modem offered data speeds of up to 33·6kbits/sec, and there was provision to operate a Hewlett Packard printer.

This summer Philips and Sony introduced a new generation of WebTV Classic products, Models MAT965/968 and INT-W150 respectively. They have more memory (8MB of RAM, 2MB of ROM and 4MB of flash memory), a faster processor (the 150MHz R5230) and a faster (56kbits/sec) modem. The Philips Model MAT968 also has a microphone input. The boxes will operate HP and Canon printers.

Philips' latest WebTV Classic box provides various audio, video, PC and telephony connections. These include a parallel printer port, RJ11 telephone jack, IR jack, phono audio output sockets, a composite video input for use with a camcorder, digital camera or VCR when making web pages or attaching images to an e-mail, an S-video output and RF input and output.

In addition to WebTV operation, the boxes contain a wide range of software for access to internet content, including full HTML support (this is the programming language used for creating most web pages) and JavaScript 1.2 compatibility. They will work using a number of audio, video and graphic formats such as MPEG-1 and MPEG-2 audio, MPEG Layer 3, JPEG images, MPEG-1 video, VideoFlash and GIF animation.

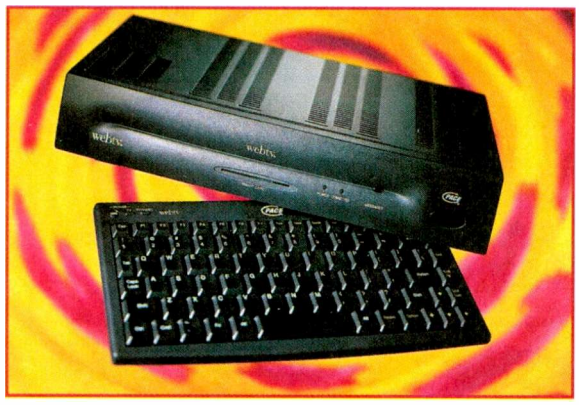
A Tesco page used in the UK WebTV trial.

One of the nicest things about WebTV is that you don't have to take the top off the box to upgrade the software – upgrades are sent to the box by WebTV Networks. There is also encryption software that makes internet transactions safe from unauthorised access or hacking. A WebTV Classic box costs $99 (£66).

Web TV Plus

WebTV Plus offers all the services available via WebTV Classic plus a feature known as enhanced or interactive TV. This combines web content with TV programming: if there's a link between the two, a small 'I' icon appears in the corner of the TV picture. Click on it and you will be taken to a related web site or page. Several companies already offer what's known as a 24 x 7 interactive service, i.e. 24 hours seven days a week. They include MSNBC, which is a collaboration between Microsoft and the NBC TV network, The Weather Channel and KCTS-TV Seattle, a public ser-

UK trial WebTV page.



A Pace set-top box for the WebTV trial.

vice TV broadcaster. Other organisations planning to offer interactive services include HBO, The Discovery Channel and HGTV.

WebTV digitises the analogue TV signal. The set-top boxes also have a hard-disk drive (about 1GB in capacity) for caching. This enables Web TV to offer some additional features. WebTV Plus has a WebPIP facility so that the user can display web content and TV pictures on the screen at the same time. There is also a seven-day programme listings feature – programmes can be searched by title or category – and a reminder facility that alerts users to the fact that a favourite programme is due to start in one minute's time (the warning also appears if the user is on the internet at the time). A one-touch VCR recording feature makes it possible to program the VCR by simply pressing a button on the remote-control handset. WebTV Plus boxes have an RF 'blaster' for transmitting data to a VCR. There's also a built-in tuner with stereo decoder.

Remote control operation.

WebTV Plus boxes are made by Sony, Philips and Mitsubishi, Model nos. INT-W200, MAT972 and WB-2001 respectively. They have 8MB of RAM and 8MB of ROM (no flash) and use a 167MHz R4640 processor. The latest versions, made by Sony and Philips so far, have 16MB or RAM, 8MB of ROM and 2MB of flash memory. They use a new R5230 processor that runs at the same speed as the earlier version. The boxes cost $199 (£133). A subscription to WebTV costs $25 (£17) a month.

Satellite Operation

WebTV Plus for Satellite adds the WebTV service to Echostar's DISH digital satellite TV service, which offers more than 300 channels and has almost two million subscribers. Echostar's DishPlayer satellite receiver Model 7100 has a built-in 8·6GB hard drive that can be used to cache large amounts of TV content. The hard drive is used for a feature known as TV Pause, which enables a viewer to freeze a TV picture for up to half an hour then resume watching without loss of any of the programme.

The 7100 has 16MB of RAM and 4MB of ROM. It uses a 167MHz IDT 3041 processor and has a 56kbits/sec modem, two smart card slots (one for Echostar, one for WebTV), two sets of AV outputs and front-mounted AV input sockets. There is also a Dolby Digital output socket. The receiver costs $199 (£133). The subscription is also the same.

European WebTV Trials

Microsoft's WebTV trial in Germany was held in conjunction with Deutsche Telekom. A UK trial, which started in late 1998 and ended in late spring this year, included content provided by Barclaycard, the BBC, BT Internet, Granada Media, Teletext, Marks & Spencer and the interactive games company Two Way TV. The services provided were home shopping, home banking, digital text, interactive advertising and internet access.

Pace made the set-top boxes for the German and UK trials. Each box had 4 x 16Mbits of SDRAM and 2 x 8Mbits of flash memory, a 167MHz IDT 79RV4640 processor and a 54kbits/sec modem. Inside the boxes there was a power supply, a multi-layer PCB, a smart card reader and 1GB of hard drive. Rear connections included two scart sockets (both RGB/composite video enabled), an RJ11 phone jack, a parallel printer port, phono audio output and an RF loop-through. The front panel had a smart card slot, power LED, a connected LED to tell users they are connected to the internet, a message LED to indicate that e-mail messages have arrived and an IR blaster to control a VCR.

Pace says that the boxes were built to standard consumer specifications and were straightforward to manufacture, though the relatively small production runs meant that there was more hand assembly than usual.

The UK trial established that over a third of households would like to have interactive TV, with over ninety per cent highlighting easy e-mail and internet access as the major benefits. The area of greatest interest was gaming, with Two Way TV the most popular content – it offers on-screen multiple-choice quizzes which are linked to the programme being watched. Other areas of high interest were shopping, education and having greater control over what is being watched.

Developments

WebTV is likely to be adopted by cable TV networks in the USA – Microsoft and cable operator Scientific Atlanta have signed a letter of intent to offer the service to cable users.

Microsoft has also launched WebTV for Windows, which enables PC users to watch TV on their PCs. A Windows 98 operating system, an ATI TV tuner card and a fast Pentium processor are required.

Prospects

WebTV is an interesting convergence of TV, computer and internet technology. Services such as teletext have shown that there's a demand for interactive features with TV while the internet has grown at a phenomenal rate.

It's fair to say however that WebTV has not taken off as fast as its backers had expected. In some areas, such as education, the system has proved popular in providing low-cost internet access.

Microsoft has not so far announced any plans to launch a WebTV service in Europe. Many believe that if it is launched over here it's more likely to appear as a feature rather than as a standalone service.

Acknowledgements

My thanks to Jim Vetter, WebTV Networks' education business manager, Andy Trott, director of technology and strategic development at Pace, and Graham Williams, Pace's commercial engineering manager, for their help in the preparation of this article.

Camcorner

Reports from
David C. Woodnott

Hitachi VMC1E

There are lots of these middle-aged 'twist-and-shoot' VHS-C camcorders around, and most of them are faulty. The usual symptoms are distorted E-E pictures with wavy lines and cramped sync etc., and correspondingly poor playback. Although the symptoms look bad, they respond well to capacitor replacement.

There are around forty electrolytics in total, most on the main deck PCB, the rest on the camera head or sensor/process PCBs. They are all of the 4mm or larger sizes, with plenty of room to work around them – unlike some later models. As with all such work, a good board wash is essential to remove all corrosive materials.

Sony CCD-F450E

We see a lot of these camcorders and similar models, usually because of capacitor-related faults. This one was a little different. It appeared to be completely dead, which is not a common symptom. Checks showed that PS991 (1 25A) on the rear battery connector PCB was open-circuit. As no short could be measured, I fitted a replacement CP and switched the unit on. Almost immediately a puff of smoke came from the interior. I switched off quickly before the CP was lost!

At this stage I couldn't be sure where the smoke had come from, so I carried out a general inspection of all the deck PCBs. Nothing amiss could be seen. So – what else do you do? – I switched the unit on again. This time it was evident that the problem was on board CT21P (digital title etc.). C702 (10µF, 16V) had leaked and was arcing underneath, carbonising the board in the process.

All was OK once the capacitor had been removed, the board had been repaired and a new capacitor had been fitted. Sometimes, even with today's high-tech computer diagnostics etc., you still have to switch on and look for smoke!

JVC GRA30

The reported fault with this old-timer was "no camera pictures". Playback was OK. It's becoming a common fault with these camcorders. Sometimes the E-E picture will appear if the unit is left on for a time. The cause of the fault is (no surprise!) capacitor failure, on the SSG PCB. There are 22 electrolytics here and it's best to replace them all.

You will need a soldering iron with plenty of heat in reserve, as the print is extremely conductive. Although they are now rather geriatric, these camcorders usually soldier on for a while without any further problems.

Sony CCD-V6000E

This well-specified camcorder (PCM sound etc.) came in because of a "poor audio" fault. Right channel recording and playback were low and distorted, with intermittent 'screeching' and 'howling' noises. The left channel was OK, as were all PCM sound functions, both the left and right channels.

This is not the easiest of Sony models to work on, but with a bit of juggling you can gain access to the AFM audio PCB in situ. The circuit uses two identical ICs for the left and right AFM channels. The right one (IC702) was faulty, also C760 (100µF, 10V). All was well once these components had been replaced. A service completed the repair.

Canon UC200E

This modern camcorder wouldn't accept a tape, though it would open and close the cassette housing without one. I noticed that the head drum didn't rotate, and stripped it down for inspection. It's not uncommon to find that poor ribbon-cable connections cause problems of this type. Not on this occasion however! The cause of the fault was the drum drive chip IC601. Normal operation was restored once this had been replaced.

Hitachi VM2300

This full-size VHS machine came in with a note to say that playback was OK but there were lines across the E-E camera picture. They waved about and sometimes, if the camcorder was left on for some time, almost disappeared.

The cause of the trouble was a faulty camera head DC-DC converter unit. I've come across this problem before with similar Hitachi models. A replacement converter and service restored the camcorder to good health.

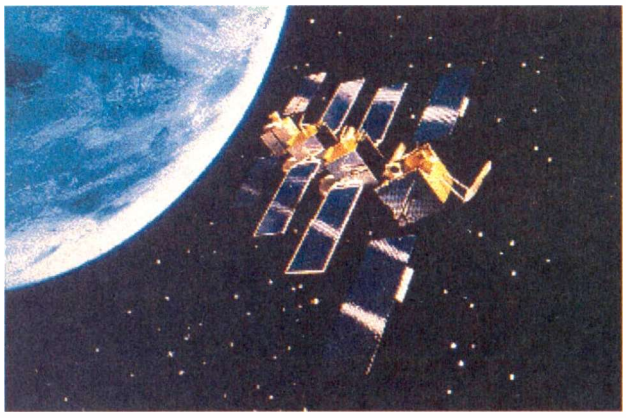
Sony CCD-TR810E

There was a half-ejected tape jammed in the mechanism of this modern camcorder, which wouldn't correct itself when powered. I had to remove the tape manually: as the loading motor couldn't be driven, the housing had to be dismantled to achieve this. At this point the cause of the problem became clear. Several teeth were missing from the outer edge of the mode switch, possibly the result of the housing being pushed during loading etc.

A new switch restored normal operation. Fortunately there was no damage to other deck parts.

JVC GRM3E

This camcorder had an E-E fault: only vertical lines with some semblance of picture information were visible in the display. Playback was found to be OK. I initially thought that the CCD imager might be the cause of the fault, or maybe the SSG drives etc. It wasn't that serious however! The cause turned out to be a faulty CCD base connector. Although they are gold-plated, the connections were intermittent and this couldn't be corrected. A new base cured the problem.



DX and Satellite Reception

Terrestrial DX and satellite TV reception. News from abroad and of satellite developments. The Scanmaster remote aerial switching unit reviewed. Roger Bunney reports

July was a very good month for Sporadic E TV reception. Conditions declined during the final week, then improved in early August. The hot weather around the 10/11th and again during the final week lifted tropospheric propagation at UHF across the whole UK: the nearer European countries were well received in the south and east. Here's a summary of SpE reception during the period:

5/7/99 RAI (Italy chs. IA and IB; TVE (Spain) ch. E3.

6/7/99 TVE E4; RAI IA, B; RTL+ (Hungary) R2; TVA (Italy) IA+; RTS (Serbia) E3; HRT (Croatia) E4; LTV (Lithuania) R2.

7/7/99 SVT (Sweden) E2.

8/7/99 TVE E3, 4.

9/7/99 RAI IA, B; TVE E2-4; TVA IA; RTL+ R2; SVE E3, 4; HTV E4.

10/7/99 RTL+ R2; RTS E3; HTV E4; RAI IB; NRK (Norway) E3; SVT E2-4; ETV (Estonia) R2; Ukraine R2.

11/7/99 TVE E3.

12/7/99 RAI IA, B; TVA IA+; Video (Italy) E2; TVE E2, 3; RTL+ R2.

13/7/99 RAI IA, B; TVA IA; RTL+ R2; RTP (Portugal) E2; TVE E2.

14/7/99 TVA IA+; RTL+ R2; SVT E2.

16/7/99 RAI IA, B; TVA IA+; TVE E2-4; RTP E2, 3; Video E2; C+ (Canal Plus France) L2.

17/7/99 RAI IA-C; TVA IA+; TVE E2-4; RTP E3; ARD (Germany) E2.

18/7/99 TVE E3, 4; TVA IA+; Video E2; C+ L2.

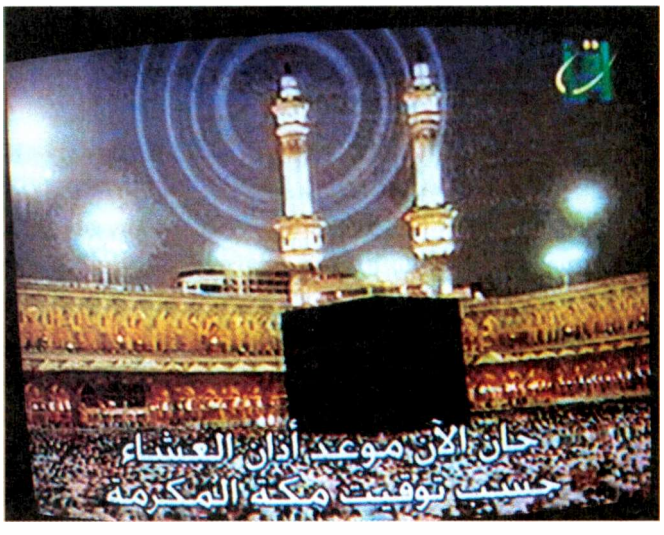
19/7/99 RAI IA; TVE E2, 3; TVA IA+; Video E2; RTL+ R2; RTS E3; TVE E2-4; SYR (Syria TV2) E2; IRIB (Iran TV2) E2.

20/7/99 RAI IA, B; RTP E3; TVA IA+; Video E2; TVE E2.

22/7/99 RAI IA.

23/7/99 RAI IA; SVT E2, 4; RUV (Iceland) E4; unidentified Arabic ch. E3 signal at 1635.

1/8/99 TVE E3; RAI IA, B; TVA IA+; RTS E3; HRT E4; RTL+ R2. Note that with TVA+ (TV Napoli) the vision carrier is at 54·095MHz.



A shot taken from the IQRA religious channel that's part of the digital multiplex at 11·767GHz H via Arabsat at 26°E.

At 1320 on the 19th Cyril Willis (King's Lynn) received Syria (SYR-TV2) from the ch. E2 Homs transmitter, identified by the Syrian TV logo at the bottom left. Then, at 1330, IRIB TV2 appeared, again identified by the screen logo. At 1040 on the 20th a PM5544 test pattern appeared, from a south easterly direction, with identification at the top and bottom. Can anyone identify this signal? I am sure that all readers will wish our long-standing contributor and friend Cyril Willis a speedy recovery from the serious operation he underwent during July.

Solar Cycle 23 is now in the ascent. But it seems that the cycle may peak at a lower than average count. Some observers are suggesting that a very low peak, similar perhaps to Cycle 16 which peaked at 78, was overdue. This information comes from the July issue of the British DX Club bulletin.

The Isle of Wight RSL-TV station TV 12 (ch. E54 H) went off-air during the evening on July 24th. Its programmes are recorded on a hard disc and transmitted from Rowridge – not the Newport studio. If the machine fails, a Bloomberg TV satellite signal is automatically substituted in daytime, or QVC overnight.

Satellite Sightings

The funeral of King Hassan II of Morocco on July 25th could be seen via Eutelsat II F2 at 10°E

(11·161GHz H) and II F3 at 36°E (the 11·170GHz H Belgacom analogue lease). The latter provided a feed for several European networks. The programme started at 1745 and was preceded by colour bars and the SNG identification "E13-RABAT".

The Freeserve ISP (Internet Service Provider) share flotation on the 26th was covered by the breakfast show uplink truck UKI-149 GMTV. Starting at 0730 the programme, from the Freeserve building, provided shots of internet operators at their workstations with the presenter walking between. This reception was at 11·530GHz H via Intelsat K (21·5°W). GMTV came quite close to us here at Romsey on the 15th, when SISLink 14 (UKI-33) came to Winchester cathedral. They are still looking for the remains of King Alfred!

Analogue programming has appeared via Eutelsat W3 (7°E), which normally transmits only MPEG 4:2:2 and is thus invisible to UK sat-zappers. The analogue arrival, in late July, is the Turkish commercial station STV (Samanyolu TV).

The John F. Kennedy jr. plane crash on the 17th received extensive coverage. When the bodies were found on the 21st, the local station WDOH-TV relayed live pictures of the recovery. Most of the Europe-bound traffic during this period was via the West Reuters lease (11·566GHz H, SR 5,632, FEC 3/4) aboard Intelsat K. There were other, intermittent offerings via PAS-3R/6 (43°W).

Dean Rogers (London SE2) watched much of the Tour de France during July. This year there were both digital and analogue feeds via Telecom 2C (3°E). Using a Humax FTA receiver, Dean noted digital feeds at 12·530GHz and 12·538GHz (both horizontal with the usual SR and FEC). He found the analogue coverage at 12·626GHz V. There are still Sunday afternoon football OBs via 2C. Check 12·606GHz V for Irish broadcaster Setanta's programming: much of the action is in clear analogue form though VideoCrypt scrambling is occasionally used. During the early evening periods in mid-July the BBC was relaying live golf from Carnousti via 2C at 12·604GHz V in analogue form. Carnousti 99 was seen at the same time in analogue form at 12·699GHz H via PAS-3R/6.

There was dramatic news footage of the Princess Ragnhld ferry fire during the early morning of the 8th: Teracom SNG used Intelsat K's digital capacity at 11·550GHz H (usual SR/FEC). The ferry was en route between Kiel and Oslo.

Eutelsat II F3 (36°E) has been relatively quiet with mainly domestic traffic apart from the Rabat funeral previously mentioned. The Llangothllen Eistedfod was featured in HTV's evening magazine programme on the 6th, uplinked by SISLink 14 UKI-33 at 11·676GHz H. Grand Prix enthusiasts might find it worth checking Eutelsat II F3: for example on the 4th Donnington Part British Grand Prix was featured during most of the day in clear analogue form at 11·178GHz H.

So, during a busy and eventful month, there was lots of activity – both digital and analogue.

Digital satellite enthusiasts often notice various identifications with wild-feed reception. A recent example was "Encoder Name not Applicable". Adam Simmonds of SIS explains that this occurs when no service identification name is fed into the DSNG codec system. The default service name is "9MHz PAL 2 Audio" unless the uplink engineer inserts another service identification.

Terrestrial News

Denmark: A new channel, TV DANMARK, is in operation. It's not connected with either DR TV1 or TV2. At present two transmitters are being used for the service, Naestve ch. E23 V (0·5kW ERP) and Odense ch. E49 H (3kW).
Greece: The BDXC, Holland reports that pirate/independent commercial stations are in operation in the Athens and Thessaloniki areas. Stations received via SpE in Holland are Club TV ch. E3 and VIP (Fashion TV) ch. E2 (with video offset). These are in the Athens area.
Spain: Carlton Communications has successfully bid with Retevision for a DTT licence, Onda Digital. Pay-TV take up in Spain is at present low at 18 per cent of the population.
Gibraltar: GBC-TV went digital with studio equipment on June 1st. New MW (2kW) and TV transmitters are to be installed shortly. At times when there are no programme transmissions the PM5544 test pattern is transmitted with GBC radio on sound.

Satellite News

Orion-3 was lost when a malfunction in the launch rocket's second stage put it into low orbit. This is bad news for the Pacific basin as the satellite was heavily booked to provide much-needed capacity in the region. Russia has launched its first Ku-band DBS satellite, Nimiq, at 91°W. It will provide a mass of digital channels from coast-to-coast across Canada.

There should shortly be the first

During breaks in a news transmission Reuters often switches in a local TV channel. This reception is via Intelsat K at 21·5°W.

commercial use of the Boeing Sea Launch project. This is a floating oil platform that has been modified to provide rocket launch facilities – control is from a nearby ship. A successful test firing was carried out in the Pacific, some 1,500 miles south of Hawaii and 250 miles east of Christmas Island. The Russian Zenit 3SL three-stage rocket, a modified form of the four-stage Proton, is to be used for launches.

France Telecom had previously announced that when its Telecom series of satellites reached the end of their lives it would lease capacity from Eutelsat. France Telecom has now formed a partnership with Eutelsat, and Telecom 2A (8°W) has been added to the Eutelsat fleet. Eutelsat has control of the eleven Ku-band transponders aboard 2A. A replacement satellite will eventually be placed in this orbital position.

A series of photographs in the New Zealand magazine *SatFACTS* (July issue, page 20) demonstrates the digital threshold effect. The point at which digital break-up occurs is directly related to signal strength, the transmission parameters (an FEC of 3/4 is much more tolerant than 7/8) and of course the overall sensitivity of the receiving installation. Attenuation in 0·2dB steps was progressively applied to a satisfactory picture (with occasional drop-out and line spats) – this is the digital threshold. The FEC was 3/4. At –0·2dB the picture started to break up; at –0·4dB the picture became more degraded with drop-outs over much of it; at –0·6dB there was severe picture tear and pixelation; at –0·8dB the picture had dissolved into a mass of pixelation and confusion; at –1dB the screen became blank. A lower FEC ratio provides a gentler slide into picture loss – but a drop of 1dB still means a change from quality to nothing.

Discovery Networks Europe is expanding into Russia with three digital channels via the NTV Plus multiplex at 36°E. The new channels are dubbed into Russian: they join the basic two Discovery channel package launched in February. CNNI continues to develop regionalised services: after Spain and Turkey the Asian region is to be targetted.

The Scanmaster Remote Switching Unit

Over the last couple of years I've tried several aerials for Band I DXing at my new location. At the start of the 1999 SpE season I was using a crossed-dipole set, with phased connection to a single downfeed cable. Though the system worked, I was not happy with its lack of directional capability. After some thought I decided to construct an aerial based on the well-known WB1 wideband Band I dipole, with slight modification. Two of these were mounted at 90°. The cables were routed from the aerial mast down the wall to a Scanmaster aerial switcher unit that enables either dipole to be selected.

It's the first time I have used remote aerial switching. The technique is more costly than a second run of low-loss cable to the receiver, but I wanted to see how it compared with conventional rotor operation.

The Scanmaster HF2 aerial switching unit, which is made by SSE UK, first appeared on the UK amateur market earlier this year. It provides remote switching between two aerial inputs and a single downfeed cable. The unit contains a PCB on which a VHF SPST changeover relay and a minimal number of other components are mounted. It's housed in a weatherproof box with the connection sockets beneath. Various hardware items supplied provide wall or mast mounting.

On examination I found that the unit is very well made. There are aerial socket options: either the familiar SO329 (PL259 CB radio aerial plug), the N or BNC type. The suppliers stock the first two, the BNC being available to special order. Thought has been given to the design – even down to the small air hole which is just enough to prevent condensation without allowing entry to troublesome spiders. An indoor selector unit provides a 12V feed to the switcher to operate its relay.

I bought the SO329 version – it's being used below 100MHz – and first checked for connection continuity. The centre socket is the output to the receiver (marked 'IN'). The socket marked 'NC', at the right-hand side nearest to the earth post, is the through connection from the aerial to the receiver with the 12V supply switched off. The left-hand socket, marked 'NO', provides continuity when the selector unit applies 12V to the unit.

Installation is simple. Ensure that when a PL259 plug is being used the cable's inner conductor is soldered to the plug's inner connection. Once the cables have been connected, protect the plugs with silicone grease and either push-over boots or the self-amalgamating tape supplied. SSE includes everything, even plastic ties, PVC tape etc. A 12V supply is required at a maximum of say 500mA.

The system is simple and works. The insertion loss is <0·2dB at up to 500MHz (1GHz with N plugs). 12-14V at 80mA is needed for relay switching. The box is 113mm wide, 86mm deep and 51mm high (excluding the bracket plate and socket protrusion beneath).

I was impressed by the high standard of construction and the installation aids provided. The HF2 is a useful addition to my TV-DXing facilities. A second cable run and indoor changeover switch would be cheaper if the cable can be run easily.

The Scanmaster HF2 with SO329 sockets costs £39.95 plus £2.75 postage in the UK. The version with N plugs costs £41 plus postage. It's available from Nevada, 189 London Road, North End, Portsmouth, Hants PO2 9AE. Telephone no. is 01705 662 145.

The Scanmaster remote aerial switcher unit, viewed from below to show the connections. The indoor selector switch is on the left.

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Grundig GT2105	IR9715	CH45220	£9.24
Hitachi C2146TN, C2166TN C2546TN, C2846TN, CLE902A	IR9677	CH46074	£9.98
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Tatung 576, 616, 617, FXA	IR9546	CH39218	£8.31

MAINS SWITCHES

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Baird RR5190	MS144	CH23803	£2.86
Ferguson TX85, 00E2-201-002 with microswitch	MS57	CH00677	£1.06
Ferguson/Thorn TX9/ TX90/TX100 (Remote), 00E2-145-001, 00E2-185-002/3	MS47	CH01331	99p
Ferguson/Thorn A36F/ A36R/A51F/A51N/ A59F/B51F/B51NX/ B78NT	MS145	CH23804	£1.93
Grundig P37-540, P50-540, P55-245/90 ST63-655/8, T51-540, T51-540A, T70-540, T70-640, XS63/8, XS70/8, 29703-291.21, 29703-291.22, 29703-291.32	MS102	CH46812	£1.40
Hitachi CPT2650/2188	MS51	CH00678	£1.06
Monitor Switch	MS138	CH23687	£1.06
Nikkai TLG0101	MS140	CH23727	£2.86
Philips K30/KT3 (Remote)	MS31	CH00681	£1.34
Sanyo CBP2151/52, CBP2551, 52, CBP3012	MS144	CH23803	£2.86
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Ferguson/Thorn TX100 22" & 26" Green Spot, 06D3-084-001, 06D3-087-001	FAT3758	CH55435	£9.98
Goodmans 2575, 2875	FAT30103	CH55303	£10.97
Hitachi 2434593/CMT2130/ CPT2174/6/8/2476	FAT30003	CH55254	£10.11
Philips 140-10306/ 140-10353/140-10367	FAT3830	CH55460	£10.37
Philips 140-10274	FAT3829	CH55459	£10.57
Philips AT2076/40, AT2079/40 15"/17"/21"	FAT30186	CH55349	£9.98
Philips GRI-AX, 14GR1220/1/4/5 140-10369, 140-10379, 140-10421	FAT30057	CH55277	£9.98
Toshiba 1400 RN/TBT, 1510RBT, 15GR9BG/BT/BW	FAT30170	CH55336	£9.71

VIDEO HEADS

Model	Konig Ref	Order Code	Price Each
Amstrad 153063, VCR6000	VH2732	CH40918	£6.64
Bush VCR177	VH2732	CH40918	£6.64
Ferguson 40104700, FV31R, FV41R, FV51R	VH2836	CH65222	£10.97
Ferguson FV14T, 57H	VH2656	CH65223	£22.41
Grundig VS620/6	VH2680	CH38755	£9.24
Hitachi VTM620/ 625/722/822/922	VH2845	CH65221	£10.99
Hitachi VT540/545/546/ 548, VTD660/665, VTM598/640/645/646/730/ 731/735/736/740/741/745/ 746/747/748/753/754/768/ 830/831/835/838E/840/ 841/845/930/931	VH2702	CH65225	£14.28
JVC HRD 330/440/640/ 720/740	VH2783	CH65220	£11.64
JVC HRD 530/840	VH2656	CH65223	£22.41
Mitsubishi HS5300, 5424	VH2875	CH31521	£17.25
Panasonic NVG 33/G45	VH2680	CH38755	£9.24
Panasonic NVG30/40/130	VH2681	CH40711	£7.91
Philips VR6485/91	VH2680	CH38755	£9.24
Sony SLV310/315/325	VH2681	CH40711	£7.91
Sony SLV373/410/415/474	VH2801	CH65224	£20.62

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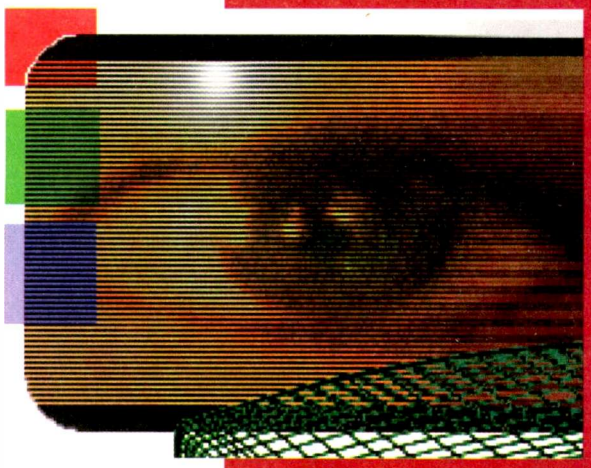


Monitors

Reports from
Ian Field
Graham M. Colebourn
Adrian Spriddell and
John Edwards

Hitachi CM1587M

This monitor's power supply was tripping silently. It took me some time to establish which output was causing the trouble. The task was made difficult by the need to avoid accidentally removing any of the supplies used by the TL431 regulator and the optocoupler. When the 92V rail was isolated at connector B102 the power supply sprang to life.

This supply goes to only two places, the TL431 and, via B102, the CRT base. The five electrolytics on the CRT base panel checked OK, but one of the four disc ceramics didn't. C328 was short-circuit and had a chunk blown out of its surface. Since this customer pays a nil-returns bonus, I replaced all four disc ceramic capacitors, using Philips MKT resin-dipped PETP types. The capacitors replaced were C327 (10nF), C328, C330 and C332 (all 1nF). Disc ceramics have a poor reliability record: I prefer to use the better, readily available alternative. **I.F.**

Samsung CUM4967PL

Despite the very similar model number, this monitor is quite different from the CUM4967T. It has a UC3842/MOSFET-type chopper power supply instead of an STR-type five-pin chip. The power supply was attempting to start but did not get going. Diagnosis was complicated by the fact that a 2SC5149 line output transistor is used: this type of transistor is notorious for 'latching up' when HT is applied but reading OK when checked cold.

But the fact that the IRF9610 FTB/B+ PWM MOSFET was undamaged suggested that the 2SC5149 transistor was OK. When it plays up, the MOSFET is almost always destroyed. I never fit a 2SC5XX9-series transistor once I've removed one, even if it's OK. A 2SC4742 plus insulating kit is much more reliable.

The power supply could be made to run by disconnecting the feed to the line output stage, so I began to suspect the LOPT. But a 60W lamp dummy load also prevented power supply start-up.

In desperation I started to spray the electrolytic capacitors in the power supply with freezer. When I got to C618 (10µF, 50V) and C621 (22µF, 25V), which are small and close together, the monitor started up briskly. As they warmed up again, the start-up performance deteriorated. I didn't bother trying to find out which of the two was faulty and simply replaced them both.

The testing of this monitor involved a fair amount of switching off and on. At one stage the fuse blew and no obvious cause could be found. A couple of fuses later I rechecked the four 1N5399 mains bridge rectifier diodes and found that two of them were short-circuit. This behaviour is very similar to that of a 2SC5XX9-series transistor. **I.F.**

Trident TUGA8900D Video Card

These PC ISA cards are becoming hard to come by. The 8900D is the only one I've found that has decent tests included in the software. Occasionally I get sufficiently desperate to try to replace the large, square PLCC chips. As the only source of these is other, scrap boards, the success rate is not high!

The best version of this card is the one with the RAM-DAC (ADV476KN66E) integrated into a custom Trident TKD8001 PLCC chip, leaving the VGA-BIOS extension ROM and the four-bit x 256k RAM as the only chips with sockets. In this case the fault symptom was a dim display with patterning and I was lucky: replacing the HY534256AS-70 DRAM chips cured it. **I.F.**

DELL P1428E

The customer who brought this unit in asked for the 15-pin sub-D connector at the back to be resoldered. As I was removing the PCB I noticed that the top of C631 (100µF, 200V) had become bulged. When this happens C622, C651 (both 10µF, 50V) and C618 (100µF, 35V) are suspect. C618 is provided with a low-ESR shunt in the form of C619 (0·1µF disc ceramic). It is obviously not big enough to do the job intended, and an upgrade to 0·47µF mylar is worth consideration. It's also worth considering the addition of similar ESR-shunt capacitors across the other two small electrolytics – to reduce the ESR-loss heating effect and prolong their life. When these electrolytics fail completely the PSU produces quite a bang! The last one I found in this state wasn't even worth stripping for parts! **I.F.**

KTX M1448L

This monitor was dead with the LED out. The fuse was intact, and power was present at the reservoir capacitor. As this chassis has a similar look to the Acer Peripheral design I started off by checking the start-up resistors, but a pulsing voltage at pin 7 of the 3842 chip put paid to that theory.

The cause of the trouble turned out to be a dry-joint at the source terminal of the 2SK1507 chopper MOSFET Q101. It had completely let go. The MOSFET was short-circuit gate-to-source, but had only very slight leakage from drain to source. The gate-protection zener diode ZD101 was undamaged, and had succeeded in protecting both

the gate-bleed resistor R114 (10kΩ) and the gate-feed resistor R113 (47Ω). The 3842 chip was also undamaged. Further examination revealed that all components in a TO220 or larger package were in dire need of fresh solder.

Once the repair had been completed I found that instead of a 'green' power-saving shut down when the sync signals are not present this monitor produces a grid-style test pattern. It has a group of white blocks in the middle surrounded by black blocks: the pattern inverts periodically if the monitor is left running.

Caution: This chassis has no PCB support pillars. So you'll soon find out if you've left any wire clippings on the work surface! **I.F.**

AT&T/NCR CDM4A3D

This 17in. monitor is similar to the Digital VRC16HA but is more modern. It has the more recent dual focus preset LOPT. It's also similar to the IBM version in having a normal VGA cable instead of five BNC connectors, and front-mounted user controls including a membrane pad for geometry adjustments. This one was dead because the on/off switch had failed. It's so easy to get at that you don't even need to take the back off! The underside plastic cowl is fitted with four screws, a further six screws hold a metal cover plate and two more hold a sub-PCB. The PCB-mounted switch is of a type used in countless TV sets and monitors, so there's no difficulty in obtaining a replacement. **I.F.**

Fujitsu/ICL 140V (H1014A)

This monitor, which uses the **Hyundai HN/L4838P chassis**, suffers from the same problem as Samsung types that have a PCB-mounted VGA connector at the rear. In this case all nine soldered pins had parted from the PCB, as had the securing solder lugs. Externally, one fixing screw stub had sheared off while the other one was missing. Fortunately the stubs are of the screw-in rather than the rivet type, and can be replaced without having to renew the whole connector, which is held in position by the tinplate screening that covers most of two edges of the PCB. **I.F.**

Gateway EV500

Two of these monitors arrived with a note that said "overvolted when factory neutral failed – smoke!" Amazingly, the only damage seemed to be a burst reservoir capacitor in the mains rectifier circuit. It's C901 (220µF, 400V). A replacement brought both machines to life, but while one produced a perfect display the other one had only half the correct scan width. Its regulated HT output was correct at 185V, but the HT output from the pulse-width modulator FET Q507 was too low. The cause was collector-base leakage in the 2SA1270 current-source transistor Q503. **G.M.C.**

Viglen DX1595

If there's no EW correction, check C106 (6·8nF, 680V) which produces this symptom when it goes short-circuit. **A.S.**

Elonex SV14LR

I've had a few of these in the workshop recently. All were brought in because they were dead. In each case I found that R807 (47kΩ) was open-circuit and that nothing else was wrong. Note that reservoir capacitor C806 remains charged at over 300V for days when this fault is present.

Here's another fault that is becoming quite common. It's something you may encounter when the monitor is first switched on. It seems to fire up normally, with the sound of an EHT rustle, then goes dead. When this happens you'll almost certainly find that the cause if C424 (33µF, 160V). **J.E.**

GoldStar CQ453B

The power supply squeaked when this monitor was switched on but there was no raster. As the tube's heaters were alight I rotated the first anode control (on the LOPT), expecting to see frame collapse or maybe a blank raster with flyback lines. Well, we live in hope! But the screen remained blank, with no sign of any activity.

A voltage check at the collector of the 2SC4744 line output transistor Q706 produced a reading of 93V, because there was no line drive. Silly me. I then realised that the heater feed comes from the power supply, which is quite common practice with monitors.

Q706 proved to be short-circuit base-to-emitter. I fitted an equivalent, type BU2508DF, then tried again. Still no line drive. I traced back via the driver stage to the GS9336 chip IC701, which should produce a line-drive output at pin 12. It didn't, and furthermore there were no voltages at any of its pins. The chip should receive its supply at pin 10. While checking back from this point to the power supply I came to D701 which was open-circuit. There were no markings on it, but as it appeared to be a small-signal type I reasoned that the demands on it couldn't be high. I fitted a 1N4001, connected a signal, stood back and switched on. There was the welcome sound of EHT, then a good picture. There remained the problem of putting everything back together again. **J.E.**

Compaq Presario V410 (Model 304)

The mains fuse had shattered because one of the bridge rectifier diodes, D813, was short-circuit. I renewed all four diodes and, as I couldn't find any measurable shorts, I switched on. All seemed well until I tapped the PCB near the line output transformer. The monitor then shut down and started tripping. I found that the 2SC5296 line output transistor had gone short-circuit. A BU2508DF as a replacement got everything going again. A check for dry-joints failed to reveal any, so I resoldered the line and power supply stages. After that the monitor remained stable. **J.E.**

Tatung CM14UHR

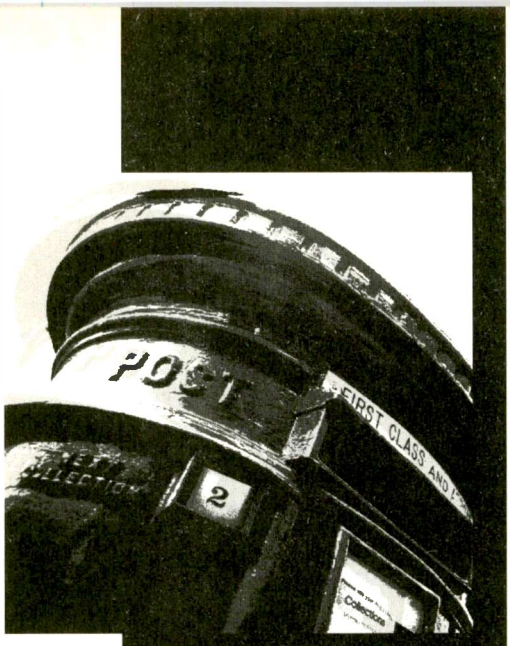
The surge limiter resistor R804 going open-circuit is a common fault with this monitor. It's a special 10Ω type that looks like a thermistor. You usually find that its body is split and cracked in several places and that the PCB is scorched where it sits. There's usually no other fault. R804 is cheap and is available from Wizard Electronics under part no. TAT451. **J.E.**

Dell D1528LS

The cause of tripping was a short-circuit 2SC5002 line output transistor. A BU2508AF worked well in its place and ran cool. **J.E.**

Digital PCXBV-PE

The picture quality was good but the customer couldn't adjust the brightness. As usual with a monitor repair I'd no circuit diagram and had to resort to following print tracks and sketching out the circuitry. Eventually I came across an open-circuit resistor, R477 (47kΩ). It's between the collector and emitter of a small-signal transistor whose base supply is obtained from rectified line output transformer pulses. One end of the resistor is also connected to the CRT's grid. It could be to do with beam limiting or spot suppression. **J.E.**



Letters

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

Yes, there is a future!

I sympathise with Michael Maurice (letters, September) who aptly described the present difficult situation in the servicing trade. May I suggest a positive approach to the problem? Here are some suggestions.

(1) Forget about digital TV. No one will earn anything from it.

(2) Utilise your skills and investment in test equipment to the full. Manufacturers often make horrifying charges for any repairs needed to many of the electronic gadgets in use today. Not all such items will bring you much, but they can lead to bigger things. Here are some examples: welding; central heating and electric vehicle controllers; insectocutors; electric fences; PA systems; CB radios; etc. You will be surprised to find how simple most of these items are. I avoid burglar alarms, computer games and ICE, but see (4) below.

(3) Get known at local pubs, social clubs, schools, hospitals and by companies. Some have quite sophisticated AV or CCTV systems and will pay well to get their equipment back in action quickly.

(4) Identify products or services that your competitors don't touch. Became an expert at them and watch the cash roll in! I have two informal contracts which provide a steady 'background' income.

(5) Maximise on any extras. For example PAT test a product that doesn't carry the BEAB logo and charge for this. It's best to do this when the customer comes to collect his goods. To persuade the customer to have the test done, suggest that you have concerns about the product's safety .

(6) Generate a repertoire of good reasons why customers should pay a little extra for repairs, for example "it's a top-of-the-range product" – a very wise choice on the customer's part!

(7) Quote a little on the high side each time. If the customer dithers, suggest a discount for cash. They will think that you are fiddling the tax or VAT, which will get them on your side. But be selective with this one!

Finally, give yourself some time off every week and spend it with your family. They will appreciate this more than they might miss some fashion/hi-tech product you may be unable to buy them. It will relieve some of the stress evident in Michael's letter.

There's no lack of work out there. You have to be adaptable, positive, persevering and, maybe, a little devious. I'm sure that Michael is capable of this.

Chris Cory,
Thatcham, Berks.

DTT Propagation

Following Peter Murchison's letter (August issue page 722) I have been checking up on digital terrestrial TV transmission and reception. The situation seems to be as follows.

The radiated RF signal for a digital multiplex continually changes in both frequency and amplitude (within limits), as with an analogue transmission. Thus if the signal radiation pattern from a transmitting aerial is circular with a PAL TV transmission, a digital transmission must also have a circular response. Gaps in the received radiation pattern may well exist, but for a different reason.

Current analogue TV transmitting aerial systems are almost invariably mounted around the relatively thin spine at the top of the mast. When it came to adding new aerial panels for the digital transmissions, these often had to be mounted around the mast itself. Since this has a much larger cross-section, maintaining a smooth omnidirectional radiation pattern became very difficult. Hence the gaps in the radiation pattern. The effect tends to vary with frequency and can thus change with different transmitters.

With COFDM, the subcarriers in the channel are separated in time by a small guard interval. This is to ensure that multipath transmissions from different transmitters which use the same frequencies don't cause destructive interference. If the transmitted signal is at a low level, as with two of the ONdigital multiplexes from Hannington that serves the Basingstoke area, multipath signal cancellation might occur, with the threshold at the receiver falling below the level required for accurate decoding. As a result, the receiver displays a blank screen. The three Hannington ONdigital multiplexes are transmitted at 5kW down to 0·85kW, which is a long way below the 250kW used for the transmitter's analogue signals. A receiving aerial with a low degree of directivity will contribute to this problem. In addition, if a digital receiver is being fed from an older aerial system its gain might be too low for the ONdigital transmissions. Either way the

receiving aerial system is suspect.

The problem at Hannington and in the Basingstoke area is aggravated by the fact that the close-by Guildford analogue relay station uses four of the same frequencies employed for digital transmissions from Hannington – chs. 40, 43, 46 and 50. A receiving aerial with a low degree of directivity will contribute to this problem. To avoid interference to reception from Guildford, the power radiated from Hannington in that direction is limited.

While it is generally accepted that digital signals can be satisfactorily received when transmitted at levels about 20dB down on the analogue transmissions from the same source, at Hannington the digital signals are reduced to levels of over 17dB, 23dB and 25dB down on the 250kW analogue level.

All this reinforces the recommendations made by the transmitting authorities – that careful attention must be given to the existing aerial system when installing a digital receiver.

Geoff Lewis,
Canterbury, Kent.

Doom and Gloom

I agree with Michael Maurice (letters, September): the trade is breathing its last gasp. I have been on my own now for five years, after 24 years with one of the large rental companies, and have watched the rental business slowly die. When I started there were two retailers and a one-man band in this small town and the surrounding rural area. In the space of three years they have all gone. A second-hand shop set up selling TV sets and VCRs, but the proprietor now feels that it's a waste of time.

Many people tell that that I'm lucky, with little or no competition. But analogue satellite receiver, small audio, portable TV and remote control repairs are a thing of the past, going the way of kettle, toaster and iron repairs. These items are all now thrown away. Larger TV sets and VCRs are left, but with the magic words "if it costs too much, don't bother". Sometimes I'm asked whether I would like to keep a set for spares if its repair is likely to cost about £50. I already have a garage full!

Customers go off to Tesco and the like to buy a cheap piece of equipment. Then they phone up to ask "how much do I charge to tune it in?" When I tell them £25 I get the reply "don't bother, we'll manage".

So, Michael, it *is* time to look elsewhere for income. I do airport runs, which at times has become more important than TV repair. But at least it keeps the money coming in.

Most of those I've known for years in the trade are now in their fifties and will be retiring in the next ten-fifteen years anyway. There will then be no one to repair faulty equipment, whether digital or analogue.

R.F. Hughes,
Holbeach, Lincs.

In reply to Michael Maurice (September) who asks "what future?", I'd say there isn't one for 80 per cent of service engineers who run their own business in this country. Manufacturers have seen to that, with their cheap TVs and VCRs. I've seen new VCRs on sale for under £80. The free (plus installation) set-top boxes from Sky and ONdigital finished off my repairs to Sky analogue receivers overnight.

If I sound like a 'doom raker', it's rightly so. This is a worrying time for engineers who have their own business with workshop and shop front. Bills have to be paid! I get estimates to repair TV sets and VCRs, even Nicam models, refused though they are under £50.

I've had my ups and downs in the trade since I started back in 1967, but enough is enough. This present down is lasting too long with no prospects in sight. I will shortly be closing down my business, what's left of it, to seek other employment.

Paul Byrne,
Ruthin, Denbighshire.

May I add my two pennyworth to Michael Maurice's comments (September *Television*, also in the *Daily Mail*)? If we hadn't started to do B&B when we did some years back our financial situation would be considerably worse than it is. Although June-July was fairly busy, the only work I've had in the last two weeks has been two under-guarantee repairs. So I thought I would set to and repair some stock sets. I obtain these from the general public by placing small ads in the paper. Although I pay only £5 or £10 for such sets, I sometimes have to travel a considerable distance to inspect and collect them. They are not always worth collection, especially when the cost of disposing of scrap is considered.

This has been my experience with a couple of them recently. I purchased a nice 21in. Sharp set with Fastext for £10. The original diagnosis was a faulty chopper chip, which was replaced at a cost of about £5. I was rewarded with a very acceptable picture, but after a few minutes on test the set died. This time it was the LOPT. The cost of a replacement is about £45. Add this to the purchase price and the cost of collection and the total is more than I can sell the set for! The second set had to be written off as soon as I started to check it because of the price of a new LOPT.

Not every case is as bad. I sometimes get very nice sets that don't need much work done to them. But I need only a few like the previously mentioned ones to wipe out the profit on the good ones, particularly as the price I can ask is diminishing by the week. A few weeks ago I sold a 14in. portable for £35 and had to deliver it to an address seven miles away. Sounds ridiculous, but it's that or nothing.

VCR repairs have become virtually a waste of time. The only TV sets you can make a reasonable charge for are the large-screen type that either give you a hernia or you have to pay someone to help you to collect them.

There are some who still make a reasonable living. But I think they are mainly Mensa types or those with enough work to be able to sort the wheat from the chaff. As for me, after 44 years in the trade my TV repairing days are nearly over.

In a slightly less negative vein, I have overcome, almost anyway, the problem of time-wasters. When they phone I tell them that the average repair bill is £40-£60 and if they are not prepared to pay that I am not prepared to go out. This may be why I've no work!

To finish on a nostalgic note, I have been very interested in the discussion on test card music. I think I have the full set of Herb Alpert records, but haven't played them since the Sixties. Must listen to them again. Do I still have a record player?! Something else I would like to see again are the colour test transmission films – *Home made Car*, *The cattle carters* and numerous other titles. Does anyone have copies?

Peter Nutkin,
Charmouth, Dorset.

Continued from page 848

away. "Well, you never know" I tell myself. The trouble is that the shed has got a bit out of hand over the years. I spent the next hour like a man possessed, rummaging knee-deep through piles of scrap boards and chassis ever hopeful of finding a DPU2553 chip. I don't recommend this system of spares storage – you can spend hours when you come across interesting stuff you didn't know you had! Anyway there was not a single DPU2553 there.

I eventually returned to the job in hand – after shovelling the scrap back into the shed, which was then in a worse state than when I started. I decided to order a new chip which arrived next day. After a very careful and slow soldering job, I switched the set on. Hurrah! A working TV at last.

Sony KVM2131 (BE1 chassis)

There were six flyback lines at the top of the screen, two of each colour. Although the soldered joints around the µPC1488H field output chip IC501 looked perfect, resoldering them cured the fault.

Sony SLVE520

Operation in the playback and E-E modes was faultless, but when record was selected the machine switched off. The culprit turned out to be a yellow-covered cylindrical component designated PR511. I am not sure whether it's a fusible resistor or a type of circuit protector link, but here was a brown scorch-ring around its body.

The always 5V rail was rock-steady until record was selected. Then, probably because of the increased current demand, the voltage dropped very slightly – but enough for the syscon to take precautions by shutting down.

Akai CT2870 (Nokia Comp.D2 FST chassis)

When this set was switched on from cold a very loud popping sound, at about two pulses per second, would sometimes blast from the speakers. The picture would fully compress and expand in sympathy. The customer would then turn the set off and try again later.

I took the set to the workshop and decided to see how long this behaviour lasted with the speakers disconnected, hoping that it would give me a clue as to where to start. The fault symptom persisted for five minutes, then the picture suddenly stabilised. But no amount of heating, freezing, tapping or verbal comment while the fault was present had any effect. I didn't have a clue, so I called on my years of expertise!

Looking at the electrolytic capacitors in the power supply, I declared aloud "if in doubt, whip it out". I then renewed C700 (10µF), C707 (2·2µF), C711 (47µF) and C752 (47µF). After that I carried out a blanket soldering job virtually everywhere.

During the next four days in the workshop I switched the set on and off randomly dozens of times. Every time it was OK. With growing confidence, I arranged with the customer to give me a post-dated cheque and test the set at home. So far, so good!

Ferguson IKC2 Chassis

"I can't move the on/off witch" the customer said over the phone. "It's completely jammed."

"OK, no problem" I replied, "I'll pop round with a new switch on my way home tonight."

When I arrived the old boy immediately put the kettle on and told me how grateful he was that I should have gone to so much trouble after work. It felt good to be treated with courtesy and respect for a change, so I decided that for good PR I would charge only a minimal amount.

After about fifteen minutes the new on/off switch had been fitted and it was time to switch on. Bang! My heart sank as I disconnected the mains supply and removed the shattered fuse (FP01).

"That's it" he said, "that's what it did before the switch jammed. Frightened the life out of me. My boy put a new fuse thingy in it then told me to call you. Don't let your tea get cold."

"You might have told me" I said, trying not very successfully to smile.

"I don't like to tell people their jobs" he replied.

A few minutes later I'd removed the degaussing circuit posistor, which thankfully rattled when I shook it. Needless to say I didn't have one with me, so I explained that I'd have to call back in a couple of days. Then, when I switched the set on, the picture was OK apart from a slight purple blob in one corner – not enough to worry about temporarily.

In view of the extra component and call-back work I decided to hell with PR and charged my normal rate.

Hitachi CPT2488 (Salora K chassis)

When this set was first switched on the screen displayed an over-bright raster with flyback lines. Then gradually, over a period of a few minutes, the picture appeared section by section until it was normal. The cause of the trouble turned out to be in the field output stage, where the flyback boost capacitor CB574 measured about 10µF when cold instead of 100µF. Presumably it was affecting the sandcastle pulses.

CB1716SL Multi Scan

Another unbadged monitor. I think one's supposed to know who makes them by the model number! This one had no green in its display, and it didn't take long to discover that the 2SC3953 green output transistor Q411 was very leaky base-to-emitter. As there isn't really a direct equivalent, I waited a few days for a replacement to arrive. After all it was going to be a routine job – well, almost.

When I switched on after fitting the new transistor there was green flaring to the right of any object. After marking the positions of the six drive and background presets on the tube base panel I tried small adjustments to each while looking at the picture on the screen. As I wasn't getting anywhere, the small, careful adjustments became desperate full rotations back and forth. This only served to confuse me further.

When you have three identical stages, a comparison of the waveforms in each can provide valuable clues. So I returned the presets to their original positions, then scoped a staircase waveform at the collectors of the three RGB output transistors. This confirmed that the green output stage was still in trouble. The output waveform produced by the new transistor was markedly flattened at the top, in fact the top two steps were virtually non-existent. They were perfect in the red and green output stages.

Time for some DC measurements. The base-to-emitter voltage at the red and blue output transistors was 0·6V: at the green output transistor it was over 2V. So I switched off and carried out some cold checks on the tube's base panel. It didn't take long to discover that R462 (4·7Ω) in the green output stage was open-circuit. A replacement resistor produced a perfect display – no grey-scale adjustment was necessary.

Answer to Test Case 442

– see page 821 –

Oh dear! Two technicians, more than two hours spent so far and, when we left them, nothing very definite by way of a diagnosis. It was indeed reasonable to assume that the control chip and the I^2C bus were OK, and it had been proved that the colour decoder module worked correctly by checking it out in another set. They could perhaps have swapped over the whole chassis, but doing this is often a disaster for various reasons, a common one being an intermittent fault that lurks in the donor chassis.

Sad to relate, they did actually try replacing the 40-pin microcontroller chip IC701 before they found the real cause of the trouble. TechnoCrat was quite right to suspect the beam-limiter circuit. A diode is usually employed here to sense the current at the earthy end of the EHT overwinding. In this case a zener diode is used, D501 (BZX79-8V2). It was found to be very leaky, and was thus pulling down the voltage at pin 28 of the colour decoder chip IC552. As a result, there was very little contrast. The beam-current limiting diode is in rather an exposed position should a flashover occur. That could well have been the cause of its failure.

A replacement 8·2V zener diode produced an excellent picture, and the set is now back at its rightful place in Snoring Cat Cottage. Another pencilled ring has been added to the Tatung B chassis circuit diagram.

NEXT MONTH IN TELEVISION

Test Equipment Supplement

Servicing efficiency depends on investment in the right test gear. Needs keep changing as consumer electronics products evolve. Our annual servicing equipment supplement, in next month's issue, is designed to help you make the right choices.

VCR Servicing

J. LeJeune provides guidance on servicing the LG W series and GoldStar G series VCRs, which use the company's F deck.

The Internationalle Funkausstellung '99

We know it better as the Berlin Radio Show! There will be over 900 exhibitors this year, from the broadcasting, consumer electronics and multimedia industries. The emphasis will be on digital systems and equipment. George Cole reports for us.

Monitor Servicing

Ian Rees provides a servicing guide for the IBM colour monitor type 6322-002. These Valuepoint SVGA monitors are well-made workhorses: many of them have entered the second-hand market.

Simple Video Security System

Denis Mott presents a much-improved microcontroller-based version of the camera/VCR surveillance system he originally described in the April 1997 issue.

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Announcement!

Vista Electronics Ltd

Vista Electronics Ltd, the UK's largest supplier of replacement Picture Tubes, are pleased to announce that as from 1st October 1999

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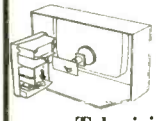

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Working voltage	600V DC or pk-pk AC

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Switch position 'Ref'

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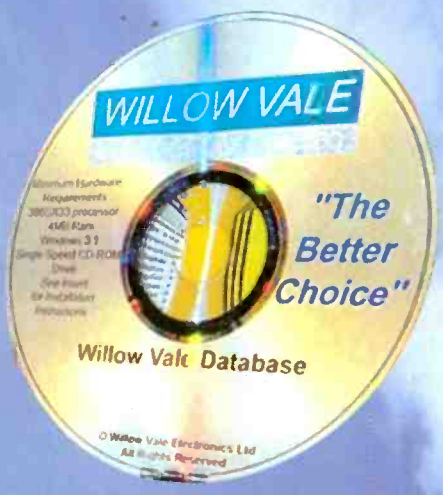

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