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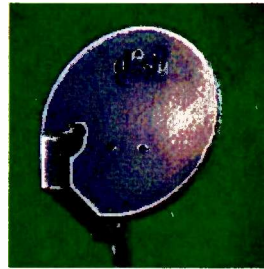
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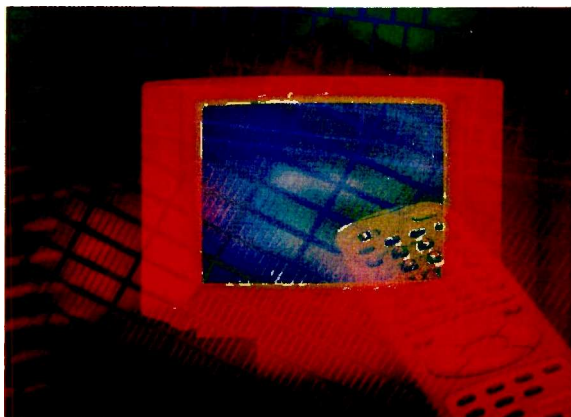
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Words and Language

We all have to use words to communicate with one another. The aim should be to use language to convey messages in the clearest possible manner. I would have thought that went without saying. But so often it doesn't happen. I am amazed at the amount of time I have to spend puzzling over the contents of press releases for example. You would expect them to be clear and to the point. All too often this isn't so. Here's an example of the sort of thing that can come my way:

"WorldGate services can be enabled exclusively on the CFT2200-1 for a configuration cost that mimics today's advanced analogue pricing. Alternatively, the CFT2200-1 can support all of the applications available on the CFT2200 platform today while also enabling the WorldGate services for a small cost-adder."

What on earth is one to make of such verbiage? You can spend quite a time trying to tease out the meaning and significance. All too often the offending item passes to the waste bin without further ado. Everyone's time has been wasted.

Now it might be a bit unfair to quote the above example. For one thing it comes from the USA, where they tend to put things a bit differently from us despite using the same basic language. For another, it is to do with computers, the internet and software. It seems that the people in these fields have developed their own way of communicating with one another. Presumably they can understand themselves, but it would be better if they could use the language of common communication – especially as the rest of us have to use their products at some stage and thus become involved.

Technical terms can't be avoided when technical matters are being dealt with. But this doesn't mean that text has to be incomprehensible. If technical terms have a fairly obvious origin and are used with care, even the uninitiated should

be able to get the gist of what is being said.

The problem today lies more with abuse and misuse of perfectly ordinary words than with the use of technical terms. I suppose it's too late to complain about the use of input, output and access as verbs. This has become too common to stop, though it's still possible to avoid such infelicities. What about trial and other nouns that are nowadays all too often used as verbs ("the XYZ company is trialling a new VOD system" and that sort of thing)? Do we have to put up with it? Just why is it considered clever by some to ignore the distinction between nouns and verbs? Is the idea to appear with-it and technically au fait?

I make this last suggestion because some of the worst excesses come from those employed in advertising agencies rather than technical people. A lot of those who work in what is loosely known as the 'communications industry' seem to hold the view that to dress messages up in contemporary near slang is more important than to convey meaning. Much the same complaint can be made about a lot of modern layout and design. With many leaflets and page layouts today you have to waste time trying to figure out what it's all about. Is it an advertisement, or is it editorial matter? Who thinks it is clever to put the text at the top of the page and the heading at the bottom, up the side, on the opposite page or somewhere else? In Western countries at any rate, the convention is to direct your attention first to the top, left-hand side of the page, then scan across to the right and down as the message/story/information unfolds. It doesn't strike me as being fuddy-duddy to ask for such simple rules to be retained. They are there to help us.

The previous quotation highlights a couple of words that today find increasing use when the writer is uncertain about what he is saying, is too lazy to exercise a bit of discipline so that his message is expressed precisely, or feels that trendy lingo is appropriate. They merely cloud the issue.

The words I refer to are platform and support. Some of those who are not too sure what a thing is decide to refer to it as a platform, as in say "the ABC unit serves as a platform for a new generation of applications being introduced by the XYZ company". If you are not sure what it does, you can say that it supports whatever it is associated with. This usually means that it's compatible with, works with or can be used to control or drive something. Why not say so?

As someone who has spent a lot of his life trying to extract meaning from unnecessarily obscure prose, I was delighted with the news that the government is to lay down rules on how English should be taught. Help at last: with luck we might look forward to a generation of people able to express themselves lucidly and without ambiguity. Some hope! It seems that teachers have got at the programme before it has even started. Reading on, I find that 11-year old pupils should be familiar with the words assonance, calligram, cinquain and grapheme. What sort of nonsense is this? Well, it seems that poetry enthusiasts have been at work. They appear to think that to achieve a good command of English an 11-year old should appreciate what a cinquain is. Heaven help us. Poetry is, after all, a specialised use of language. It is best introduced as a later option. Would poetry enthusiasts feel it appropriate for an 11-year old to understand admittance, conductance and impedance? Specialist terms should be left until the relevant subjects come up in the syllabus. If this is anything to go by, the government's attempt to introduce a "literacy strategy" won't be very successful.

Going back to the mangled prose all too common in our own field, I have this horror that one day the slipshod talk of Silicon Valley may take over, and it will be straightforward English that, to a future generation, becomes incomprehensible. It would make clear thinking far more difficult.

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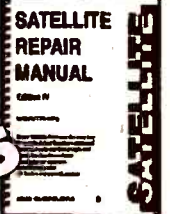
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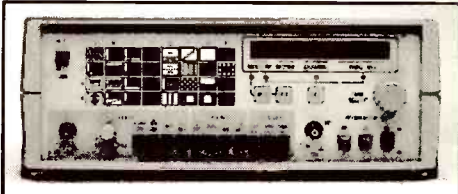


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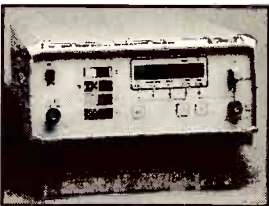
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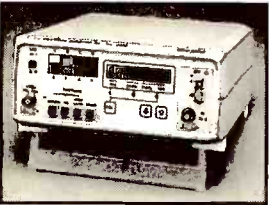
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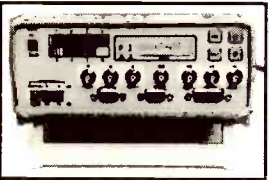
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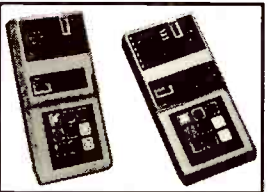
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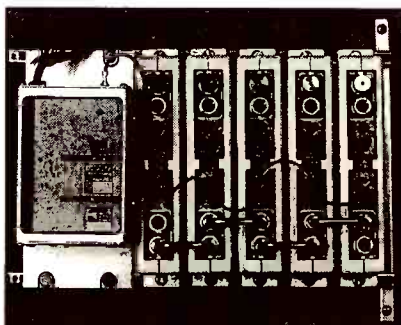
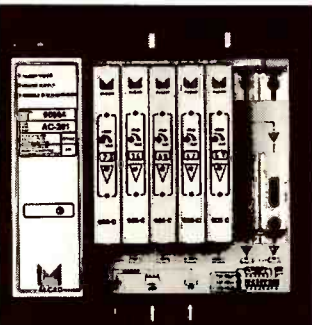
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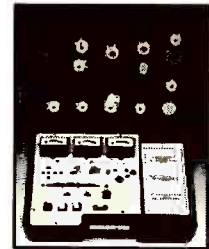
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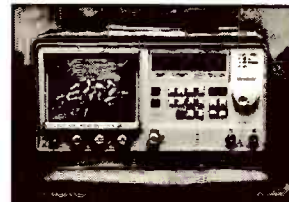
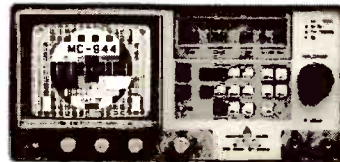
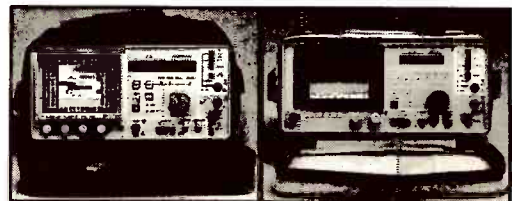
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Sony CCDV5000E

The customer complained about intermittent operation. When the unit was inoperative there was a DEW warning in the EVF and LCD displays. The unit would function correctly for long periods then fail, often after being moved. A bad dew sensor circuit connection was suspected and confirmed – it was at CN002 on the syscon PCB. The fault was cleared by cleaning then reassembling the connector pins. Sounds quite straightforward, but gaining access to the connector involved a lot of dismantling. D.C.W.

Nikon VM9500/Sony CCDV900E

The complaint with one of these early Hi-8 machines was that the picture would intermittently collapse into lines. When I gave the unit an initial test everything seemed to be OK, but after some minutes the E-E picture disappeared into a scrambled array of lines, as the customer had said. The evidence presented by the monitor suggested that the SSG circuits would be a good place to start, as it looked as if one or more of the CCD drives was missing. But getting at the SSG PCB is difficult – it's inside a heavy-duty screening can. How nice modern camcorders are: at least you can get to where you want without a

Camcorner

can-opener! Once I'd managed to get at the board I was able to carry out some tests and discovered that the H1 and H2 drives were missing. The cause of the problem was print corrosion between pin 51 of the DT73P hybrid chip and pin 2 of CN221 – the result of capacitor leakage.

After hardwiring the damaged print I cleaned the PCB thoroughly and replaced all the electrolytic capacitors on it – it's not wise to take chances with a PCB that takes so long to get at. Some capacitors that showed signs of failure on other PCBs were also replaced, to try to prevent further problems. On test everything was, thankfully, OK. D.C.W.

Hitachi VME10E

Electrolytic capacitor failure is becoming increasingly common with models in this range. You get a wide variety of symptoms. We recently had three of them in and decided that blanket replacement was the best prospect. Replace all the electrolytics on the main and the audio PCBs. Take care when removing them, as the print can easily become detached. Thorough board cleaning is also advisable.

This procedure may not seem to be very sophisticated technically, but is becoming more and more appropriate with such faults. The result should be greater reliability. D.C.W.

JVC GRM3E

"No operation" the customer had said: it was an accurate description. On examination I found that CP1 (N38) had failed. As a replacement seemed to cure the fault the unit was put on test. It worked for some time, recording a full 45-minute tape without a problem. But when rewind was requested the unit powered down. It seemed to be OK when it was switched on again – until rewind was selected. I noticed that excessive current was being drawn as the capstan began to rotate, but this time rewind was suc-

cessful. When play was selected there was again excessive current demand, but the machine continued until the end of the tape. Then, as rewind was requested, CP1 failed. I decided to replace the capstan motor, which is not a fun job – especially as much of the pinch mechanism has to be removed to get at the motor. A new motor and N38 circuit protector restored reliable operation. D.C.W.

Sony CCDFX700E

The complaint with this Hi-8 unit was that the tape-end symbol appeared in the viewfinder before it should do. Despite the presence of the warning light, the unit would continue to record to the end of the tape, when a bar-graph type display shows the final minutes of tape remaining.

The flashing symbol was annoying to the user rather than being a major problem. Service bulletins from Sony have covered this sort of thing with the 700E and other models in the FX range. With this particular model the action required is to replace L586 on the main PCB. It's also wise to clean the deck sensor connector pins and apply some Floil grease to the contacts – this applies to all the models in the range. D.C.W.

Panasonic NV55B

When this palmcorder was powered it did its reel shuffle at enormous speed. The play/record and cue/review speeds were also far too fast. A scope check at the output from the first capstan FG amplifier chip on the drive PCB revealed that there was no signal here: there should be a 1V peak-to-peak output. Neither was the noisy 100mV peak-to-peak input present.

A scope check directly at the FG head on the motor showed that there was no output here either, though its 5V and chassis connections were OK. A transplanted head from an old motor cured the fault. The DC level at the faulty head's output pin was about 0V. With a working head there should be about 2.2V here. N.B.

TELETOPICS

BDB Orders Set-top Boxes

British Digital Broadcasting (BDB) has placed orders for the set-top boxes (STBs) that will be required for reception of its digital terrestrial TV service with six manufacturers – Grundig, Nokia, Pace, Philips, Sony and Toshiba. BDB plans to start its DTT service this autumn: the manufacturers all expect to have their products in the shops in time for the Christmas buying season. BDB is still in negotiations on prices and quantities, and has not divulged the prospective value of its orders or the number of STBs involved. The boxes will go on sale at a subsidised price of around £200, the

same as BSkyB's satellite DTV boxes, provided buyers take out a year's subscription with BDB. The unsubsidised price has been calculated at about £350-£400.

The BDB package will provide the existing five TV services, new free channels including BBC News 24, ITV2 and other services, and fifteen subscription channels. Castle Transmissions International, which provides the BBC's TV transmission service, has been confirmed as the supplier of BDB's services.

Panasonic, Philips, Sony and Toshiba plan to launch integrated digital TV sets (IDTVs) later this year.

UK trial for WebTV system

Microsoft and British Telecommunications are running a UK trial of the WebTV system, which enables viewers to gain access to the internet via their TV sets – WebTV is owned by Microsoft. The trial involves some two hundred households initially and will last for about five months. Its aim is to assess the reaction of a representative cross-section of UK households to the system. If successful, a commercial service could start early next year. The WebTV set-top boxes are being supplied by Pace and Philips.

WebTV has been reasonably successful in the USA, where there are some 300,000 subscribers. Since the set-

top boxes cost only a few hundred dollars, WebTV is a cheaper way of gaining access to the internet than buying a PC for the purpose.

The basic aim of WebTV technology is to make TV interactive, including access to the internet. The set-top boxes provide high-speed communications over standard phone lines. Their use of VideoFlash technology gives fast downloading of full-screen, full-motion, high-quality video clips. Animation, pictures, music and speech from around the world thus become accessible to a UK viewer using a standard PAL TV receiver.

Latest Video News

Sony has developed the XR (eXtended Resolution) system for Video-8 and Hi-8 camcorders. It's claimed that the horizontal resolution with Video-8 camcorders will be improved from around 240 to 280 lines. With Video-8 models the Y FM signal bandwidth is extended from 3MHz to 3.5MHz, while with Hi-8 models the increase is from 5MHz to 5.5MHz.

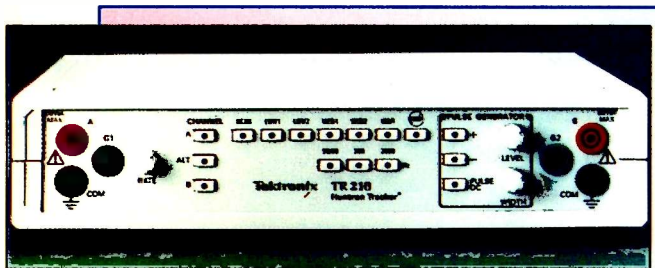
The system works by extending the frequency range of the Y FM signal into the FM audio band. A dynamic filter system preserves most of the Y FM signal's lower sideband. In the playback mode the filter removes the audio FM carriers from the overlapping band. The system is compatible with standard Video-8 and Hi-8 models.

Sony has also developed NightShot, which enables camcorder

users to record in complete darkness. The system uses a built-in infra-red light and will be available with both Video-8 and Hi-8 models.

Samsung has introduced a new type of widescreen TV called Super Hitron Plus. It's claimed to combine the width of a 28in. 16:9 picture with the height of a 29in. 4:3 picture. The set's model number is CW764AHD. Other features include Nicam, 100Hz scanning, Megatext and three smart sockets. Suggested price is £950.

Sharp has introduced three new TV models with SRS (Sound Retrieval System). The larger, 25 and 28in. models in this latest SRS range have an additional bonus – a sub-woofer. SRS sets provide 3D sound using only two built-in speakers. As a result, the 3D effect is not restricted spatially. The sets also have black-matrix FS tubes and AI optical picture control. Model numbers are 51DS05H, 59DS05H and 66DS05H. Suggested prices are £340, £480 and £580.



The Tektronix TR210 Huntron Tracker is a quick, cost-effective tool for fault-finding in assembled, unpowered PCBs. It's particularly suitable for dealing with intermittent failures, catastrophic failures and situations where the application of power could cause further problems. Components are checked by applying to them, across two test points, a current-limited AC signal that can be varied in amplitude and frequency. When used with an oscilloscope, this produces a current/voltage display that indicates whether the component is faulty. The Tracker costs £720 plus VAT.

For further information contact Tektronix UK Ltd., Fourth Avenue, Globe Park, Marlow, Bucks SL7 1YD (01628 403 300).

Cable TV

Cable and Wireless Communications (CWC), the UK's largest cable TV company with some 760,000 subscribers, is to use an operating system developed by Network Computers Inc. in the set-top boxes for its digital TV service. A trial is to start this summer, with a roll-out to the full launch planned for the autumn. The set-top boxes will be supplied to subscribers as part of the 200-channel service. CWC is to invest some £100 million in digital TV technology.

The NCI software, called DTV Navigator, will also enable subscribers to use the internet, send and receive e-mail and eventually engage in other interactive activities such as on-line shopping.

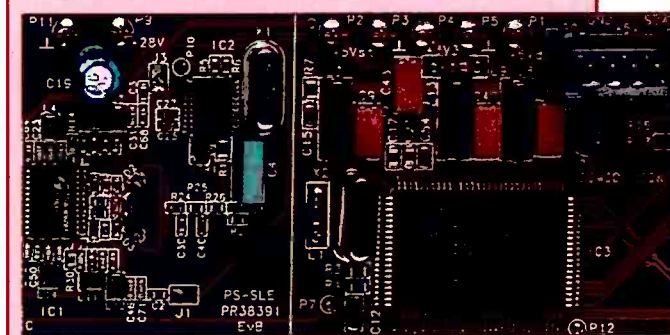
According to the latest ITC figures one in ten UK households now receives its TV services via broadband cable – the total stood at just under 2,374,000 homes on January 1st, 1997 was a record year for building cable TV networks, which were available to nearly 10,694,000 UK households at the beginning of the year: almost a third of them (32.7 per cent) took a service of some kind from their local cable operator. Telephone connections were being installed at a rate of over 3,000 a day throughout 1997.

Front Row, the consortium consisting of Telewest, NTL, General

Cable and Diamond Cable, launched its five-channel movies-on-demand service for UK cable subscribers on March 12th. Films are being supplied by Columbia Tristar, Warner Bros and Buena Vista. There are up to twenty screenings a day, with a choice of four films every evening. Films can be requested via a remote control handset at a cost of £3 each. The potential audience size is 1.3 million.

NTL Satellite Services was awarded the contract to distribute the Front Row movie-on-demand service. The system uses terrestrial circuits to the play-out centre, MPEG digital compression equipment, uplink facilities and satellite capacity aboard Sirius-2. Encryption is used to prevent unauthorised viewing of the transmissions.

Three of Kingfisher's leading retail operations are to run a trial home shopping operation in partnership with the Hull-based cable TV company VideoNet. A national service, initially in London, is expected to start in July. Households in the pilot area already have access to VOD movies and entertainment services and will now be able to buy MVC and Comet products via their TV sets. B&Q will be added to the trial in May.



Philips Semiconductors has introduced this three-chip system for use in digital satellite TV set-top boxes: the OM5712 module provides a complete tuning system. It's based on a TDA8060 zero-IF chip, which provides direct conversion of the input from the dish to baseband without the need for a second IF section. This is followed by either a TDA8043 or TDA8044 QPSK demodulator/forward error correction chip. A TSA5512 PLL chip provides frequency synthesis tuning. The output is an MPEG-2 data stream.

Latest Philex Remotes

Philex has introduced a new range of universal, pre-programmed remote control units. Suitable for use with leading TV brands, the Uni range is easy to use and is ready for use in seconds. No set-up codes are required: Uni units are fully operational by following a set of simple instructions. They are brand-for-brand replacements, and provide Fastext and a wide range of other teletext control functions. With this range there is no longer need to order a specific replacement or an original to replace a broken or lost unit.

For further information contact Philex plc, Philex House, 110-124 The Broadway, West Hendon, London NW9 7PP (0181 202 1717, fax 0181 202 0014).

Intercast TV

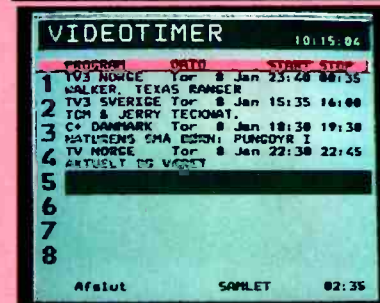
TV broadcasters can now transmit web-like pages during the vertical blanking interval, with linkage to the World Wide Web. The technology, called Intercast, has been developed by Intel and is already being used by US broadcasters including CNN and NBC. It is now being used in Europe as well, by ZDF in Germany for example. Viewers receive the service free of charge.

Photokina Dates

This year's Photokina exhibition – the world fair for imaging – is to be held at Cologne during September 16th-21st.

The Danish company Force Electronics A/S has introduced what is claimed to be the world's first analogue satellite TV receiver with a built-in electronic programme guide (EPG). The design, for which patents have been taken out, is based on text-TV data that's converted to a common user form. During the night the EPG for more than thirty channels is automatically updated so that the viewer has instant access to all relevant programme information.

Key features include an information bar with visual indication of time passed/left with the programme being viewed; various sorting functions, e.g. programme now displayed, next to come and channel categories; and a search system that looks for key words in programme titles – each member of a family can have his/her own personal programme search system. Another unique feature is infra-red blast control (IBC), which is linked to a VCR timer: programmes to be recorded are selected from the EPG directly. The company is to introduce a version for digital transmissions this summer. For further information phone + 45 981 94433.



Test Report



ESS Car Radio

Coder

Martin Pickering finds that the service he can offer with this equipment provides a useful extra source of income

The car radio coder unit arrived from Electronic Sound Systems in a large brown box. We opened it enthusiastically, like children with a present at Christmas. Inside we found the main processing unit, a number of leads ("probes") and adaptors ("pods"), and the all-important installation instruction book.

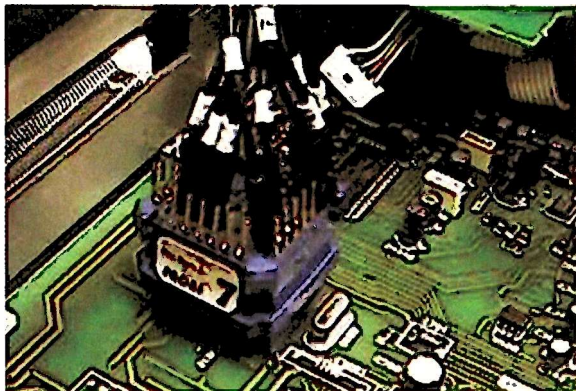
Installation

I would love to be able to say that installation was easy, but for us it wasn't. Bear in mind that I'm a dedicated Macintosh computer user and you will begin to understand the problem. Thankfully the coder software is designed to run with DOS, not Windoze, so this was one less worry. The main problem was that we were trying to install the unit for use with a 486 PC which was already being employed for the office accounts and the internet connection, so both COM ports were occupied – by the mouse and modem respectively.

I won't recount the days we spent trying various data switching boxes, male-female adaptors, and the horrors of "IRQ vectors", nor the cost of hiring a PC 'expert' to sort it all out after we had tried and failed. Suffice it to say that everything worked beautifully once the correct connections had been made.

If you know as little as I do about PCs, or even a bit more, I would recommend buying a second-hand 386 PC and dedicating it for use with the coder unit. Do it this way and, by following the simple instructions in the booklet, you will have it up and running in ten minutes.

There's even a probe for the Blaupunkt models



Use

The unit is a delight to use. It does everything it's designed to do, and the on-screen help eliminates need to refer to the manual and that "where did I put it" business! A simple menu system enables you to select the radio make and model from dozens of choices. It tells you which "pod" and "probe" to connect, while an on-screen diagram shows you where to attach the probe inside the radio. In practice we found it helpful to do a print out so that we had a copy of the diagram while we went through the connection and coding routine.

The starter kit consists of the software/hardware combination required to code Philips, Ford std, Blaupunkt std, JVC, Hitachi, Volvo and Panasonic radio receivers. It costs £375 + VAT. Additional software modules can be added at any time: each one comes complete with its own data prods and probes. The complete system sells at the heavily-discounted price of £1,995 + VAT. It includes all the software available.

There is also a special version of the software called "index software". This works as follows. When you read or write a radio receiver code, the system displays a special index number which you phone or fax through to ESS. The company enters this number into its computer, which decodes it and produces the original security code. The system also extracts the make and model number of the radio being coded as well as the customer's name and address, for billing purposes. Codes are charged at £5 each. There is no rental charge for the equipment, and no restriction on the number of codings (either a minimum or maximum). The cost of this system is £275 + VAT. It contains all available software.

Verdict

The prices reflect the work that has gone into the design and the cost of the equipment. The CE-approved control unit is well made, with a professional printed circuit assembly inside. We found that the IC type numbers had been ground off, while the software has a number of security features that should keep the student hacker happy for years. These security features and the price mean that the casual car radio thief is unlikely to have access to the unit or a pirate copy.

The "probe" leads are sturdily constructed, with a vari-

ety of sockets and spring-loaded connectors to cope with the wide range of memory and microcontroller chips in use today. The Blaupunkt lead in particular can cope with a multi-pin quadpack microcontroller. Although most of the probes have to be held in place by hand, it really is just a one-man job to code the majority of radios.

Earning its Keep

Once you've got the equipment working you have to make it pay for itself. We began by phoning all the local garages and electrical shops to tell them of our new service. This was followed up with low-cost advertisement cards in local shops and the post office. The system won't pay for itself for at least two years. Meanwhile we content ourselves with being able to offer this additional service and the fact that it attracts new customers who also bring in their TVs and VCRs for repair.

As a precaution, just in case we are asked to handle a stolen radio receiver without realising it, we record the serial number of each one in a little book, with details of the owner. This keeps the local police happy.

In Conclusion

Electronic Sound Systems is at Hilton Road, Aycliffe Industrial Park, Newton Aycliffe, Co. Durham DL5 6EN. Phone number is 01325 307 442, fax 01325 300 189. It might be an idea to visit the ESS website at:

<http://www.elecsys.com>

where you can download full details and price information on the various options by clicking 'DEMO'.

By the time you read this, the Windows version of the coding software should be available.

BACK ISSUES

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Book Review

Monitor servicing has received quite a lot of attention in *Television* recently, and it's generally agreed that it can form a useful and profitable addition to a TV/video service department's work. The subject has been given little attention in books published in the UK, so I was interested in a new book that's just become available here from the USA – **Troubleshooting and Repairing Computer Monitors**, second edition, by Stephen J. Bigelow. It was published in 1997 by McGraw-Hill, has ten chapters and 298 pages and provides a comprehensive coverage of the subject, including monitors with LCD and plasma displays.

US books on TV/electronics servicing have not found much of a market in the UK for various reasons, which are not confined to being based on the NTSC/525/60 system, 110V mains supplies and, very often, cable and VHF delivery. But while this particular book does have a typical US style and flavour, the systems and standards used for computers and monitors apply worldwide. This increases the book's

value and relevance.

Although the preface says that the book's intended readership is PC users and electronic enthusiasts, its main appeal will probably be to computer technicians seeking to extend their skills to the largely analogue world of monitors. So a lot of space is devoted to CRT operation, timebases, power supplies, generating high voltages, video drive circuits, basic test equipment (multimeters, oscilloscopes etc.) and fault-finding in these areas. All this will be familiar to TV engineers and indeed to most readers of this magazine. In many cases the fault-finding advice stops short of component-level diagnosis, instead advocating board replacement where relatively simple checks fail to reveal the cause of a fault.

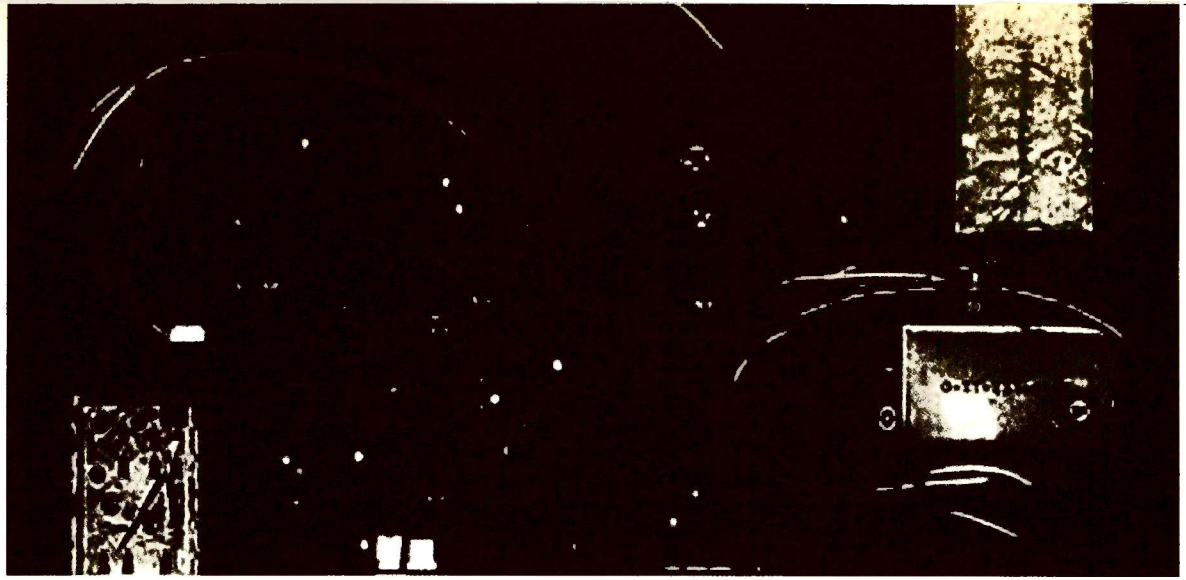
The most useful chapters are those that describe the line and frame scanning standards used and video-graphics adaptors, with much information on the different VGA protocols and pixel counts/ratios; energy- and screen-saving systems; and LCD technology, with much detail on cell structures and back-

lighting systems. The comprehensive advice on safety in Chapter 2 is also very good.

I would have liked to have seen more detailed coverage of the delta-gun tube and its convergence arrangements, long since forgotten in domestic TV but still very much alive and well in computer monitors. System control and scanning standard auto-switching, and the associated scan-amplitude compensation, also get scant attention unfortunately.

Despite these criticisms I would recommend the book to anyone in need of a complete, 'from-scratch' course in monitor servicing. For those, probably the majority of *Television* readers, who are already familiar with TV receiver servicing the book's value is harder to assess: much of the material covers familiar ground and the remainder, good though it is, is probably not worth the £30-95 the books costs. But it has to be said that £31 is probably less than the labour charge for a single monitor repair.

The book is available from CPC (phone 01772 654 455, fax 01772 654 466) under order code TB00076. **E.T.**



Satellite Notebook

Reports from
Hugh Cocks and
Pete Gurney, LCGI

Digital LNB Problems

The owner of an Echostar digital receiver, which he used to pick up the Dutch Multichoice package via Astra, had a problem: every evening the signal would go off, though reception via his analogue receiver, which was fed from the same universal LNB via the same IF splitter (see Fig. 1), remained OK. When I checked I found that the Echostar receiver's digital signal level bar display was high and the analogue receiver produced good pictures. So I replaced the LNB. The customer reported that there was no further signal loss during the following few evenings. Being curious, I decided to investigate the faulty LNB. With a 22kHz

tone generator switched on and an analogue receiver fed with Astra signals, a universal LNB's 10.6GHz local oscillator produces the German NTV analogue signal at an IF of about 1,040MHz. I chose this signal because it's not scrambled and is moderately weak. Several LNBs – not the suspect one – were tried and NTV was found to be centred on 1,041MHz. This was done by looking at the picture, noting the frequency at which black sparklies appeared, repeating the process with white sparklies and then tuning the receiver to the mid-position.

When the suspect LNB was hooked up the NTV centre frequency was found to be 3MHz low. During a cold evening, when the LNB's case contracted, the frequency could well have gone even lower. The digital receiver was just about able to cope with the 3MHz difference during the day, but the extra shift in the evening lost the digital signal default frequency.

I gave the LNB's high-band local oscillator screw a tweak to produce NTV at the correct IF and left the LNB running for several hours. It stayed spot-on for the duration of the test, even when the temperature dropped in the evening.

Incidentally I didn't use the LNB test signal source (*Television* January 1996) because of the extra local oscillator involved and the possibility of frequency measurement errors as a result of this.

I returned the LNB to the customer and fitted it to his dish. It has performed faultlessly for several weeks. Interesting that in heavy rainstorms, when analogue signals start to produce the dreaded sparklies, the digital pictures start to

freeze and jerk more, accompanied by sound dropouts.

With an installation like this a passive two-way IF splitter should if possible be used. Active splitters seem to overload some digital receivers. At worst the result is a blank screen on some channels (though the channel identification often remains), or sometimes jerky pictures and a long channel lock-up time. Often the receiver's bar-type signal display shows an increase with an active splitter – it's measuring the AGC.

Poor smoothing in an analogue receiver's switch-mode power supply can result in ripple on the LNB supply. When a universal LNB detects this it may switch to the digital high band. As a result, all analogue signals are shifted high by about 850MHz – CNN at 11,622MHz will appear at around 10,772MHz in the receiver's frequency display. If this happens, check the smoothing components. If the LNB still stubbornly shifts to the wrong band, add a 470µF (minimum) capacitor across the LNB supply, adjacent to the tuner. This should cure the problem. H.C.

Pace DVR600

The later DVR600 is now being supplied for Multichoice reception. Software and operation are similar to the DVR500. A new-style curved remote control unit (RC16 code) is used and the receiver has a sloping front panel. A modem is fitted for telephone connection, to make payments for pay-per-view services.

The UHF modulator in this model covers the entire UHF band – previously it covered only from ch. 28 upwards – and the signal-strength menu provides an audio

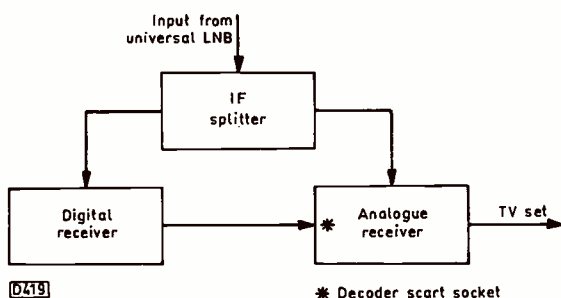


Fig. 1: A typical analogue/digital receiver set-up. The digital receiver sends a 22kHz tone to the LNB to switch it to the Astra digital high band. For analogue reception (Astra low band) the digital receiver must be switched off.

Some digital receivers, notably ones made for Canal Plus, have an IF loopthrough system: the incoming IF is fed to the digital receiver and an output is present at an F socket for feeding to an analogue receiver. The digital receiver still has to be switched off however.

The digital receiver's video and audio outputs can be fed via a scart lead to an analogue receiver's decoder socket. An analogue receiver channel can then be labelled 'digital'. This enables a single scart lead to be used to the TV receiver, from the analogue box.

tone to assist with dish alignment.

A scart connection facility at the rear of the receiver is a useful addition. Early versions of the DVR500 employed phono sockets only, though this was altered in later production.

For me, the greatest difference is becoming familiar with the new remote control button layout! **H.C.**

Pace PSR800

One of these non-decoder PRD800 receivers had given good service for nearly five years. It then began to suffer from intermittent factory reset of the programmed channels. The result was a "no pictures" complaint from the owner as the modulator defaulted to ch. 38 from ch. 25 - and all the German channels were placed first. As the receiver was used with an external Sky decoder, a lot of retuning work was required.

I removed the PCB from the chassis to replace C5, C7 (both 10µF) and C8 (22µF) in the usual way, to avoid future power supply blow-ups, and then found that there was no remote control. When the board was tapped, normal operation was restored - there was a poor contact between one of the

IR sensor's legs and the PCB. If a PRD/PSR receiver suffers from intermittent remote channel change operation, try tapping the case moderately firmly in the vicinity of the IR pickup (right-hand side front of the unit) to see if operation can be made to vary with the taps!

The early version of the PSR800 is due to be included in the next version of the PaceLink PC programming system. The PSR800 was rarely seen in the UK: it was superseded by the PSR800 Plus, which is on PaceLink. I'd forgotten how tedious retuning a complete channel list is! The current PaceLink (version V1.28) includes the MSS228 500-channel non-decoder receiver, and a 'tilting' facility which gives side-by-side viewing of stored files - this is useful when comparing channel lists in different models. For more information check the internet at

<http://www.pacelink.demon.co.uk>

or the Pace site at

<http://www.pace.co.uk>

or check with Kesh Electrics, Main

Street, Kesh, Co. Fermanagh BT93 3TH (01365 631 449, fax 01365 631 003. **H.C.**

Pace SS9000

This receiver came from another dealer with a report that it was stuck in standby. A power supply rebuild had been tried without success. On carrying out some voltage checks I found that the supplies were all low. The 5V supply was down to about 2.5V. Hence the receiver's reluctance to work.

All the usual suspects were checked, including R5, R13 and C16, and found to be blameless. The voltages on the primary side of the power supply seemed to be about right, and the mains rectifier's reservoir capacitor was OK. I noticed that when the receiver had been working for a few minutes the chopper transistor and transformer ran hotter than usual, though the power supply showed no other signs of distress. I removed and checked the transformer, which produced readings no different from those with a new one, but a replacement cured the fault. I can only assume that it had developed a shorted turn in one of its windings. **P.G.**

John McCormac's
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John Edwards'

Casebook

Hitachi C2519TG (G8Q Chassis)

The set was dead with no power supply operation. This version of the chassis doesn't use the infamous start-up thermistor, so a bit more investigation was required. A check at pin 6 (output) of the UC3844 chopper control/driver chip IC901 produced a short-circuit reading, the cause being D907 (BYV10-40) which is connected from this point to chassis. I replaced D907, the UC3844 chip and the two chopper transistors Q901/2.

I then found that the set wouldn't start up when powered via a variac. This had me puzzled for a time, as I looked for faults that didn't exist. When the set was powered directly from the mains it worked normally.

Panasonic Alpha 2W Chassis

Apart from the channel indicator LED and a momentary squeak from the power supply this set remained dead when it was switched on. A check showed that the 2SD1441RL line output transistor was short-circuit. When a replacement had been fitted the set worked perfectly.

I don't like line output transistors that fail without any obvious reason. So I resoldered the line output stage, the line driver transformer and the power supply. Then I gave the set a long test run.

Ferguson TX100 Chassis

After a few minutes the set would make a fizzling noise and go into the standby mode. When I took its back off a strong smell of EHT ozone was present. The anode cap was coated with nicotine and, while I waited for the suspected flashover to send the set to standby, the picture suddenly went completely out of focus followed by a vicious arcing noise. This directed my eyes to the CRT base board.

Even in the bright light of the workshop you could see a pulsating bright yellow glow at the focus lead entry section. The cause was nicotine embedded in the focus gap. I tried cleaning, but a new holder was required. Once I'd fitted this and cleaned the anode cap and its connection point the set was OK. Fortunately no chips had died during the raging internal storm.

"What caused the fault?" the customer asked.

"Err . . . Do you by any chance smoke?" I replied gingerly.

Hitachi CPT2282

This was a new set to me. It looked very dated with its bulky mains transformer, but it did have teletext, a scart socket and RGB phono inputs. The set was dead with its mains fuse and the degaussing posistor both shattered.

I removed the remains of the posistor and powered the set via my variac. It remained dead right up to the full mains voltage, with only 86V present across the bridge

rectifier's reservoir capacitor. As I didn't have the service manual I tried checking this and that then wondered whether the posistor plays a dual role. I'd no idea about the type, but decided to fit a P181 from CHS. Well, it looked the same and is suitable for a lot of Hitachi models.

I crossed my fingers as I wound up the variac. Suddenly the set burst into life and produced a good picture and sound. Luck again.

Grundig CUC120 Chassis

These portables are getting on in years but produce a really nice picture. So it was not surprising that the customer wanted his dead one restored to life. Checks showed that there was a supply across the mains bridge rectifier's reservoir capacitor and at the collector of the chopper transistor. But there was no drive at its base.

The voltages at the pins of the TDA4600 chopper control chip were near normal except for the 12V supply at pin 9, where the reading was 8V. Every other component in the power supply was then checked – it doesn't take long. As they were all OK the TDA4600 chip was replaced. This brought the set back to life, but for peace of mind I replaced all the electrolytic capacitors associated with this chip. After giving it a long test run I pronounced the set fit.

Samsung CI3312Z (P58SC Chassis)

This portable's owner complained about "weird colours". The picture displayed a typical degaussing problem. No matter how many times the set was switched off and allowed to cool down, when it was switched on again the fault was still present.

The cause of the trouble was poor wiring connections to the degaussing plug. I decided to remove it and solder the leads to the board directly.

Philips 2A Chassis

Although the mains fuse was intact, the BUT11A chopper transistor was short-circuit: part of the print that leads from the transformer to its collector had burnt away. I renewed the transistor and repaired the print, then I replaced the CNX62 optocoupler which I do as a matter of course with these sets.

To test the power supply I disconnected the 140V feed to the line output stage and fitted a 60W bulb as a dummy load. Then I powered the set via my variac, increasing the voltage slowly. At only 50V AC input the power supply was producing 140V HT which was rising – it would have gone through the roof if I had continued to increase the input! So the power supply was working but there was no regulation.

All the diodes and transistors in the power supply were checked and found to be OK. So it was time for a systematic check on all the other components, one by one.

It wasn't long before I found that R3664 (150Ω, 5W), which is connected to the collector of the chopper transistor, was open-circuit. It forms part of a tuning/efficiency network with D6664 (BYD33J) and C2664 (1.5nF, 2kV). As a precaution I replaced all three components.

JVC HRD160

Four equally-spaced horizontal tracking lines covered the entire picture when some prerecorded tapes were played. An investigation showed that the entry guide was slightly higher than it should have been when it entered the V block: as a result it jammed against the side of the block, which prevented full entry. I used one hand to support the top of the guide and the other to push the loading arm retaining pin fully home into the guide from underneath. The guide then clicked back into its correct position.

The reason why it would play some tapes but not others was differences in the take-up torque with various tapes. Low-torque tapes allowed the guide to remain correctly seated when it entered the block. Others would pull back on the guide, tilting it upwards and raising it.

Samsung CI5012Z (P58SC Chassis)

When the set was first switched on it produced a saturated white raster with flyback lines. After a few minutes this display cleared to provide a normal picture. Slight tapping on the tube base when the fault was present made it come and go. There were no obvious dry-joints on the tube's base panel, but some resoldering here cured the fault.

Ferguson FV11R/JVC HRD170

After a few minutes the playback picture produced by this VCR deteriorated into noise, similar to the effect with dirty heads. But the symptom continued to get worse until the noise completely obliterated the picture. I had no manual, but struck lucky when I applied freezer to the tuner/IF board, near the 5V regulator IC1: the fault immediately cleared, leaving a good, clear picture.

A scope check at the regulator's output pin when the fault was present showed that a perfect 200mV peak-to-peak 3.7MHz sinewave was sitting on the 5V output! At the 10V input there was a sinewave in excess of 1V peak-to-peak. By a process of elimination and accurate freezer application to the components in the area the cause of the fault was found to be the 10nF disc capacitor C42. When I checked it out of circuit I found that its resistance varied between a few hundred ohms and open-circuit, depending on the heat applied. It's nice to have a bit of luck sometimes.

Mitsubishi CT1447BM (Euro 3 Chassis)

The original complaint with this 14in. portable was intermittent operation. Now it wouldn't come on at all. One of the two 2.2kΩ, 3W start-up resistors, R916, was open-circuit. I also renewed its partner R915. When I switched the set on it came to life then tripped off intermittently. The three legs of the degaussing resistor were dry-jointed. Resoldering cleared the fault.

Ferguson TX90 Chassis

There were four text-type dotted lines in the top half of the picture. They spread from the extreme left of the screen to just short of centre, also from the right-hand side to just short of centre. Otherwise the picture qual-

ity was OK. The culprit turned out to be the 95V supply's reservoir capacitor C191 (22μF, 160V). When checked with a meter it measured only a few microfarads.

Solavox 140

This set was brought in with field collapse. The LA7830 field output chip was short-circuit while the 3.3Ω, 1W surge-limiter resistor R122 in the 24V supply was open-circuit. When these two components had been replaced the set produced a full picture but the top half was severely stretched. The 24V supply's 1,000μF, 25V reservoir capacitor C108 had fallen in value to only 2μF. A replaced restored correct scan linearity.

This set is the same as the Nikkai TLG88/89.

Philips K35 Chassis

As soon as the line output stage started up after switch-on smoke billowed from the air vents in the back cover. One of the capacitors in the EW diode modulator circuit, C567 (8.2nF, 1.5kV), was badly dry-jointed. As a result, there was a carbonised hole around the component pin. The set worked normally when the print had been scraped clean and fresh solder had been applied.

Ferguson TX9 Chassis

This portable was immaculate inside and out and was obviously treasured by its owner, whose complaint was that the picture would disappear intermittently – the sound remained. I connected a meter to the tube's heater pins, expecting to see a voltage drop when the fault occurred. It took a long time for the fault to put in an appearance, and the cause was not failure of the heater supply.

Just before the screen blanked out I heard a fizzing noise and the line hold went wild, followed by line collapse. Switching the set off and on again restored normal operation. A look around in the line timebase area with a magnifying glass revealed a very slight dry-joint at C158 (10nF) in the line oscillator circuit – it's connected to pin 15 of the TDA9503 line processor chip. The fault could be instigated by tapping the capacitor's body lightly and was cured by resoldering.

I then adjusted the RGB drives for a better grey scale. The result was a beautiful looking set with a perfect picture.

Amstrad TVR1

Most engineers will be familiar with the usual power supply breakdown in the TV section, requiring renewal of the fuse, the four bridge rectifier diodes, the surge-limiter resistor and the STK7348 regulator chip. This unit was no different except that when the items just listed had been replaced it remained lifeless. Individual checks on each component in the power supply revealed that C1509 (1μF, 63V) was short-circuit. This capacitor is well known for going open-circuit or changing value: I've never had one go short-circuit before. Unfortunately I had to replace the regulator chip again as well as the capacitor to restore normal operation.

Akura CX10

When the standby button was pressed the relay (RLY401) clicked but there were still no results. There was 15V across the main smoother C403 (1,000μF) but only 2.3V at the output from the AL271 regulator IC402. A replacement got the set working.

DVD's

UK Launch

The DVD system is an important addition to the range of consumer electronic products available. It may eventually supersede the use of tape. George Cole reports on the launch plans

The UK DVD Committee held a special meeting on March 6th to announce the official launch plans for DVD in the UK. If everything goes according to plan, DVD players and discs should be in the shops by the time you read this.

The DVD launch is being promoted by both the consumer electronics and video software industries – an unprecedented collaboration. UK DVD Committee members are Panasonic, Philips, Sony, Toshiba, Columbia Tristar, PolyGram, VCI and Warner. Simon Turner, the chairman, said the launch of DVD was “the most significant development since the launch of VHS.”

DVD has been available in Japan and the Far East since late 1996, and in the USA since the spring of 1997. During that time around one million players have been sold.

It's odd to recall that Thomson once promised to launch DVD players in the UK in October 1996: DVD's advent in the UK has been delayed for a variety of reasons, some technical, some commercial. At long last however DVD is here.

Antecedents

A number of video disc formats have been launched in the UK in the past, including LaserVision which has analogue video and sound on a 30cm disc; the Capacitive Electronic Disc (CED) which stored video and sound on a disc made of conductive PVC – the format was introduced in the UK by Hitachi for a short time in the early 1980s; CD Video which mixed analogue video and PCM (pulse-code modulated) digital audio on discs of various sizes; and Video CD which can store 74 minutes of MPEG-1 video on a CD-size

disc. These formats all failed in the market though Laser Disc, which is essentially a 30cm CD Video disc under a new name, has survived as a niche format for film buffs prepared to pay a premium for improved picture quality.

DVD Basics

DVD can store an entire film on a CD-sized disc (12cm diameter, 1.2mm thick). It does this by using data pits that have a minimum length of 0.4 microns (this compares with 0.834/0.97 microns for the CD) and a track pitch of 0.7 microns (compared to 1.6 microns for the CD). These smaller pits are read by a red laser whose output wavelength is 635-650nm (CD lasers have an output wavelength of 780nm). This increases the storage capacity by a factor of seven – to 4.7GBytes compared to 650Mbytes with the CD. The DVD specification includes dual-layer and double-sided discs: this increases the data storage capacity to 8.5-17GBytes depending on the disc configuration.

DVD uses MPEG-2 video compression and a component video recording system. A horizontal resolution in excess of 500 lines is achieved, compared to some 440 lines with the Laser Disc and 250 lines with the VHS system. A single-sided, single-layer DVD disc provides up to 133 minutes of video and can in addition carry multi-channel digital surround sound such as Dolby Digital or MPEG-2 audio, eight language channels and up to 32 subtitle tracks.

Launch Plans

Toshiba's marketing director Mike Brown made a brief presentation about the DVD hardware launch plans. Rather than go for an initial “big bang”, DVD's launch is to commence at the beginning of April and build up over several weeks. No DVD sales figure forecasts were given.

Columbia Tristar's operations director Steve Brown (no relation) talked about his company's software plans. There will be some forty titles on the launch date, much of it back-catalogue material such as *Four Weddings and a Funeral* and *Lawrence of Arabia*, with the number of titles expected to build up to 300 by Christmas 1998. PolyGram plans to introduce DVD titles on the same days and dates as its VHS rental and retail launch-

Toshiba's Model SD3107 DVD player is being introduced at about £550.



es, which should help boost the new format.

Most of the DVD titles will have Dolby Digital 5.1 multichannel sound, not MPEG-2 – Columbia Tristar's titles will have both audio formats. Most titles will be in 16:9 widescreen form, though a number of double-sided discs will offer 16:9 pictures on one side and 4:3 pictures on the other, allowing viewers to use whichever best suits their TV sets. Few titles will offer any additional information, such as extra scenes or biographical details.

Asked whether any of the companies would launch the Divx system in the UK, all those represented said no. Divx is an alternative DVD format with discs that can be played for 48 hours after which the contents are scrambled – see the CES report in last month's *Television*.

A number of companies had DVD hardware on show. All the players are designed to link with domestic TV and hi-fi systems, and are operated by remote control. Players designed for use in Europe will include firmware that holds the Regional Coding system: unlike CDs, which can be bought and used anywhere, DVD players and discs are intended for use in specific regions (the USA is region one, Europe and Japan region 2 and so on).

Some, but not all, DVD titles will include an ID code to tell the DVD player the region the disc is intended for. If there is a mismatch, the player will refuse to read the disc. A consumer magazine recently ran an article which showed readers how the Regional Coding system could be bypassed with one of the first DVD players to reach Europe. Asked about this, Simon Turner said that manufacturers would probably take legal action against companies that modified players and then sold them under brand names.

Hardware

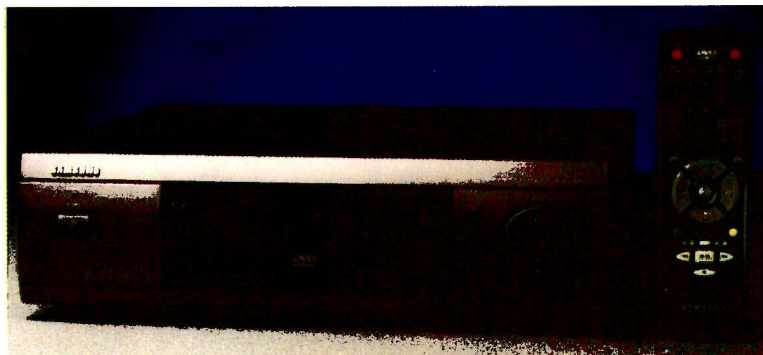
Philips is launching two players initially, the DVD930 at £500 and the DVD730 at £450. Model DVD930 can play DVDs, Video CDs and music CDs, and has digital audio outputs for Dolby Digital, MPEG-2 audio and PCM sound. There is also an analogue output for Dolby Pro-Logic and stereo sound. Video outputs include scart, S-video and RGB. The DVD930 can play PAL or NTSC discs – provided the latter do not have the Regional Coding system that restricts use to specific areas. The player can provide 'trick' modes such as slow motion, step advance, pause and AB repeat. It also offers multi-angle camera selection, audio selection, subtitle selection, aspect ratio conversion and a parental control system, though all these will depend on whether the disc has been encoded with the relevant data.

Model DVD730 provides most of the features mentioned above but doesn't have a universal remote control handset with jog-shuttle, favourite track selection for audio CDs, and a headphone socket with volume control (all provided with the DVD930).

Philips is also to launch the first digital home cinema receiver offering both Dolby Digital and MPEG-2 multi-channel sound. Model FR980 includes an FM/AM tuner with RDS and six-channel preamplifier output. Price is £800.

The Toshiba SD3107 DVD player includes Dolby Digital/MPEG-2 compatibility, Dolby Pro-Logic and MPEG-1 audio, jog-shuttle control, 4x picture zoom, a digital pan-around feature and interactive operation. It has a scart connector with switchable RGB, S-video and composite video outputs. Price is about £550.

Sony will be launching two models, the DVP-S715 at £600 and the DVP-S315 at £500. Specifications were



not available. Panasonic, which introduced the DVD-A100 in several European countries last year, is to launch a second-generation player, Model DVD-A350, at about £700. It includes a built-in Dolby Digital and MPEG-2 decoder. Panasonic plans to launch its DVD-L10 portable player this autumn. It has a built-in 5.8in. LCD screen and built-in speakers – see photo on page 435 last month. Price will be about £1,000.

Samsung's second-generation DVD player, Model DVD905, which was featured at the company's CES '98 display.

In Conclusion

Will DVD succeed where other video disc formats have failed? Technically, it is definitely superior. But much will depend on whether sufficient software to interest potential customers is available.

There seems little doubt that disc technology will ultimately replace tape-based systems for many home entertainment applications. When recordable DVDs arrive, we might see the beginning of the end for VHS. But not even DVD's most ardent supporters expect this to happen for many years.

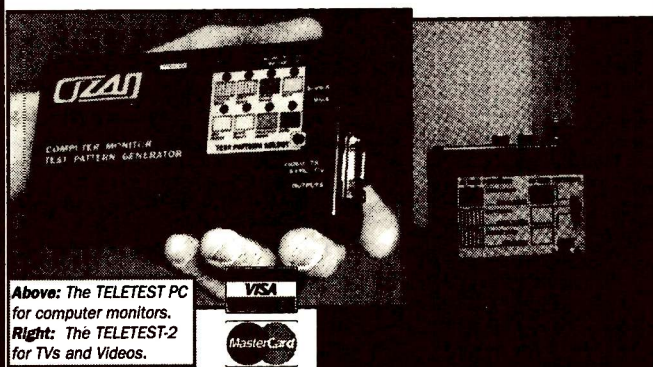
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LG Electronics/GoldStar

Fault Guide

LG Electronics, whose products were formerly sold under the brand name GoldStar, has released a wide range of TV sets, VCRs and audio equipment in the UK. The following is a list of TV and VCR faults that often come up on the LG Technical Line.

Non LG account holders can obtain parts from CPC, SEME, Willow Vale and Charles Hyde. For addresses refer to the *Television Spares Guide* in the April 1998 issue.

TELEVISION

PC33J Chassis

Models CF25C22F, CF28C22F and CF29C42F

Repeated failure of the field output chip IC301 and/or EW distortion after replacing IC301: Fit kit part no. KITPC33J.

Models CF25C22F and CF28C22F

Dead set with relay chattering and D401 in the line output stage short-circuit: Change R308 to 33 Ω , 3W (part no. 0RS0322L667), D401 and D402 to type RU4DS (part no. 0D400000AB) and X501 to part no. 156-A05B.

No line drive, 155V line OK, SCL and SDA inputs missing at pins 4 and 5 of IC503: Replace X01N (part no. 156-005N) on the Nicam board. If this doesn't cure the fault, replace IC03N (part no. 0ITI700880A).

Dead set with the chopper transistor Q801 (part no. 0TF910000AA) faulty: Reduce the value of R810 from 12k Ω to 6.8k Ω .

Service remote: Note that with these sets a special remote control unit, part no. 105-188Z is required to make all service adjustments.

PC58A Chassis

Models CF25C22F, CF25C28F, CF25A50F, CF28C22F, CF28C28F and CF28A50F
Intermittent purity patches in high-brightness pic-

ture areas: Increase the value of R704 from 5.1k Ω to 5.6k Ω (part no. 0RD5101F609) and R702 from 11k Ω to 13k Ω (part no. 0D1302F609). These components are in the ABL (brightness limiter) circuit.

PC31A Chassis

Models CI14A80F, CI20A80F and CI21A80F

Failure of R802 (680k Ω) in the power supply: Fit 1W instead of 0.5W replacement, part no. 0RF0101H609.

Dead with the chopper transistor Q801 short-circuit: Replace Q801 (part no. 0TR900000AA) and IC801 (part no. 0ISM460520A). Check R821 (150k Ω) and R806 (120k Ω).

Tuning problems: For drift check Q18 (part no. 0TR319809AA). If there's no 33V tuning supply check FR403. If it's open-circuit, fit a 1 Ω , 0.5W replacement.

PC42B Chassis

Models CI20C22F and CI21C22F

Remote and front panel controls cease to function after a period of time: Replace C814 (part no. 0CE4766H630) and Q811 (part no. 0TR968000AA).

PC53A Chassis

Models CI14E20F, CI20E20F and CI20A96F

Intermittent sound and colour variation: Replace IC01 (part no. 0ISG853403A). Also check Q06 for poor soldering.

PC04A Chassis**Models CIT2168, CIT2180, CIT2190, CIT4902 and CIT9902**

Field scan problems: The field timebase chip IC301 must be type TDA1170N (TFK type, part no. 0ITF117010A). Replace C301 (1,000 μ F, 35V), C302 (100 μ F, 35V), C309 and C311 (both 0.22 μ F, 35V part no. 181-032H) and D301 (part no. 0D400309BA). R320 is 10 Ω , 1W (part no. 0RS0102J665).

Sound muted, goes to standby after approximately ten minutes: Replace IC401 (part no. 0ITF194000A) and fit a 1k Ω resistor in place of link J8.

PC07X2 Chassis**Models CIT2172X and CIT2175X**

No sound when playing prerecorded tapes from a VCR: Adjust L204 a quarter-turn anticlockwise.

Low contrast when first switched on – the contrast level cannot be stored: Replace R520 with an 18k Ω resistor (part no. 0RD1801G609).

MC05B Chassis**Model CIT2588**

Intermittent picture blanking: Replace VC53 (part no. 181-503A) on the teletext panel.

VCRs**Models P13i, P134i and P234i**

E-E picture remains on in playback: W152, which may be marked FR501, goes high-resistance (up to 2 Ω). It's under the power supply. Part no. is 131-096C.

Fast forward and rewind are slow with shorter-length tapes (mainly 2-hour), or certain Video Plus ITV recordings that are programmed to start at 17:10 start at 17:00 and finish at 17:30, while recordings programmed to start at 22:40 for an hour fail to record: Replace IC501 (part no. 0IHI766R).

Models T16i, T163i and T263i

Fast forward and rewind are slow with shorter-length tapes (mainly 2-hour), or certain Video Plus ITV recordings that are programmed to start at 17:10 start at 17:00 and finish at 17:30, while recordings programmed to start at 22:40 for an hour fail to record: Replace IC501 (part no. 0IHI839766Q).

Model T263i

Clock setting changes by itself, sometimes causing lost timer recordings: Override the auto-clock setting by inserting a small-signal diode, e.g. 1N4148, in position D610 on the front panel.

Model W228i

Fault as Model T263i: As above but diode position is D622.

Models T163i and T263i

Playback picture fault: See first fault under Models P13i etc.

Model RDD10i

Poor sync and low contrast in the E-E and playback modes: Replace C814 (22 μ F, 10V) on the premier in/out board.

Intermittent colour with playback of prerecorded tapes: Reduce the value of R332 from 2.2k Ω to 1.5k Ω (part no. 0RD1501G609).

Dead with C139 short-circuit and maybe the mains transformer open-circuit: Change C139 to 0.047 μ F, 100V (part no. 0CQ4731N408). If the transformer (part no. 641-340B) is replaced C139 must also be replaced.

Model P934i

Poor LP-mode picture: Increase the value of C806 and C807 from 27pF to 39pF, 50V (part no. 0CX3900K408).

Models GHV1240i, GHV1244i, GHV1246i and GHV1248i

No fast forward or rewind: Replace the slide plate assembly (part no. 256-473A).

Models GHV1240i and GHV1246i

VCR shuts down, display shows flashing < >: Replace the loading motor (part no. 321-630A).

E-E picture overloading: Replace C715 (1 μ F, 50V, part no. 0CE1056K618) which is connected to pin 7 of IC701.

Models GHV7340i and GHV9400i

Intermittent picture blanking in the record mode: Adjust VC902 on the Nicam board until the picture locks.

Models RC700i, RC703i and RC705i

No sound in the E-E mode: Replace IC703 (part no. 0IIT241000A).

Models RQ/GSEQ 20i, 200i, 203i and 403i

Damages tapes after rewind: Change R237 to 6.8k Ω (part no. 0RD6801G609).

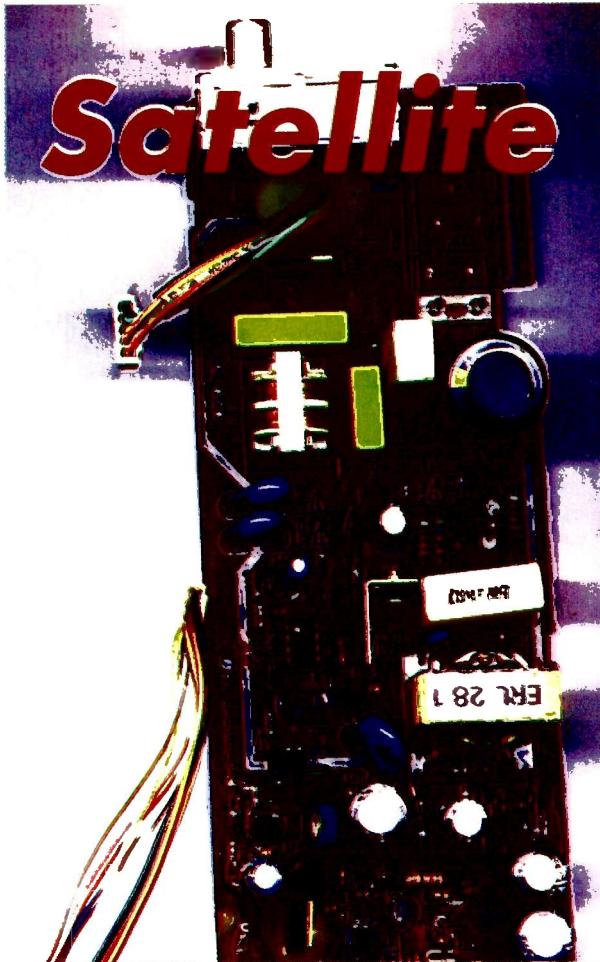
All D17 Deck Models

Tapes damaged on eject: Replace the take-up lever and pinch gear (part no. KITD170001A).

Our thanks to Des Bray and Michael Hardy of the LG Technical Department

Satellite

WORKSHOP



Jack Armstrong

Grundig GRD150

Most customers are friendly and are grateful when a repair has been completed. But some are downright ungrateful! Mr Sodital fell into this latter category, and I almost told him where to put his GRD150 receiver. He had insisted that I collect it from his house – I normally charge for a call out and, unlike some businesses, get round this by advertising “local call out” rather than “free call out”.

Anyway, having collected the

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

jack@netcentral.co.uk

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

receiver I put it on the bench to test it. The mains fuse had melted. This is quite common with the GRD150, also with the Nokia SAT1700 Mk. 1, the Cambridge ARD200 and badged clones. The fuse was chosen to protect the receiver from mains voltage spikes, and does this with alacrity. In such a case I tell the customer to avoid the use of electric hand tools and vacuum cleaners on the same ring mains or, if this is unavoidable, to fit a spike-suppression plug to the receiver.

I returned the GRD150 to its owner and tried to explain the nature of the problem to him.

“But it’s under guarantee if it fails again?”

“No” I replied. “I recommend that you fit a spike-suppression plug, but I still can’t guarantee that the receiver will be trouble-free. It depends on the cause of the surge and the size of the voltage spike.”

With that he refused to pay and slammed the door in my face! This was a few months ago. He paid after I’d posted the invoice to him twice, but only after discussing it with Trading Standards. My invoice was for the call out only by the way: I didn’t charge for the fuse or for labour.

Pace Apollo

The reported symptom was “no signal”, which is exactly what I saw when I switched this receiver on. When the blue-screen generator was turned off by pressing F then store there was a good picture that drifted around the screen aimlessly. The channel name was nicely locked in the corner of the screen however.

The pictures from the VCR scart connector were perfect. This provided a clue, and I checked with the circuit diagram. This led to the discovery that there was no sync pulse input at the graphics generator chip, which wasn’t surprising since the PTV111 sync separator chip U12 wasn’t producing any pulses!

I’m accustomed to seeing “no decoder messages” with this model,

caused by the 1µF electrolytic C109. A replacement made no difference, as expected, nor did a new 503kHz resonator (X3). It turned out that the PTV111 chip itself was the culprit.

Another Apollo 120 produced very poor pictures, apparently because the video level was very low. The dealer who brought it to me had been tearing his hair out (he’ll soon look like me!).

“I’ve replaced every component from the tuner onwards” he said, “and it still won’t work.”

“Oh” said I, “and did you check the power supply voltages?”

He stared at me blankly, as if he’d never heard of such a thing. Funny how people miss the obvious. The 13V supply was far too low. When the reservoir capacitor C73 had been replaced the receiver worked normally.

While I had the receiver on the bench I connected my Pace Link computer system and upgraded the receiver to 250 channels. This is really of no benefit to the customer, and Pace probably hate me for doing it, but it gives me an excuse to charge the going rate. The dealer went away balder, wiser and several quid lighter in the pocket.

By the way, if you can’t justify paying £199 for the Pace Link Pro system the Pace Link Lite system is now available at just £99. This is model-specific and is available from Kesh Electrics in County Fermanagh (01365 631 449). If you want to upgrade an Apollo 120 without this you can get a 250-channel kit, a 22kHz tone kit and a reliability upgrade kit from SatCure, PO Box 12, Sandbach, Cheshire CW11 1XA – send two 26p stamps for details.

Pace MSS100/Prima

Following stormy weather I’ve repaired quite a few of these receivers with no terrestrial TV loop-through, or “no E-E” as they say in the trade. Alternatively there may be grainy terrestrial TV pictures.

The cause has not been hard to

find. Dust borne by the wind had produced a charge at the aerial with a resultant high-voltage surge at the input to the TDA8725T aerial signal processor chip in the RF modulator. Most MSS100 receivers have a surface-mounted 39Ω resistor here: it goes open-circuit, but not before the chip dies. The Prima has a link that remains intact. Replacement of the surface-mounted TDA8725T chip is not difficult, but for a while I've wondered whether the input protection could be improved.

It can: Pace has issued a Technical Bulletin which describes a modification to remove the "hum bars" that may, with some receivers, be present on terrestrial TV pictures. It also seems to improve immunity to a high-voltage charge at the aerial. It's obviously impossible to provide protection against large surges or lightning, but the modification might help. It consists of adding two components, a $1.2\mu\text{H}$ surface-mounted inductor (part no. 913-0012501) and a surface-mounted BAV99 diode (part no. 912-0009951). The diode is in a dual SOT-23 TR package while the inductor's full specification includes "5 per cent high-SRF 230MHz". The green resist

(early receivers) on the copper earth line has to be scratched away to solder the new components. Later receivers have tinned copper pads where the components can be fitted, or they may have been added in production. The components are identified as 4 and 5 in Fig. 1. If a static discharge has already occurred, it may be necessary to replace other components: these are identified as 1, 2 and 3. If a $1\text{k}\Omega$ surface-mounted resistor is fitted in the coil position, remove it and fit the coil.

The other day I had a different problem with an MSS100 receiver that came to me through a chain of dealers. When it arrived there was only the owner's fault description, "no menus". I plugged in my scart connector and mains lead. Sure enough, when I pressed menu on the remote control unit the LED flashed but there were no menus. There were no channel names either. An hour was spent learning how the graphics generator works, and scope checks showed that everything was OK. The video output definitely had the menu superimposed on it, so how could it disappear before reaching the scart socket?

The answer was simple. I had

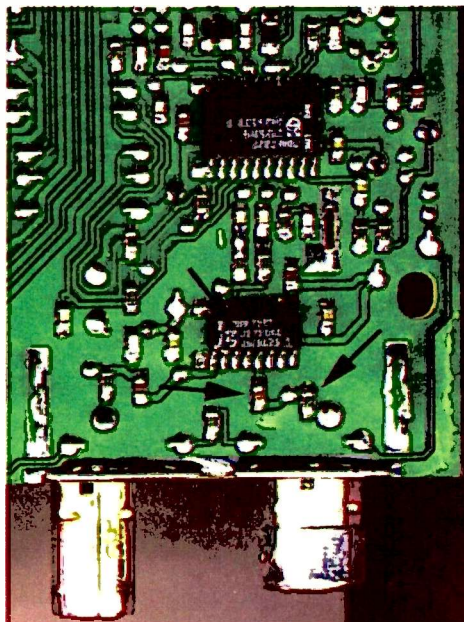


Fig. 1: Modification to Pace MSS100 and Prima receivers to reduce loop-through hum and provide protection against aerial static discharges.

inadvertently plugged my lead into the VCR scart socket, which takes its output prior to the graphics generator! Since the receiver worked fine all day, I can only assume that the customer had fallen into the same trap.

Test Case 425

There are good and bad videotape decks. One of the good ones is the type that's fitted to the Amstrad VCR6000/6100, the Hinari VXL8, the Tatung TVR6122, various Fidelity and Goodmans models and other VCRs. It's not especially reliable, but it is predictable, the important point for servicing. The most common faults are a sticking front-load worm, and loss of fast-forward and rewind action because of a worn rubber buffer near the take-up reel. The one problem the deck doesn't suffer from is tape slack at eject.

Except for this one on Sage's bench! Sage would have sent it straight back had there not been, sitting on top of it, two cassettes with several inches of tangled tape hanging from their flaps. On test the machine would not misbehave: time after time the tape was retracted properly into the cassette shell whilst unthreading and was ejected intact. Then, out of the blue as it were, the tape ribbon piled up in the deck and was snagged up during the eject sequence. There seemed little doubt that the supply (left-hand side) spool had failed to reel in the tape, but why? A transparent dummy cassette was inserted to carry out further testing, but the machine behaved itself for the next ten minutes of repeated insertion, threading and ejection of the tape. Sage put the machine on one side, still in the stop mode.

In this design the drum spins for eleven minutes (tape threaded up) in the stop mode. After this the deck 'times out' if no instructions are received, then the drum stops. Sage noticed this happen, and pressed the stop/eject key twice (the machine was a Tatung TVR6122). He saw that the supply turntable failed to rotate as the tape was unthreaded. He fed the tape in again and

immediately ejected it. But the symptom had disappeared once more, and wouldn't return – until the machine had been left in the stop mode for eleven minutes and the drum had ceased to turn! Then the supply spool table again refused to turn backwards. What devilish agent was at work here? Apart from a really strange microcontroller fault, it was difficult to see any connection between the two events.

Sage, now able to reproduce the fault more or less at will, though only at intervals of eleven minutes or more, turned the machine upside down to confirm that the reel drive belt didn't slip when the fault occurred and that all the visible cogs that should turn were turning. Everything was OK, so it seemed that either the idler plate assembly didn't swing far enough to the left to engage with the take-up reel teeth or the reel-drive clutch was slipping, even though the clutch was supplying more than enough torque. Progressive tests then established that the fault had a time-delay factor rather than being related to the cessation of drum rotation: the longer the tape remained threaded – but stationary – the less likely the supply-side turntable was to rotate when unthreading was required.

With this deck it's not possible to watch the action of the idler plate assembly from above, even with a transparent dummy cassette present – the cassette cradle's bottom plate masks it. In the event however this was not necessary, because careful observation of the supply-spool table area showed up the strange and, to Sage anyway, unique cause of the fault. What was it? Not the clutch, nor anything to do with the idler plate. For the solution, see page 519.

A Life in TV

From the days of 405 lines and H aeriols to satellite TV and dishes, **Peter Nutkins** chronicles his experiences in the trade

My affinity for rubbish dumps must have been something of an embarrassment to my parents. But there were few other opportunities in the early post-war years for an impoverished schoolboy with an obsession for things electrical to satisfy his needs.

My first major find was on a compost heap in the allotments adjacent to our school playing field. I couldn't wait for lessons to finish so that I could go and investigate what I thought I'd seen over the fence at lunchtime. Yes, there it was, undamaged and unruined – a Blue Spot balanced-armature loudspeaker! What I couldn't understand was why my fellow students didn't share my enthusiasm. But that was their loss.

Early Days

I gradually got to learn of others in the area who were either in the radio trade or connected with it. As a result, I began to acquire a stock of various components. The earliest ones were a crystal detector, some coils and condensers – and a variometer! Then, having built every variation on the crystal-set theme, I moved on to greater things.

When I left primary school I went to Charterhouse. Well, Charterhouse Road Secondary School actually. Here my maniacal interest in radio, and by this time TV, often got me into hot water. The only subjects I had any interest in were physics, then called science, and related ones – chemistry, electricity etc. One of my teachers strove unsuccessfully to discourage my interest in favour of “an all-round education”. Another one

shared my interest in TV however, and had actually built the Viewmaster kit featured in *Wireless World*.

The next highlight I remember was when my father bought a new radio, a Sobellette in a white plastic cabinet. It had a row of those GT octal valves that gave off such a comforting glow – I would spend ages just looking through the slots in the case. I think my mother still has it somewhere in the loft.

As a result of this purchase I was given the old radio, a Lotus two-valve mains set with some features I'd not met before. These included a mains-energised speaker, a metal rectifier which announced “Westinghouse Brake and Signal Co” on the insulators at the ends, and a valve with a screw terminal on the side. The speaker's energising coil kept me supplied with 30 swg wire for coil winding for a long time. I think the valve was an MKT4, which was an output tetrode. As the valves of that era had a maximum of five pins, a further connection had to be provided for the screen grid.

Projects

By this time I had found two other boys with similar interests at the school. They were both called Brian. We used to compete with one another to build the amplifier with the best bass boost circuit. I had a certain advantage here, as by this time I had acquired a mains transformer, a metal chassis and a couple of 6V6 valves. Later I did even better, with a couple of KT66s.

One of the Brians lived not far from

the school and was envied for having the use of his father's garage and tools for construction work. I keenly followed his development from scratch of a TV set based on a VCR97 6in. green-screen radar CRT and a quantity of EF50 valves. It was built on a wooden framework fitted with sheet zinc panels. I don't remember actually seeing any pictures, but I do remember hearing the sound to Muffin the Mule or something similar.

At about the same time I came by a partly-built Denco TV kit. The hard work – construction of the RF strip – had been done. This left for me to complete the timebases, the sync circuit, the sound circuit etc. When I'd finished I was amazed to find that it all worked. As we couldn't afford a cabinet for it, the TV stood in the corner of the lounge on an up-ended orange box. It was covered with a table cloth when not in use.

The small town in which I was born and raised, to the south east of London in Kent, was divided in two by a railway line. Woolworths and the Embassy cinema were on our side, also a TV shop at which I was later to find employment. “Across the bridge” was altogether more posh, with a square of mock-Tudor shops that surrounded a matching pub. There were two TV shops on this side. One of these was at the corner of a driveway that led to a row of lock-up garages. The first of these was used as the workshop, and at the far end there was the rubbish dump to beat all rubbish dumps, a veritable Aladdin's cave. This is where they emptied their waste bin!

My frequent trips there would sometimes be rewarded with say a brace of SP41s, a PZ30 or even a PL38. The most useful items were burnt-out TV mains transformers. In the early days the EHT was about 5kV and was obtained from an extra winding, sometimes on a separate bobbin. This was the winding that usually burnt out. It could be removed, with judicious use of a hammer and cold chisel, leaving a fully functional HT/heater transformer with a spare bobbin on which you could put the winding of your choice. Very useful for making battery chargers.

A Start

As you will have gathered, I was not overly enthusiastic about school. So I was delighted when my father found a job for me in the TV and Hi-Fi department of a then-famous London photographic firm. This involved wearing a black suit and joining the commuter set – all for the princely sum of £3 per week.

The department was located in the basement, and one of my responsibilities was to sweep up and clean the displays every morning. I naturally took a rather dim view of this and some of the other jobs I was given – I wanted to repair TV sets! After a somewhat painful induction period, and several clips around the ear, I did eventually get to do some more rewarding work. This seemed to consist mainly of fitting EY51s and LOPTs to Pye V4s, but at least it was TV work. I soon progressed to making house or business calls, which could be to anywhere in London.

The event that led to my departure from the firm after about a year, by “mutual consent”, was not entirely my fault. At that time London had a diversity of electrical supply systems. Different areas would have a different mains voltage – some even had DC! Our shop was fed by a two-phase, three-wire system, i.e. 110V either side of earth, which was in the process of being changed to single phase. The contractors had rather jumped the gun in installing a consumer unit (solid ‘neutral’) before the changeover. I managed to short the ‘neutral’ to earth via one of the metalclad 15A outlets that supplied the shop. When I had regained my sight and hearing it was dark in the shop and also apparently in the insurance company next door. It was also dark in the basement projector demonstration room, which was in use. My boss gave me a call to deal with several miles away so that it would “last the rest of the day”. I



One of the vans Peter used for outside calls in the Sixties.

arrived at work next day with some trepidation and was called into the manager's office. It was suggested that I might like to look for employment elsewhere.

Second Job

Back in Kent I would sometimes call into the local TV shop for a chat on my return in the evening. Its owner would usually be pouring over the day's till roll. He had mentioned that he planned to build a new workshop, and might then be in a position to offer me a job. As progress seemed to be slow at best, I'd given up asking. One evening however, as I was walking past the shop, he ran out after me. Apparently one of his engineers had left and he was in immediate need of help. In view of recent events in London, I jumped at the chance.

As in so many cases, the business had started as a cycle and radio shop. TV and domestic appliances had come later. There was in fact still a rack of cycles on display outside. Above the window there were the words “accumulators charged”. They still were, and that was to be one of my first jobs – until I dropped one through a carboy of acid. Things had not changed very much!

There were two other staff in the workshop. Bill was close to retirement and was a wizard with Philips projection sets. These were quite advanced for the time, with protection circuits to prevent tube burn in the event of timebase failure. They also had a 400V HT supply, obtained from two PZ30s in a doubler circuit, and woe betide you if you came into contact with it. The other employee was Jim, who was about the same age as I. He had started there from school, and was still there long after I left.

The first TV set I was asked to repair was a 12in. Philips receiver. I can't recall the model, but the

mechanical, magnetic focus assembly was controlled by a knob on the front via a bowden cable. The set also had a sloping back, and the entire cabinet could be lifted off after removing four screws at the rear. Judging by its position at the far end of the bench, against the wall, it had been there for some time. No one had been able to trace the cause of the fault, poor line sync – cogging on the picture. In those days, prior to fly-wheel sync, the sync circuits were very simple, consisting of a single valve (usually an EF80) with a small capacitor in the feed to the line timebase and a larger one with a series resistor in the feed to the field timebase. Not much to go wrong! Everything had been checked and changed, probably several times, to no avail. To cut a long story short, the cause of the trouble was in the video output stage, where the cathode bypass capacitor had gone open-circuit. Sounds simple now, but TV and its engineers were then in their infancy. It gave me some credibility as a TV repairer.

Start of ITV

Independent TV started soon after I began to work at the shop. The first signal we received came from the ITA transmitter at Beulah Hill. It produced a test card with the inscription G9AED. The significance of this didn't dawn on me until some years later, when I became a radio ham.

The demand for Band III receivers was immense. This was the start of the boom years. In addition to sales of new sets there were the conversions, which kept us busy until late in the evening in the days and weeks prior to the start of programmes. Converters came in various forms, one of the ones I remember best being the neat kit which Ekco supplied for its T161 series receivers. It consisted of a turret tuner that was



Peter's house at Charmouth, Dorset - where you can get B&B and your set repaired!

secured inside the cabinet by three countersunk screws fitted outside, using the template provided. The screws were covered by a flat plastic ring on which the channel numbers were marked. To complete the job, you fitted the fine tuning and channel selector knobs and made wired connections for the heater and HT supplies - also the IF input of course.

Another that comes to mind was the type fitted to the famous Bush TV22 9in. Bakelite sets. It was especially tailored to fit the IF panel and was housed in a brown plastic box. You first had to secure it to the panel and wire it in, then cut a hole in the back cover to allow it to protrude. Channel selection was accomplished by means of a push-pull knob that projected at the rear, right-hand side of the cabinet - to tune in a station you rotated this knob. The unit was fitted with what we now regard as a standard coaxial plug, but the input to the original Band I section was via a cable clamp and screw. You had to remember this when taking a set away for repair!

Many of the receivers in use at the time were of the TRF type, and thus couldn't be fitted with a conventional tuner. This problem was overcome by using a Band III receiver whose output, in Band I, was fed directly to the aerial input. This worked well with the good-quality converters made by some well-known manufacturers, but these were expensive. One or two enterprising firms produced some cheaper units, one of which fitted inside the cabinet. The screening and filtering left a lot to be desired however, with the consequence that neighbours even two or three doors away would also receive ITV whether they wanted it or not!

Developments

Looking back, I think the years I

spent at that shop were the most interesting and exiting of my working life. I was keen to keep up with the advancing technology, and when the first multi-channel sets arrived - Pye VT4s - I couldn't wait to get inside the tuner to find out how it was done. Unfortunately there was a label on the side with wording to the effect that the guarantee would be invalidated if the unit was opened.

Then there was the advent of transistors. The first transistor radio receivers cost about a month's wages and sounded dreadful, but they rapidly improved and the price came down. My first encounter with a transistor came with a hybrid car radio that used an OC16. A special range of valves that would run with a 12V supply had been introduced, eliminating the need for a vibrator unit or a rotary converter: the transistor was in the output stage, with a transformer to match its output to the 3Ω speaker. Sound quality was surprisingly good, particularly as it was a single-ended output stage.

Transport

The first transport I owned was a Vespa scooter, on which I duly passed my test. But what I wanted was four wheels. When I reached the relevant age I was allowed to drive our nearly new Austin A40 Somerset van. While awaiting my driving test the Suez crisis erupted and petrol rationing was introduced. But this came as a bonus for me: driving tests were suspended, and those with a provisional licence were allowed to drive unaccompanied! When tests were reintroduced, they couldn't really fail you, could they?! So I obtained my treasured driving licence.

Unfortunately my propensity for accidents was still with me. When the first winter ice came I managed to

leave the road on a corner where there was a strategically placed lamp post. Jim was trapped under the dashboard as the passenger seat slid forwards.

Improvisation

Receivers were still relatively expensive. So were spares. Because of this we were often called on to improvise in order to make a repair affordable. There were still quite a number of sets around with a mains EHT transformer. This item cost about £5 to replace - my weekly wage! We overcame this problem by removing the EHT winding (as previously mentioned) and using instead a voltage-doubler made from two K3/45 selenium rectifier sticks and two TCC Visconal EHT capacitors. The input was taken from the anode of the line output valve. The results were not as good as with the original design, but at least there was a picture - even if the curtains had to be pulled to see it!

I also remember a small but exceedingly heavy Philips set. It had been fitted with a 66V battery as the mains transformer's low-voltage winding, used to power the picture shift system, had gone open-circuit.

Setting up Shop

My employment at the shop lasted for eight to nine years. Then I got married and decided to go it alone. We moved down into The weald of Kent and bought an ex-farm cottage in the middle of an orchard. Although born not far from London, I'd always wanted to live in the country. Now my wish had been granted.

I already had a small customer base. But I didn't realise how small until we tried to depend on it for our living. Despite an aggressive advertising campaign, our business grew slowly and our financial situation could be described as 'interesting'. I would sometimes leave home to make some service calls, hoping that someone would pay cash so that I could put enough petrol into the car to get home again. Eventually my wife Christine also got a job, and we managed to survive. But things gradually improved, and after a few years we took a lock-up shop in a nearby town.

At first the shop was quite successful. Christine would stay behind the counter while I did the outside calls. Our business was mainly in second-hand TV sets which we sold or rented. The shop's rent, £4 a week, was more than covered by the first twenty rentals we put out, at 4/9d a week for a 17in. slimline set - typically a

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Ferguson 506T. If we sold a set it paid the rent for a month! Christine was no longer able to help with the business once our son Martin was born, and I then had to work all day in the shop and late into the evening doing the service calls. Something clearly had to be done about this unsatisfactory arrangement.

A Move

My mother had a caravan at Beer in Devon, and we would escape to it whenever we had the opportunity. We came to love the area and made many good friends there. After a particularly enjoyable weekend I suggested that we might move down there. Christine's initial reaction was one of horror. She asked me to sleep on it, which I did, but I still wanted to go. Eventually, with reluctance, she agreed. So we put the house and the business on the market and within two months had moved into an even more rural cottage on the Dorset/Devon border. This time it was detached, with a little land.

Because of my experience during the previous few months, I decided that I didn't want to be self-employed any more. So I sought work locally. I didn't have much dif-

ficulty in finding it, as there was still at that time a considerable shortage of engineers. I worked part time for a shop on the Devon coast and also for a large rental business that was run from a farm in Somerset.

It wasn't long before I decided that employment wasn't for me. So I put an ad in the local paper for TV trade-ins. The result - nothing! But the shop in Devon had a large stock of trade-ins. I asked what they intended to do with them and they didn't know. This was my opportunity: I offered to take the sets off their hands for a number of hours work per week - by this time we'd run out of money - and they readily agreed. The first car load was subsequently taken home for servicing. I then placed another ad in the local paper, offering reconditioned TV sets for sale or rent, and this time the phone did ring. We got calls from all over east Devon and west Dorset, and within eighteen months we again had a viable business.

BBC-2

Prior to leaving Kent we had gone through the second conversion phase, with the advent of BBC-2 with 625 lines. A local lad David,

who had only recently left school but had managed to buy a new mini van, installed UHF aerials for me. When we reached the west country it was back to 405 lines again, as Stockland Hill had yet to carry BBC-2. But I must admit that I didn't miss those troublesome system switches!

A year or so later we got BBC-2 in Dorset/Devon and business boomed. David, who had worked for me in Kent, moved here to work as an aerial rigger/engineer, and a few years later I had to take on another engineer. Then, as valve TV sets came to be replaced by ultra-reliable solid-state ones, it all fell apart.

Today

I am surprised that the business has lasted this long. We still get little flurries of activity, but can no longer rely on it.

So now there is just me, with Christine providing some assistance with the paperwork. To earn a living we have had to venture into the B&B trade. It's different, and a lot less taxing on the brain. During the quiet periods I work on the house, preparing it for the next season. I have seven years left until I retire. Will I be able to understand the trade at all by then?

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Technical Training

For some time now I have been concerned about the shortage and poor quality of technical training available in the domestic electronics field, and the doubtful quality of the new certification process for service engineers and technicians. In the near future the wonders of digital radio and TV will be delivered to our homes. The broadcasting side of the industry is fairly well prepared for this mammoth change. What about those closer to the public? A number of dealers and technicians have told me that they cannot find any useful digital TV training courses. So how are they going to provide the back-up that will be essential to the success of digital transmissions?

There is a lot of concern, particularly in the south of England, about the quality of the training provided by the newly-established Community Colleges. From my experience it seems that many of these colleges are run by highly-paid Principals who have little or no understanding of the technical fields they are supposed to serve. The governing bodies also seem to have no great concern for engineering. I doubt, to say the least, whether they are making the best use of the funding available for the new training courses that are so essential.

The new GNVQs for the radio and TV servicing industry are not without their problems. They are due to start replacing C&G 2240

Letters

later this year. The new scheme has a large gap beyond Level 3 (even if Level 3 proves to be satisfactory). Little attention is being paid to servicing satellite equipment, VCRs and the more intelligent items that are due to appear in the domestic market over the next few years.

A lot of training is going to be required within the next two years if the new digital services are to be supplied to the public successfully. Information coming from the City & Guilds of London and the Electronics Examinations Board, which have to certify these new qualifications, is not very promising. *Geoff Lewis, B.A., M.Sc., MIEE, MIEE, Canterbury, Kent.*

Spares and Warranty

I hope this is not the way things are going to be in the future. Recently the shop where I was working had in for repair a Sharp Model 59CS-03H. It was dead, and meter checks indicated that there was a short-circuit in the power supply area. But that's as far as we were able to go. You see Sharp provide an exchange service with this chassis, at approximately £60 plus VAT – provided no attempt at repair has been made. The replacement chassis was fitted and the set was given a day's soak test. It was then returned to the customer. Fifty nine days later it was back on the bench. This time it seemed that the line output transistor was short-circuit. But there's no warranty with these replacement chassis!

A phone call to Sharp produced a sympathetic response. The chassis would be exchanged free of charge, but we were given to understand that this was not the normal procedure. The set is now working again. Anyone without an account is not likely to get such sympathetic treatment however. Personally I don't see that it's fair to either customers or the service repair trade for manufacturers to operate in this way.

Recently, while working for a shop in the Manchester area, I had to repair a number of Samsung

VCRs. The company had an account with Samsung, so spares were readily available. The VIK310/320/350 series is notorious for a chain-fault condition (see Mike Leach's excellent article in *Television*, February 1997). There's a reasonably priced kit, part no. 6WINNER1MODKIT, that contains all the parts required. But it's available only to account holders.

When I wanted one of these kits for a VIK350 I was repairing the lady I spoke to in the spares department said the kit didn't exist and demanded to know where I got the part no. from! Why do non-account holders get treated in this way? *Graham Richards, Rochdale, Lancs.*

The Negative Screw

I always read *What a Life!* with interest. In his March column Donald Bullock mentioned the fact that in a mains plug it's the screw on the negative side that tends to become loose. Recently I repaired a Panasonic Model TX2471 with a blown line output transistor. Two days later the set came back with the same fault. I fitted a replacement but the set remained dead. Yes, you are right, the negative screw in the mains plug was loose – very. The cord-grip screws were moderately tight, so the cause couldn't have been a pull on the cable.

Is this a coincidence? I normally check the plug connections, but this one had been overlooked. Will I never learn?! And why the negative side: it's the same current after all.

David Smith, Leigh, Lancs.

The Pace Apollo

In a letter in the March issue K.E. Prior suggested that it might be possible to program a blank 24C32 EEPROM with 250 channels by inserting it into an MSS300 receiver. Unfortunately this is not possible: in Pace receivers from the PRD900 Plus onwards the channel information is not contained within the microcontroller chip – there

simply isn't 32K of internal ROM to spare. Consequently the result will be just one channel, not 250.

Anyone who wants to upgrade an Apollo receiver for 250 channels without buying an EEPROM programmer can however use a SatCure kit which contains a preprogrammed EPROM, a socket and instructions. For details of this and other repair/upgrade kits, send two 26p stamps with details of the make/model concerned to Satcure, PO Box 12, Sandbach, Cheshire CW11 1XA – or check at the web site

<http://www.netcentral.co.uk/satcure/>

I should perhaps mention that the Pace kits are not manufacturer approved, but they are tried and tested.

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

Correction

There was a slip in Donald Bullock's March What a Life! column, which I always enjoy reading. The Willow Vale part no. for the 'electronic screwdriver' chip in the JVC MXII chassis is 87024ST. This chip is referred to as IC1707 in the parts list, the 1 being the board prefix number – the chip is IC707 on the circuit diagram and in the setting up instructions in the manual. Our part no. 87028M, quoted by Donald, is for the service manual.

Max Hofmann, Marketing Director, Willow Vale Electronics, Reading, Berks.

Grab the set and Run

Whenever possible I try to avoid in-home repairs: I prefer to grab the set and run. No matter how simple the initial diagnosis, I find it better to carry out the repair in my workshop.

Over the years I've accumulated a range of tools and test equipment, some custom-made for specific purposes. All this has proved indispensable in helping me to solve the most baffling cases (perhaps it's just me, but recently too many faults have fallen into this category). So the tools are invaluable, and because of the falling profits associated this trade regular purchase of tools and test gear is not feasible. For this reason my equipment, except for a handful of basic tools kept in the van, stays in the workshop, away from hard pavements, thieves and the absent-minded times when I reach for a tool only to realise that I've left it in some-

one's house – but which one?

Provided my initial guesstimate, usually made over the phone, has been accepted I'll happily provide a collection and delivery service. Then I can sit and ponder over a fault should it turn out to be more difficult to cure than I had expected. Let's be honest, this is often the case.

The workshop environment reduces stress levels and provides the right conditions for logical thought and ultimately working out the cure. Even with the most mind-bending faults, it always helps to be able to try this and that, check this then that, renew this or that, leave on test, see what happens etc. It's amazing how many times I've been close to giving up and have walked away from a job, put the kettle on, relaxed for a few minutes then returned and solved the problem.

The customer benefits from workshop repairs. Often while working on a set dry-joints that have nothing to do with the fault in hand are noticed and can be dealt with to prevent further problems. Likewise known modifications or problems with a particular chassis can be sorted out.

Although I consider myself sociable and a nice, helpful sort of chap I still, after many years, find it extremely difficult to concentrate on a real teaser of a fault in the near darkness of the average living room. Even something like renewing an on/off switch can be difficult while attempting to appear interested in the customer's family history. Then there are the problems that pets and children introduce.

No wonder I like to grab the set and run!

John Edwards, Welling, Kent.

Thanks CPC and DAL

I feel I must commend the excellent service I received from CPC of Preston recently. An Orion VCR, not one of my favourites, had come in for repair because some ham-fisted person had forcibly inserted a cassette and broken the plastic drive piece on one side.

I rang CPC and said that unfortunately I couldn't provide a part number as I didn't have the service manual. "We'll ring back" a voice said. Within two hours I received a reply to say that while CPC could not help directly they knew who could, DAL in London – presumably the importer. I rang DAL, described the part required and subsequently sent a fax with a bad sketch of the offending item. A

photocopy of the deck mechanism, with component numbers, came by return post. A fax back to DAL with the required part ringed produced a phone call within an hour to give me the correct part number. I was also told that CPC's database had been contacted to inform me that there was one in stock.

One phone call to CPC and I had the part next morning. So there was a quick repair and a happy customer. I have to add that I don't have an account with either CPC or DAL. It would be nice if all manufacturers and their agents could behave in this way. Next time I get an Orion I'll probably look at it much more kindly!

Mike Harris, Cheadle, Cheshire.

Try Zambia

During the past four years of sourcing spares for machines in Zambia we've built up quite a good database of difficult items (semiconductor devices, video gears etc.) and would like to try to help readers to obtain spares they've so far failed to find.

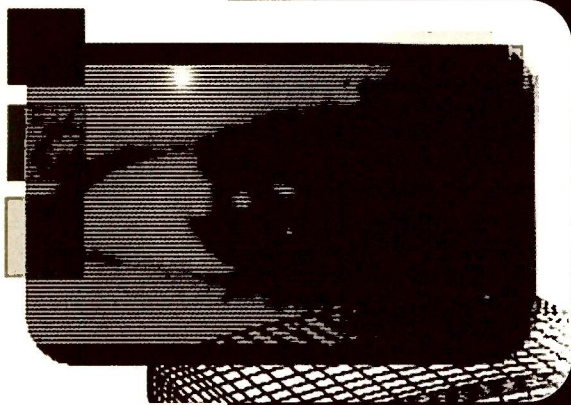
We have already helped quite a few readers who have written to the Help Wanted column. Others may like to contact us if they have failed to locate a spare part. At the moment readers will have to write to us, but they are assured of a reply. E-mail and fax facilities to Zambia will be available very soon. *M.P. Nalletamby, Box 23186, Kitwe, Zambia.*

Tip

VCR engineers will be aware of the little rubber 'Amstrad dampers' that so often go soft, and the various rubber brake pads (Hinari etc.) that become 'gooey'. The answer is to get some lengths of rubber multi-core audio cable of various diameters, remove the wires and cut the cables into slices. Problem solved! They work a treat.

Incidentally for a number of years the occasional GoldStar TV has turned up with a peculiar label stuck to the bottom of the cabinet back. I've often wondered whether anyone else has spotted one of them. The little label simply says "LUCKY HIPS". (Ed. Yes, Chris enclosed a sample with his letter.) I'd like to meet the Korean girl on the assembly line who sticks them on. But, knowing my luck, the label probably refers to the cabinet brackets!

Chris Plaipe, Winch Wen, Swansea.



Reports from
Philip Blundell, AMIEEIE
Giles Pilbrow
Michael Maurice
Brian Storm
Paul Hardy
Richard Flowerday
Michael Dranfield
Andy Barkley
Chris Watton and
Terry Lamoon

Mitsubishi CT21A2STX (Euro 12 Chassis)

If the field output chip IC451 has failed, replace the flyback boost capacitor C452 (220 μ F, 35V) as well. You will probably find that it is losing its electrolyte. Also check that the power supply is producing the correct outputs – check the 122V HT line at TP91 (cathode of D951) in standby as well as the picture mode.

If the HT voltage is high, replace the following capacitors: C905 (470 μ F, 35V), C906 (47 μ F, 50V), C909 (2.2 μ F, 50V) and C920 (100 μ F, 35V). This should restore correct operation. Use 105°C capacitors where appropriate. **P.B.**

Grundig ST63-660 (CUC5360 Chassis)

If you have problems with storing the tuning and/or analogue information, suspect that the memory IC has failed (some models have two, IC847/8). Before you switch on with the new chip(s) installed, check that the earth line is OK – there could well be a dry-joint where the track is soldered to the metal chassis frame. **P.B.**

Toshiba 285T8B

For lack of height, with the bottom of the picture folding up when you

TV Fault Finding

try to increase the height, check whether R321 (11k Ω) is open-circuit. **P.B.**

Mitsubishi CT2553STX (Euro 4Z Chassis)

One of these sets had lost its tuning memory. Signals could be tuned in but not stored. Checks at the EEPROM showed that the -30V supply was missing. The cause was not the usual dried up electrolytics (C958/C562) but an open-circuit secondary winding on transformer T951. **P.B.**

Ferguson ICC9 Chassis

For weak drive to the line output transistor, check the 1N4002 diodes in the line driver circuit. The diodes used can develop high forward resistance. Check DL61 first, then the group DL64-70. **P.B.**

Mitsubishi CT21A2STX (Euro 12 Chassis)

After about five minutes all signals would be lost, leaving just snow. The cause was traced to a dry-joint at the 4MHz crystal in the pre-scaler section of the tuner **G.P.**

Matsui 1492

This set had no picture, just a blank raster. The cause of the fault was traced to C206 (0.47 μ F). **G.P.**

Ferguson ICC9 Chassis

This set was stuck in standby. The cause of the problem was traced to the BC858B surface-mounted transistor TP66 which was leaky. **G.P.**

Sony AE2B Chassis

The complaint was no teletext. There was no fault however: the set had simply forgotten that it should have text! Teletext can be enabled/disabled as follows:

(1) Hold down any two buttons at the front of the set whilst switching it on at the mains.

(2) The letters TT should appear at the top right-hand corner of the screen. Type in 18, using the remote control unit.

(3) Switch off and on again at the mains. Teletext should be restored.

Should teletext still not function there's a genuine fault, but go through the procedure again to re-enable teletext. **G.P.**

Sanyo CBP2572 (ED1 Chassis)

The picture seemed to be dark and lacked contrast. In addition it was not possible to get an "OK" indication while adjusting the first anode voltage in the service mode. Both faults were cleared by replacing the VCU2136 chip IC501 on the digital PCB. The part number is 409 212 0608. **G.P.**

Sony KV1412 (XE3 Chassis)

Intermittently dead was the complaint with one of these sets. I found that R602 (2.2M Ω), which is connected to pin 4 of IC601, was open-circuit. Note that the voltage at pin 4 will be about right even though R602 is open-circuit. **G.P.**

Mitsubishi CT29B2STX

Excessive blue was caused by diode D656 on the CRT base panel. It was leaky. For a similar problem with either of the other colours check D655 (red) or D657 (green). **G.P.**

ITT ST38767

This digital set appeared to be dead. On inspection I found that the braiding which earths the tube's Aquadag coating had become loose because the plastic lug had broken off. When the braid had been refitted, using a cable tie, there was still no picture. The TDA2170 field output chip was short-circuit. This was replaced, along with the flyback

boost capacitor. There was now a very blue picture with blue flyback lines. The cause was traced to the ribbon cable between the CRT baseboard and the digital board: pin 7 was broken where it connects at the CRT base. An excellent picture was produced once this connection had been remade. **M.M.**

Sony KVX2532U

There was very distorted field scanning with distorted colours. The usual cause of this is C531 (680 μ F, 25V) in the field output stage. Sony now supplies an uprated capacitor (50V, 105°C) under part number 1-111-123-11. **M.M.**

Mitsubishi CT2553STX (Euro 4Z Chassis)

One of these sets produced a very strange field scan. Checks in the field output stage showed that there seemed to be a lot of ripple, but the 25V supply was ripple free. So attention was turned to the field oscillator, which is in the TDA2579A timebase generator chip IC501.

During manufacture an extra capacitor and some wire had been added to the print side of the PCB. They were held in place by some brown glue that was similar to Evo-stik. When this was removed the set worked normally. As a precaution C920 and C922 were replaced, also R563 and R570. A previous repairer had twisted two 2.7 Ω carbon resistors together in parallel and soldered them on the print side of the PCB. **M.M.**

Bush 2857NTX

When this set was switched on there was no sound or picture. But after a few minutes a green line appeared in the centre of the screen. It looked like field collapse, but the line didn't reach the sides of the screen. The cause of all this was C926 (22 μ F, 160V), which showed signs of distress. Once this capacitor and the chopper transistor's base coupling capacitor C910 (47 μ F, 63V) had been replaced the set worked normally. **M.M.**

Goodmans 2875

If the picture is smeary, defocused and lacking in one or more colours, giving the appearance of a flat CRT, check the three 68k Ω resistors on the tube's base panel. You will find that one or more has gone high in value or open-circuit. **M.M.**

Panasonic Euro 2 Chassis

This digital set was stuck in stand-

by. It came on when the EAROM chip's clock and data pins (IC1203, pins 4 and 5) were desoldered. Although the picture was dark and the geometry poor, everything seemed to be working.

A few days later we fitted the new EAROM chip. The set then lapsed into the standby mode again. Bother! After many hours spent checking various items I found that R558 in the beam limiter network had gone open-circuit. **B.S.**

Panasonic Alpha 4 Chassis

This set refused to power up though no faults could be found in the power supply. The set came to life when pins 3 and 4 of the optocoupler were shorted together. Eventually transistor Q890 (2SC3311-R), which buffers the power switching line from the main microcontroller chip, was found to be slightly leaky. A replacement restored normal operation. **B.S.**

Ferguson ICC8 Chassis

This set was dead. It had been going off intermittently for some time. I resoldered some distinctly poor-looking joints in the power supply and replaced the BU508AF line output transistor, which was short-circuit. This got the power supply working, but there was no 24V supply because RP62 was open-circuit. When this had been replaced the power supply tripped – the TDA8178FS field output chip and DF16 had both failed. Replacing these items completed the repair. **P.H.**

Mitsubishi CT2125TX

There was only snow and there were no stored channels. Transmissions could be tuned in but couldn't be memorised. I found that the -30V was low and that C962 had leaked, corroding one of its legs right through. Once this capacitor had been replaced the -30V supply was correct and channels could be stored and selected. **P.H.**

Bush 2114T

The customer complained that there was no sound. When I tested the set I found that the HT was high. C818 was, as usual, the cause of this. Unfortunately it looked as if the customer had been using the set in this condition for some time. Most of the electrolytics were showing signs of distress, with bulging tops and split plastic coverings. I had to replace C806, C808, C810 and C890, also C409. After this the HT

was stable and there were no disturbances on the display, but there was still no sound. A new TDA2006 audio output chip (IC601) cured this. **P.H.**

Philips CF1 Chassis

"No colour" was the customer's complaint. In fact the colour was excessive, with what looked like Hanover blinds (the colours were desaturated) on the left-hand side of the screen. A new TDA3560/N6 colour decoder chip and oscillator set-up failed to cure the fault, and use of freezer simply made matters much worse – with the left side of the picture in monochrome and broken up colour on the right-hand side. More careful use of freezer led me to C2218 (2.2 μ F), which had fallen in value. It's connected to pin 5 of the colour decoder chip. **P.H.**

Sony KVM1421

Lines on the picture and sometimes a black screen with only on-screen graphics present were the symptoms with this small set. The tuner was the cause. I think the oscillator would stop, and since there was then no signal the tube would be blanked except for the graphics. I sent the tuner to MCES for repair. It came back almost immediately and, when refitted, the problem had been fixed. **P.H.**

Hitachi C2874TN

"Picture rolls when warm" was the customer's complaint. So we put the set on soak test. After three hours or so the picture began to jump and flick over about once every three seconds. Since the fault cleared when freezer was applied to the field output chip (IC601) this item was replaced. The fault was still present however. Further checks showed that the supply to the field output stage was 4V high at 29V. The main HT supply was also higher than normal at 162V instead of 145V. The culprit was R952 in the HT sampling network. It read 75k Ω instead of the correct 68k Ω . A replacement restored normal operation. **R.F.**

Sony KVX2532 (AE1B Chassis)

The customer said that the sound took half an hour to come on. We found that the two muting transistors Q251/261 were both on when the fault was present – a scope check showed that there was a line-frequency squarewave at their bases. Faulty LT smoothing we thought. It didn't take long to dis-

cover the culprit: the 16V supply reservoir capacitor C615 (1,000 μ F, 25V) had over 12V of ripple across it. A replacement cured the fault. **R.F.**

Panasonic TX21S1T

One of these sets had partial field collapse – there was about an inch of scan. As it was from out of town the 1in. band was filled with snow. We didn't have the manual, so we had to play this one by ear. While checking voltages we came across a wirewound resistor with 200V at one end and 0V at the other: it was also very hot. Tracing from the 0V end brought us to the 33V tuning voltage regulator IC012 which was short-circuit. A replacement restored the field scanning! **M.Dr.**

Sharp DV5103H

At switch on this set tripped back to standby because the 113V supply was high (170V). The usual cause of this is R754 (150k Ω) in the HT sampling network. Not this time however. The cause was the CNX82A optocoupler. **M.Dr.**

BPL 9002ECR

This Sanyo-based colour set emitted a hissing sound from its line output transformer and the EHT was low at only 12kV. Fortunately we didn't rush off and order a new transformer. Further checks revealed that the HT was very low at 75V, with a massive amount of ripple. A new HT reservoir capacitor, C561 (220 μ F, 250V), restored basic operation but there was patterning on the picture. C562 (22 μ F, 250V) had also dried up. **M.Dr.**

Matsui 1455

This set was dead though the standby light was on and the power supply worked. The cause of the problem was R624 (100k Ω) which was open-circuit. It's in the section (Q605 etc.) that switches the HT supply to the line output stage. **M.Dr.**

Ferguson ICC5 Chassis

This set was dead with only the standby LED alight. The voltage at the emitter of TP45 in the standby power supply circuit was about 4V instead of 11.5V. I next checked the bridge rectifier which was OK. Strange.

The standby transformer LP03 has a centre-tapped primary winding to provide 125V for the start-up system. It turned out that the neutral side of the winding was open-circuit – the small current drawn by

the start-up circuit enabled the transformer to provide a small voltage at its output. **M.Dr.**

Toshiba 214E7B

If one of these sets won't store stations after tuning, replace CA17 (3.3 μ F, 160V). **M.Dr.**

Hitachi C2509T (G7PS Chassis)

The standby light provided the only sign of life. Initial checks revealed that the 2SD1884 line output transistor Q781, the BUT12AF chopper transistor Q903 and the P6KE180A overvoltage protection diode ZD903 were all short-circuit. Further checks showed that R760, R761, R762 and R766, which are connected in parallel, had all gone high in value. They should each be 2.2 Ω , 0.5W.

Close inspection of an under-board wire link near these resistors showed that its insulation had been pierced by a solder joint. So the link was replaced and re-routed to avoid any such joints.

ZD903 is a special type which provides protection against transients. It's rated at 600W for 1msec. I had difficulty finding an exact one from my usual suppliers, but the BZT03C180, which is rated at 1kW for 1msec, is available from Farnell (stock no. 368-532). **A.B.**

Bush 2004

If all you get when you switch on from standby is the sound of a relay clicking, check whether R652 (390k Ω , 0.5W) has gone open-circuit.

This also applies to the Matsui 1436 and Alba CTV100 which are fitted with the same chassis. **A.B.**

Toshiba 216T9B

This set would display only a blue screen for the first ten minutes after switch on. Use of a hairdryer and freezer spray revealed that the tuning voltage stabiliser DA30 (μ PC574JC) was the cause of the fault. You'll find it between the two screened sections in the mid/front of the main PCB. **A.B.**

Alba CTV340

Loss of colour was the problem with this set. Tests around the decoder chip IC301 would sometimes bring a flash of random colour to the screen. The DC voltages at the IC's pins were all more or less correct except for pin 8, which was low at about 3V and jumped to 11V in synchronism with the colour flashes. The fact that the

colour was wrong when it appeared pointed to the phase correction system in the chip. I eventually discovered that C322 (0.022 μ F, mylar) was open-circuit. **A.B.**

Ferguson ICC8 Chassis

"Wrong colour" the card said. But at switch on it didn't look too bad. Then, after only half a minute, the grey scale began to vary, first going a bit green then to a magenta picture. I naturally gave the set a good thrashing to check for poor soldering, which is the cause of many faults with these sets. Not this time. So voltage and scope checks were carried out. The cause of the trouble was the 39k Ω feedback resistors RT24/44/64 on the CRT base panel. They all looked a bit stressed and were nowhere near the correct values. Replacing them produced a picture without strange effects. This is the base panel with the TEA5101A RGB output chip. **C.W.**

Nokia Stereo Plus Chassis

There was an intermittent line tear. It gave the impression that there were dry-joints in the EW circuit. Then, as the set warmed up, the picture began to move to the right. No dry-joints were found. The cause of the trouble was the BC858 surface-mounted transistor VK16 in the line drive circuit. It was intermittent. A replacement cured both symptoms. **C.W.**

Philips GR1-AX Chassis

"Intermittently dead" was the complaint with one of these sets. The HT supply (95V) was OK when the set went off but a scope check at the collector of the emitter-follower transistor in the line driver stage showed only rubbish. The 12V supply to this stage is decoupled by C2523 (6.8 μ F) which was very low in value – less than 1 μ F when checked with a meter. **C.W.**

Ferguson TX90 Chassis

When this set warmed up line lock was lost and there were pops from the speaker. Use of a hairdryer and freezer soon established that the line oscillator's tuning capacitor C124 (2.7nF) was responsible. It's connected to pin 23 of the TDA4500 chip. **C.W.**

Fidelity ZX5000 Chassis

If you get a blank raster with a few green lines flickering at the top of the screen and a few odd noises come from the set, before you delve into the digital section check

the 220µF, 250V HT reservoir capacitor C18. When faulty it can cause some strange effects. C.W.

Goodmans CTV2170

This set was dead. The 320V supply was present but the chopper circuit wasn't in operation. R108 (270kΩ) was open-circuit. C.W.

ITT Nokia Core 110° Chassis

The remote control unit would operate this set but there was no front panel operation. I also noticed that two LEDs flashed when remote-control commands were received. The cause of the fault was traced to a BC328 transistor, T1454, which was leaky. C.W.

Seleco 24SS487

If the set works fine when operated with the on/off switch but not when put into standby by the remote control handset, replace the two 100µF capacitors next to the IC in the power supply. C.W.

Matsui 2199N

There was no sound or picture and the standby light went on and off

when the set was powered up. Checks showed that the power supply was working, its outputs all being correct. But the 112V HT supply wasn't present at the line output stage. A special 2A fusing resistor had gone open-circuit because the line output transistor was short-circuit. Normal operation was restored when these two items had been replaced. T.L.

JVC AV25F1 (JX Chassis)

This set came in dead. A quick check revealed that the SGSIF444 chopper transistor Q001 was short-circuit. I replaced this item, the TEA2261 chopper control chip IC001 and the CNX82A optocoupler. IC001 and Q001 often fail together in this chassis. The set worked perfectly when powered up. T.L.

Grundig T55-730

This set was normally OK, but occasionally black lines appeared all over the screen. I set to work with my trusty tapping screwdriver and found that the set was very sensitive around IC501. But I couldn't see any dry-joints. In the end I

resoldered the whole area, which cured the fault. Normally I prefer to find the actual component that's responsible for a fault, but sometimes you have to resort to blanket resoldering. T.L.

JVC C14ETIEK

There was an over-bright picture with smearing. A check on the HT voltage at the CRT base panel showed that it was low – 90V instead of 180V. When I traced back to the source I came to the 0.68Ω fusible resistor R435 which was open-circuit. The set produced a good picture when this item had been replaced. T.L.

Toshiba 2563

This set would work perfectly for two-three hours. Field cramping would then develop. A check on the HT voltage when the fault was present showed that it was low at 110V instead of 125V. Use of spray failed to reveal the culprit, so I had to resort to replacing the semiconductor devices in the power supply one by one. The cause of the trouble turned out to be the error amplifier transistor Q827. T.L.

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What a Life!

Mostly TVs and their faults this time – and Jean's difficulties with her handsets. Donald Bullock on the problems that come his way

Bessie Blower is a bit like me – everybody's runaround. "Hello Mr. Bloater" she croaked as she rushed in. "I'm popping in for poor old Jean Tasker as lives in the flat above me. Says 'er telly's dead. Phone's up the creek too. She ain't 'alf laying her tongue into you an' them Telecom people. Reckons you're all bloated capicalistics prayin' on 'er 'cos she's old."

Since Stephen was anchored with a bad foot and Paul had gone off to fetch his new old car, and I hadn't suffered any Old Buck for over half an hour, I volunteered to be the Outside Lackey and popped in on old Jean.

She was glaring at her blank TV screen and pummelling the buttons of the unit in her hand.

"About time" she blared. "No telly and no phone. And me a pensioner! It's not good enough, Mr Butcher, not good enough."

I pressed the standby button on her TV set and the picture and sound came up. "Nothing wrong with that" I said.

"Then why won't it come on with this?" she asked, waving her hand and stabbing at the buttons.

I looked closer, then at her. "Because that's not your remote control" I said. "That's your mobile telephone."

"Don't talk rubbish" she replied. "My phone's on the sideboard – and that's faulty too. Doesn't work, and interferes with the telly."

I picked my way to her sideboard and saw that she was pointing to the TV's remote control. So I picked it up, pointed it at her set and switched it off. Then I switched it on again and saw a gabbling, pop-eyed misfit. "Channel 5" I muttered as I handed her the remote control unit.

In no time her eyes were glued to the screen. She paid me without looking away from it.

"I'll test your phone before I go"

I said and rang the shop. Paul answered.

"Mr Butcher here" I said, "or maybe Mr Bloater. Difficult to tell. I'm not really myself today. Nuts wherever I look. You might as well be the first to know that I've at last gone completely mad."

"Well, I should pop back for a cup of tea" Paul advised. "I've just made it and I've got my car."

A Tripping G90B

When I got back I settled to a cup of Paul's Bisto tea. Then Beryl Barnside strode in. She's the only traffic warden I know who was sacked for being too horrible. She's short-haired, with a deep voice, and you never see her in anything but trousers. She had with her a Philips G90B telly which she banged on to the counter.

"Get this thing right or ditch it" she said to me as she looked at Steven.

"Can't" I said, "he's the brains."

When we plugged the set in it worked all right for ten minutes. Then it started to trip violently. Paul checked the HT and found that it fell from the correct 95V to about 30V each time it tripped. He also found that TR7652 (BC858C) in the optocoupler control circuit (pulse-width modulator) was running hot. When tested it turned out to be leaky, though it read normally once it had cooled down.

Mavis's Toshiba

I like Mavis Mainwearing because she's a bit slow and I usually manage to come off best when we rib each other. She brought in a Toshiba 255T7B colour set. "It's dead" she announced.

I made a clever show of pulling out my hanky and dabbing at my eyes.

"Belongs to my lodger Walter" she continued. "It was fine until yes-

terday. But when I was doing the flowers water went inside the cabinet."

I gave her a hard look. "How did he manage that?" I asked, all innocently. "He's bigger than a grasshopper, surely? I mean, a chap as small as that, it would be ridiculous."

"He might be ridiculous, but he's not small" Mavis replied, "anyway not as small as a grasshopper."

Then Steven walked in. "What's up with the set?" he asked.

"Mavis's lodger got in through the back" I said. "Apparently he's ridiculous but bigger than a grasshopper. I expect he's pulled it about."

"Are you taking the mickey?" asked Mavis.

When she had gone we gave her set the fan-heater treatment to dry it out. We then plugged it in and soon saw that it had the usual scan-coil plug and socket trouble – dry-joints at the socket. When these had been resoldered there was a stable picture but no control over the brightness – not even with the sub-brightness preset. Steven went straight for D204 (1N4148), the clamp diode in the brightness circuit. It was leaky.

"How did you know that was the trouble?" I asked.

"Had it before" he replied.

Another Toshiba

Our next customer was Snoopy Narke, the enquiry agent. He looks every inch what he is. Fat and fifty, he dresses immaculately. His hair is short and he has piggy eyes and a thoughtful, prying way about him. He had with him a new-looking Toshiba 172ORB which he placed on the counter. Then he stood back to give me the eye treatment. I shouted to Steven, who was making the tea. "Steven, it's Snoopy the enquiry agent."

Snoopy jumped up in the air and

spun round to me as he came down. "Shhhh, shhhh" he hissed, fanning the air down with the palms of his hands. "I don't want just everyone to know what I am."

"Sorry Snoop" I said, "what goes with the set?"

"Completely dead" he replied. "Don't know why."

"You could make some enquiries" I quipped.

"Are you trying to drive me to Snoddies?" he asked.

"Hadn't thought of that . . ." I said, "hmmm."

Meanwhile Steven had removed the back and found that the 500mA fuse was broken and black, the 6.8Ω, 7W surge limiter resistor was open-circuit, the reservoir and main smoother were short-circuit, also the STRD4412 chopper chip. The R2M over-voltage diode was also short-circuit.

When he'd replaced these items he started up the set gingerly, using the variac. It took a huge helping of current. Further checks brought him to the line output transformer, where he found that there was zero resistance across all the pins. A new transformer restored the set to life, with outstanding video quality.

A Sony KVM2131U

Monica Muckler strode in wearing her jodpurs. She's a horse fanatic – and a bit horsey-looking. Walks in huge strides, pulls her face about and has an exaggeratedly posh voice. But we don't laugh at her. She's loaded you see.

"I've five or six tenners here that tell me you can mend my Sony telly" she said.

"They're dead right" I replied.

"Picture's just a line across" she continued.

"That's good" I said, "we can handle that."

The set was a KVM2131U, which means the BE1 chassis. Its μPC1488H field output chip IC501 looked well cooked. So we removed it and checked the supply voltage at pin 7. The reading was 30V instead of 24V. We then checked the IC and found that it was short-circuit. Its supply is obtained from pin 9 of the line output transformer, via a simple rectifier circuit. We convinced ourselves that the voltage would fall to 24V when a replacement chip drew current, so we fitted a new one and switched on. The chip immediately blew up.

We then did what we should have done first, wire in a dummy load. The supply remained high at 30V. When we checked the line output

transformer we saw that some of its pins were dry-jointed, including pin 11 which earths the winding from which the field output stage supply is derived. We did some resoldering and checked the voltage again. It was now correct. When we'd fitted another IC we started the set up via the variac. This time a perfect picture came up.

Video Problem

Dudley Douring is the unluckiest chap I've come across. If he's doing it and it can go wrong, it will. He had a Mitsubishi VCR strapped to his back and looked all in.

"I've just pushed my motorbike all the way from Cheltenham" he said. "Engine seized up. I'm knackered. Got a drink of water?"

"We'll make you a cup of tea, Dud" I said, "or get you a glass of Joshua Juice."

"Joshua Juice?" he asked.

"Yup" I replied. "Haven't you heard the jingle? 'If your muscles are saggy and your eyeballs are baggy, it's Joshua Juice for you'."

While Dud was drinking his tea we looked at his video recorder, an HSB32. It played prerecorded tapes all right. But when we tried one of its own recordings the playback was poor, often blanking out and leaving a blue screen. The sound was OK.

Paul cleaned the heads and belts and the usual drive surfaces. But the results were no better. So he removed the drum and checked it with a magnifier.

"It's going to be the heads" moaned Dudley, "I know it, I know it . . ."

But the head seemed to be perfectly good. Paul refitted it and turned his magnifier to the ACE (audio/control/erase) head. There was a tiny grain of hardened oxide on the gap. He gave it a good soaking with spirit then carefully removed it.

This cured the problem completely and for once Dudley raised a smile.

A Reverential Visit

Our final caller that day was the Reverend Goode, who drove up in his huge antique saloon car. He and Curate Blande struggled in with a Ferguson colour set, Model 37090 (TX9 chassis).

"I'm bringing this in for Churchwarden Tubb, Mr Bullock" he boomed. "The picture's all blurred. Give him a ring about it – he says it's the tube."

"The tube" whispered Curate Blande.

And off they went.



"It was fine until yesterday. But when I was doing the flowers water went inside the cabinet."

When we removed the back we saw that at some time in the past the set had been fitted with a Sherwood regunned tube. It had come from Express TV. Must have been years ago.

Sure enough the picture was blurred, and we noticed that the focus electrode's spark gap was cooking. It's one of those that looks like a green capacitor. When a replacement had been fitted the set worked well. Then the brightness disappeared before our eyes.

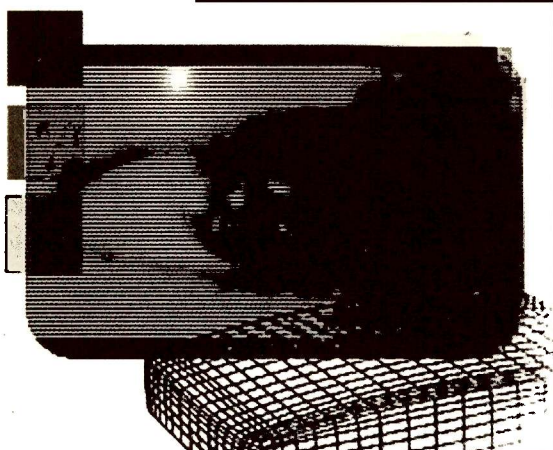
A check at the tube's first anode pin 7 showed that the voltage was missing. There was no voltage at the first anode preset RV234 either, nor at the cathode of the A1 supply rectifier D98. This receives its input from pin 7 of the line output transformer, via a 1kΩ resistor (R232) which was open-circuit. We fitted a replacement and were rewarded with a very good picture. The tube was still in excellent shape.

We telephoned Churchwarden Tubb to tell him the news, and before long the reverend and his curate called to collect the set.

"Churchwarden Tubb is absolutely delighted, Mr Bullock" said the reverend.

"Absolutely delighted" echoed the curate.

Monitors



Reports from
Gerry Mumford
Philip Blundell, AMIEEIE
Tony Bailey
Bob Yount
Giles Pilbrow and
I. Field

Escom EM1438LR

This monitor was dead. Its mains fuse had failed as a result of a power supply blow up. The chopper transistor Q103 (BUW11A), its driver Q102 (BC337) and feed resistor R116 (0.5Ω, 1W fusible) had all died. Replacements restored power supply operation, but the unit just squealed loudly. The line output transistor Q403 (SGSF444) and its pre-regulator Q405 (BDT61C) were both short-circuit and C414 (1,000μF, 35V) in the line drive circuit had fallen in value to about 80μF. This was probably the initial cause of all the devastation. **G.M.**

Samsung ML2611U

If the display is slow to appear and is then slightly dim and liney, check for noise spikes on the 15V supply to the video amplifier. The usual cause is that the relevant smoothing capacitor C517 (330μF, 25V) has fallen in value significantly.

This monochrome monitor also appears as the **Dell** and **Compu-Add 51080**. **G.M.**

Royal DN1782G

These monitors suffer from a number of power supply problems.

For a flickering picture, check the smoothing capacitor C119 (1,000μF, 16V) for the shared heater and brightness circuit supply.

If the monitor is dead with the fuse blown, check the chopper tran-

sistor Q101 (2SK956): if it has failed, replace the control chip IC101 (UC3842N) as well. If the fuse is OK, check R113 (1Ω, 1W). If the resistor is OK, check C107 (2.2μF, 50V). This capacitor can burst open when the auto-detect mains supply circuit goes wrong because the potential divider network resistors R140 (11kΩ, 0.25W), R142 (36kΩ, 0.125W) and R143 (9.1kΩ, 0.125W) have burnt up. They are slightly underrated, and always seem to look stressed even in a working power supply. So it's best to replace them with 0.5W and 0.25W types. **G.M.**

Green View GM6448LR

This monitor was dead with a power supply blow-up. The chopper transistor Q102 (2SK117), its driver Q101 (2SA1015), diodes D106 (1N4148), D111 (BA159) and D113 (HER306), the SCR Q105 (MCR100-6) and R104 (0.33Ω, 3W) had all failed. As the power supply is based on a control chip which incorporates over-current protection (U101 – UC3842) this had also obviously failed and was replaced. **G.M.**

Mitac L1450

If the problem with one of these monitors is excessive brightness, check whether R505 (150kΩ) is open-circuit. It's mounted by the scan-coil plug. **P.B.**

Samsung CVM4967T Syncmaster 3

These monitors tend to suffer from pincushion distortion. The initial version uses an LM358 operational amplifier chip (IC202) in the pincushion-correction circuit. To cure the fault we used to replace this chip and the following capacitors: C206 (10μF, 50V), C207 (47μF, 50V), C208 (4.7μF, 50V), C210 (4.7μF, 50V), C211 (10μF, 50V), C223 and C224 (both 0.047μF, 50V), and C280 (10μF, 50V).

Then we found that if you add a 1MΩ resistor between pin 5 of the chip and the positive side of C208 you will fix 99 per cent of these

monitors without having to replace the capacitors. The designers simply forgot to provide a d.c. bias at this input pin. Because there's no bias, the coupling capacitor slowly charges and the operational amplifier concerned (there are two in an LM358) saturates. There is then no pincushion control.

Later versions, including the Syncmaster 3N, use a ceramic module in the IC202 position. We've also had problems with these modules. In one case recently the module had the number SSP-02A. The replacement from Samsung was numbered SSP-02AF and cleared the problem. The Samsung part no. is 887-490032AA. **T.B.** and **B.Y.**

Apple Performa Display M9101Z/C

This monitor was brought to us because it was dead. Checks in the power supply revealed that R3121 (270kΩ) was open-circuit. **G.P.**

AOC CM335

If one of these monitors is slow to come on, check resistors R907 and R908 (both 270kΩ). They tend to go high in value. **G.P.**

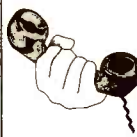
AST LR14 (ASTVGA)

One of these monitors was brought to us with the complaint that it was dead. First a warning: the chopper heatsink in the power supply is at +320V! This model was certainly not designed with servicing in mind. The only way to power up with access to the main PCB is with the monitor face down on a pile of rags: the precarious position of the chassis then makes contact between the live heatsink and the CRT's Aquadag coating a real danger.

I eventually discovered that the cause of the fault was C332 (6.2nF, 1.6kV) in the line output stage. The board is very crowded in this area, and the capacitor is one of those neat, square Philips ones. The bulging was not visible until the capacitor had been removed for a better look! **I.F.**

TRANSISTORS/LINEAR ICs

Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price		
BC107	8p	BD434	30p	BU126	65p	BUV48AF	325p	MJ4502	300p	4N35	50p	LINEAR ICs	AN6340	600p	BA335	55p	BA7004	200p	
BC108	8p	BD435	31p	BU128	125p	BUV48C	250p	MJ10012	300p			AN203	210p	AN6341	200p	BA338	80p	BA7007	200p
BC109	8p	BD436	30p	BU133	125p	BUV50	425p	MJ11015	250p			AN210	165p	AN6342	325p	BA340	75p	BA7021	180p
BC109C	10p	BD437	28p	BU137	150p	BUV61	1000p	MJ11016	300p	RECTIFIER DIODES		AN211	150p	AN6344	440p	BA343	60p	BA7022	350p
BC140	20p	BD438	36p	BU180	100p	BUV70	200p	MJ11032	800p			AN214Q	170p	AN6345	400p	BA336	175p	BA7025L	100p
BC142	20p	BD439	40p	BU184	100p	BUV90	175p	MJ11033	800p			AN217P	95p	AN6350	610p	BA401	50p	BA7107	475p
BC143	20p	BD440	40p	BU204	65p	BUV93	375p	MJ15003	250p			AN228	280p	AN6352	450p	BA402	50p	BA7212S	200p
BC147	8p	BD441	40p	BU205	70p	BUV11A	200p	MJ15004	300p			AN228	280p	AN6356	450p	BA511	145p	BA7252S	150p
BC149	8p	BD533	40p	BU206	100p	BUV11AF	225p	MJ15015	250p			AN252	150p	AN6359	500p	BA514	160p	BA7604N	100p
BC159	8p	BD534	38p	BU207	150p	BUV12	125p	MJ15016	350p			AN252	150p	AN6359	500p	BA516	150p	BA7751S	150p
BC160	30p	BD535	38p	BU208	90p	BUV12A	150p	MJ15022	400p			AN271	230p	AN6360	500p	BA518	350p	BA7752	250p
BC171	10p	BD536	38p	BU208A	75p	BUV12F	250p	MJ15023	400p			AN272	230p	AN6362	400p	BA521	100p	BA7755	150p
BC172	10p	BD537	40p	BU208AT	200p	BUV13A	200p	MJ15024	400p			AN274	250p	AN6363	375p	BA524	240p	BA7767AS	155p
BC177	14p	BD538	40p	BU208B	200p	BUV32A	500p	MJ15025	700p			AN277B	400p	AN6367NK	400p	BA526	180p	BA8504	350p
BC178	14p	BD643	50p	BU208D	130p	BUV48	550p	MJE340	25p			AN301	330p	AN6368	275p	BA527	95p	BA1521B	60p
BC179	14p	BD645	50p	BU209	90p	BUV49	550p	MJE350	80p			AN302	330p	AN6371	350p	BA532	100p	CA3140E	35p
BC182	10p	BD647	50p	BU225	120p	BUV50	400p	MJE520	30p			AN302	650p	AN6387	480p	BA534	220p	CNX62A	80p
BC182L	7p	BD649	50p	BU226	120p	BUV81A	150p	MJE2955T	65p			AN303	330p	AN6550	100p	BA536	150p	CNX82A	60p
BC183	7p	BD675	70p	BU312	90p	BUV84	75p	MJE3055T	65p			AN304	330p	AN6551	50p	BA546	160p	CNX83A	80p
BC183L	7p	BD676	40p	BU325	55p	BUV85	85p	MJE13004	100p			AN316	350p	AN6552	45p	BA612	120p	CX136	600p
BC184	7p	BD677	40p	BU326A	75p	BUX10	150p	MJE13005	100p			AN316	350p	AN6554	80p	BA614	70p	CX139A	750p
BC184L	7p	BD678	40p	BU408	60p	BUX11	200p	MJE3007	100p			AN337	600p	AN6555	50p	BA618	55p	CX141	750p
BC212	7p	BD679	40p	BU406D	85p	BUX12	150p	MJE13009	100p			AN360	100p	AN6605	35p	BA631	280p	CX145	725p
BC212L	7p	BD680	40p	BU407	55p	BUX20	350p	MJE15028	200p			AN362	100p	AN6612	60p	BA656	110p	CX150B	325p
BC213	7p	BD681	45p	BU407D	75p	BUX21	450p	MJE15029	200p			AN366	150p	AN6650	45p	BA658	350p	CX175	325p
BC213L	7p	BD682	40p	BU408	60p	BUX22	450p	MJE15030	250p			AN360	100p	AN6651	45p	BA658A	180p	CX181	250p
BC214	7p	BD683	40p	BU408A	90p	BUX23	900p	MJE15031	400p			AN360	100p	AN6652	45p	BA658A	300p	CX180A	775p
BC214L	7p	BD707	50p	BU409	85p	BUX37	220p	MJE18004	125p			AN3211K	375p	AN6671K	425p	BA683A	300p	CX867	675p
BC237	7p	BD709	50p	BU412	175p	BUX39	450p	MJF18004	175p			AN3215K	350p	AN6676	600p	BA684	400p	CX868	525p
BC238	7p	BD711	50p	BU413	175p	BUX40	210p	MJF18204	350p			AN3236K	450p	AN6780S	80p	BA685	400p	CX877	500p
BC239	7p	BD736	50p	BU414B	250p	BUX41	210p	OC28	350p			AN3310K	325p	AN6870	450p	BA715	150p	CX20015A	35p
BC300	20p	BD826	50p	BU415A	170p	BUX42	200p	OC29	350p			AN3312	350p	AN6878	65p	BA728	55p	CX20106A	75p
BC301	20p	BD828	50p	BU426A	70p	BUX47A	220p	OC35	350p			AN3313	350p	AN6879	225p	BA806	220p	CX20109	140p
BC302	20p	BD839	55p	BU433	120p	BUX48A	150p	OC36	250p			AN3313	350p	AN6880	75p	BA843	130p	CX20187	700p
BC303	20p	BD887	50p	BU500	100p	BUX55	800p	S2000AF	175p			AN3320K	450p	AN6882	300p	BA1310	160p	CXA1001AP	1600p
BC304	25p	BD899	50p	BU500D	225p	BUX80	180p	S2000AF	175p			AN3320K	450p	AN6884	200p	BA1320	75p	CXA1019P	150p
BC327	7p	BD937	50p	BU505	90p	BUX81	160p	S2055A	175p			AN3320K	450p	AN6884	200p	BA1320	75p	CXA1019P	150p
BC328	7p	BDX33	60p	BU505D	90p	BUX84	50p	S2055AF	175p			AN3320K	450p	AN6888	100p	BA1330	120p	CXA1019S	225p
BC337	7p	BDX37	100p	BU505DF	90p	BUX85	50p	S2530A	100p			AN3374	325p	AN6888	100p	BA1332	60p	CXA1044P	550p
BC338	7p	BDX44	100p	BU506	100p	BUX86	50p	TIP29	15p			AN3814K	450p	AN6893	60p	BA1350	130p	CXA1044BP	275p
BC441	28p	BDX47	60p	BU506D	70p	BUX87	30p	TIP29A	22p			AN3821K	600p	AN6913	60p	BA1355	125p	CXA1081	475p
BC446	8p	BDX54C	75p	BU506DF	100p	BUX98A	350p	TIP29B	22p			AN3821K	600p	AN700	650p	BA1356	100p	CXA1081M	250p
BC477	18p	BDX62C	150p	BU508A	100p	BUX98A	350p	TIP29E	25p			AN3830K	300p	AN7010K	90p	BA1360	160p	CXA1081S	300p
BC516	22p	BDX63C	175p	BU508AF	95p	BUZ17AF	100p	TIP30	25p			AN3990K	300p	AN7025K	90p	BA1400	120p	CXA1081S	300p
BC537	25p	BDX64C	175p	BU508APH	80p	BUZ72A	100p	TIP30C	25p			AN3991K	300p	AN7060	300p	BA1604	125p	CXA1191M	250p
BC546	8p	BDX65	80p	BU508D	75p	BUZ72AF	100p	TIP31A	22p			AN5010	250p	AN7062	300p	BA1604	125p	CSA1209P	400p
BC547	8p	BDX66C	75p	BU508DF	85p	BUZ73A	150p	TIP31C	27p			AN5011	250p	AN7072	250p	BA2266A	250p	CSA1209P	400p
BC548	8p	BDX67C	75p	BU508DR	85p	BUZ73AF	150p	TIP31C	27p			AN5020	250p	AN7081K	200p	BA3306	60p	FT575A	600p
BC549	8p	BDX71	175p	BU508V	100p	BUZ76A	110p	TIP32A	21p			AN5025	250p	AN7081K	200p	BA3308	40p	FT575A	600p
BC550	8p	BDX77	175p	BU508VF	100p	BUZ80	135p	TIP32C	28p			AN5033	400p	AN7106K	135p	BA3312	60p	HA1124	125p
BC556	8p	BDX87C	175p	BU526	75p	BUZ80AF	100p	TIP33	50p			AN5034	400p	AN7110	75p	BA3402	90p	HA1125	120p
BC557	8p	BDX88C	150p	BU536	100p	BUZ83	200p	TIP33C	60p			AN5070	125p	AN7111	100p	BA3406AL	120p	HA1137W	150p
BC558	8p	BDW24	55p	BU546	125p	BZ90A	180p	TIP34	60p			AN5071	100p	AN7112	45p	BA3416BL	80p	HA1151	175p
BC559	8p	BDW93	50p	BU503	100p	BZ91A	280p	TIP34C	60p			AN5111	450p	AN7114	325p	BA3422	350p	HA1197	300p
BC560	8p	BDW94	50p	BU606D	225p	BY448	20p	TIP35C	65p			AN5132	250p	AN7115	110p	BA3505F	140p	HA1199	130p
BC637	20p	BDY29	225p	BU608D	120p	BYT11	25p	TIP36C	65p			AN5135NK	400p	AN7116	90p	BA3506A	70p	HA1201	225p
BC639	20p	BDY56	225p	BU626	120p	IRF120	225p	TIP41A	20p			AN5138NK	350p	AN7117	65p	BA3516	120p	HA1202	125p
BC640	20p	BDY58	200p	BU706	150p	IRF130	250p	TIP41B	20p			AN5150	400p	AN7120	100p	BA3520	130p	HA1319	300p
BCY33	20p	BDY90	125p	BU706DF	150p	IRF140	550p	TIP42	20p			AN5151	400p	AN7120	100p	BA3521	130p	HA1338	300p
BCY34	20p	BDY92	100p	BU706F	150p	IRF230	550p	TIP42C	22p			AN5210	675p	AN7131	90p	BA3704	200p	HA1339A	300p
BCY70	16p	BF137	35p	BU724A	150p	IRF240	425p	TIP42C	22p			AN5215	100p	AN7133N	325p	BA3706	75p	HA1367	300p
BCY71	16p	BF167	30p	BU801	70p	IRF250	375p	TIP48	40p			AN5222	200p	AN7134	300p	BA3812L	80p	HA1377	120p
BCY72	16p	BF181	18p	BU806	70p	IRF260	600p	TIP48	40p			AN5222	200p	AN7140	170p	BA3822LS	80p	HA1384	600p
BCD15	30p	BF183	20p	BU807	60p	IRF270	600p	TIP50	60p			AN5250	600p	AN7140	170p	BA3824LS	75p	HA1384	600p
BD124P	50p	BF195	7p	BU807F	75p	IRF350	750p	TIP51	80p			AN5260	300p	AN7142	80p	BA3820	300p	HA1389	210p
BD131	25p	BF199	8p	BU808DF	210p	IRF450	650p	TIP52	80p			AN5262	175p	AN7145	195p	BA4110	75p	HA1392	120p
BD132	25p	BF200	16p	BU810	110p	IRF510	110p	TIP52	80p			AN5265	80p	AN7146	210p	BA4210	85p	HA1394	170p
BD133	25p	BF225	30p	BU824	60p	IRF520	110p	TIP102	70p			AN5315	600p	AN7147	180p	BA4220	70p	HA1396	650p
BD135	25p	BF235	30p	BU826	120p	IRF530	110												



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



LINEAR ICs

Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price				
HA13001	110p	LA2800	350p	LA7096	200p	LF353	48p	MC3302	50p	SAB3029	525p	STK3102 II	530p	STK5478	380p	STR16006	500p	TA7281	200p
HA13002	200p	LA3120	200p	LA7113	275p	LF355	60p	MC3401	45p	SAB3035	275p	STK3106	2500p	STK5479	300p	STR17006	500p	TA7282	160p
HA13006	400p	LA3150	200p	LA7116	125p	LF357	70p	MC3423P	100p	SAB3036	725p	STK3122 II	725p	STK5481	470p	STR20005	450p	TA7210	200p
HA13100	300p	LA3160	120p	LA7123	1300p	LF398	300p	MC3488AP	250p	SAB3037	700p	STK3152 II	900p	STK5482	285p	STR20012	450p	TA7283	200p
HA13108	280p	LA3161	40p	LA7210	1800p	LH2426S	600p	MC34063AP	250p	SAB3042	825p	STK3156	500p	STK5483	440p	STR20015	450p	TA7284	400p
HA13117	175p	LA3216	65p	LA7212	150p	LM301	25p	MN1237	25p	SAB3046	130p	STK4017	400p	STK5486	450p	STR20110	330p	TA7285	90p
HA13118	140p	LA3226	65p	LA7214	150p	LM311	35p	MN1228	65p	SAB3209	225p	STK4019	480p	STK5487	525p	STR30115	275p	TA7288	220p
HA13119	140p	LA3246	75p	LA7220	125p	LM319	165p	MN1228	600p	SAB3210	250p	STK4021	380p	STK5488	480p	STR30120	400p	TA7291P	200p
HA13127	350p	LA3300	140p	LA7222	110p	LM324	30p	MN1276	1300p	SAB6456	125p	STK4024 II	550p	STK5490	450p	STR30123	450p	TA7292P	325p
HA13128	400p	LA3301	110p	LA7224	150p	LM335Z	120p	MN1280	70p	SAB8048	225p	STK4025	530p	STK5632	450p	STR30125	550p	TA7294P	450p
HA13130	450p	LA3361	100p	LA7225	250p	LM339	35p	MN3004	600p	SAB8051AP	700p	STK4026	480p	STK5720	400p	STR30130	350p	TA7298	200p
HA13135	500p	LA3365	70p	LA7292	275p	LM348	50p	MN3005	2000p	SDA2003	450p	STK4028	550p	STK5725	450p	STR40090	350p	TA7299P	75p
HA13139	800p	LA3370	70p	LA7294	200p	LM351	45p	MN3021	4000p	SDA2004	325p	STK4022 II	510p	STK5730	450p	STR4015	600p	TA7302P	70p
HA13150A	1150p	LA3373	70p	LA7295	160p	LM380	80p	MN3101	110p	SDA2005	700p	STK4034 X	925p	STK6316	300p	STR41090	330p	TA7307	100p
HA13151	875p	LA3375	300p	LA7297	120p	LM381	150p	MN3102	110p	SDA2007	300p	STK4036	470p	STK6324B	300p	STR43111	950p	TA7310	100p
HA13403	400p	LA3376	40p	LA7305A	350p	LM382	130p	MN3207	375p	SDA2008	400p	STK4038	680p	STK6327	1200p	STR44115	475p	TA7312	120p
HA13406W	400p	LA3380	300p	LA7308	70p	LM386	60p	MN3208	950p	SDA2112	450p	STK4040 II	650p	STK6328A	800p	STR45111	550p	TA7313	70p
HA13408	350p	LA3390	250p	LA7311	200p	LM387	100p	MN6030B	350p	SDA2120	200p	STK4042 II	800p	STK6431	850p	STR50020	350p	TA7314	175p
HA13412	800p	LA3400	250p	LA7320	120p	LM389N	105p	MN1634	700p	SDA2131	225p	STK4044	800p	STK6627	400p	STR50092	550p	TA7315	200p
HA13426	500p	LA3401	90p	LA7323	325p	LM393	40p	MTA001M	4000p	SDA2208	450p	STK4046	950p	STK6702	725p	STR5103A	260p	TA7316	70p
HA13432	400p	LA3410	150p	LA7330	350p	LM431	50p	NE555	20p	SDA4212	775p	STK4048	1280p	STK6732	1000p	STR50113	500p	TA7317P	120p
HA13441	450p	LA3430	150p	LA7331	250p	LM710	45p	NE556	40p	SDA5241	725p	STK4050 II	1600p	STK6732	900p	STR50115	500p	TA7320P	200p
HA17524	250p	LA3600	60p	LA7332	225p	LM723	40p	NE558	80p	SDA5243-2	450p	STK4060	510p	STK6922	500p	STR5101	500p	TA7322	130p
KA2102	100p	LA3605	100p	LA7340	300p	LM741DIL	18p	NE565	110p	SDA5343	1450p	STK4065	650p	STK6932	525p	STR50213	500p	TA7323	80p
KA2130	150p	LA3607	125p	LA7376	150p	LM741MET	45p	NE567	115p	SDA5640	200p	STK4101	500p	STK6962	275p	STR50241	450p	TA7324	75p
KA2131	10p	LA4030	180p	LA7391	550p	LM747	55p	NE571	220p	SDA5641	200p	STK4102	450p	STK6962	275p	STR50341	450p	TA7325	90p
KA2106	180p	LA4032	175p	LA7420	200p	LM747	20p	NE571	220p	SDA5642	200p	STK4103	400p	STK6962	275p	STR50341	450p	TA7326	90p
KA2209	125p	LA4032	140p	LA7530	200p	LM1035N	350p	NE582P	140p	SDA5645	500p	STK4121	480p	STK6982	600p	STR56041	550p	TA7328	110p
KA2210	230p	LA4051	160p	LA7535	175p	LM1040N	650p	SAA1000	350p	SLG4031	750p	STK4122	560p	STK6982H	600p	STR58041	250p	TA7330P	80p
KA2212	65p	LA4100	85p	LA7545	160p	LM1203	225p	SAA1004	650p	SLA7020M	450p	STK4131	480p	STK7216	420p	STR59041	500p	TA7331P	80p
KA2213	130p	LA4101	80p	LA7550	275p	LM1203AN	225p	SAA1005	325p	STA301A	200p	STK4132 II	600p	STK7127	420p	STR6001	525p	TA7331P	100p
KA2214	100p	LA4102	100p	LA7555	150p	LM1875T	330p	SAA1008	300p	STA341M	180p	STK4133 II	750p	STK7225	500p	STR60145	475p	TA7332	120p
KA2215	110p	LA4110	120p	LA7620	500p	LM1891N	375p	SAA1008	300p	STA435A	270p	STK4132 II	520p	STK7226	600p	STR6181	425p	TA7335	85p
KA2244	75p	LA4120	270p	LA7680	675p	LM1886	250p	SAA1010	400p	STA403A	270p	STK4142	530p	STK7251	530p	STR6181	425p	TA7336	180p
KA2261	100p	LA4138	105p	LA7681	650p	LM1889	300p	SAA1024	250p	STA405A	280p	STK4147 II	1450p	STK7253	450p	STR6181	425p	TA7337P	175p
KA2263	100p	LA4140	60p	LA7710	250p	LM1894N	200p	SAA1025	250p	STA431A	250p	STK4151	680p	STK7308	350p	STR6181	425p	TA7339P	175p
KA2264	100p	LA4142	65p	LA7800	90p	LM1895N	275p	SAA1026	400p	STA432A	220p	STK4152	650p	STK7309	400p	STR6181	425p	TA7341	250p
KA2284	75p	LA4145	65p	LA7801	100p	LM2901N	35p	SAA1027	400p	STA434A	270p	STK4161	650p	STK7310	470p	STR6181	425p	TA7342P	70p
KA2309	175p	LA4160	100p	LA7802	300p	LM2902N	40p	SAA1029	150p	STA435A	270p	STK4162	550p	STK7310	470p	STR6181	425p	TA7343	120p
KA2401	150p	LA4162	110p	LA7805	250p	LM2903N	30p	SAA1042	325p	STA441C	220p	STK4121	520p	STK7356	425p	STR6181	425p	TA7344P	120p
KA2412	125p	LA4178	150p	LA7808	200p	LM3900	40p	SAA1043P	675p	STA451C	280p	STK4171	900p	STK7358	440p	STR6305	300p	TA7348P	100p
KA2912	125p	LA4180	150p	LA7820	100p	LM3909	100p	SAA1044	400p	STA456C	240p	STK4172 II	680p	STK7402	660p	STR6442	500p	TA7349P	175p
KA2913A	175p	LA4182	180p	LA7823	200p	LM3911N	200p	SAA1056	300p	STA471	210p	STK4181	680p	STK7404	600p	STR6442	500p	TA7354P	65p
KA2914A	200p	LA4190	300p	LA7824	130p	LM3914	160p	SAA1057	375p	STA901M	280p	STK4182 II	750p	STK7406	600p	STR6442	500p	TA7357	340p
KA22427	100p	LA4192	140p	LA7830	90p	LM3915	160p	SAA1058	225p	STK0025	420p	STK4191	700p	STK7408	675p	STR6442	500p	TA7358	85p
KA621920	200p	LA4200	130p	LA7831	350p	LM3916	160p	SAA1060	300p	STK0026	370p	STK4192	650p	STK7408	675p	STR6442	500p	TA7359	85p
KA62810H	400p	LA4431	120p	LA7832	130p	LM3933	320p	SAA1061	250p	STK0039	600p	STK4221 II	1000p	STK7458	1250p	STR6608	575p	TA7359P	90p
KA62818H	250p	LA4260	230p	LA7835	150p	LM3935	170p	SAA1062	250p	STK0040	520p	STK4211 V	800p	STK7554	600p	STR6609E	450p	TA7361	125p
KA62838K	150p	LA4261	300p	LA7837	150p	LM13600	150p	SAA1063	250p	STK0049	510p	STK4221 II	1200p	STK7561	650p	STR6610	450p	TA7362	150p
KA62893K	210p	LA4265	125p	LA7838	200p	LM13700	125p	SAA1064	275p	STK0050	440p	STK4231 II	700p	STK7562	1000p	STR6610	450p	TA7364P	175p
KA72272CP	200p	LA4270	300p	LA7850	225p	LM1829S	500p	SAA1070	550p	STK0059	620p	STK4241	1050p	STK7563	800p	STR6601	650p	TA7366P	65p
KA72713	45p	LA4282	350p	LA7851	200p	M4816B1	800p	SAA1073	325p	STK0060	820p	STK4241 V	1250p	STK7573	400p	STR6654S	900p	TA7368P	35p
LA497	300p	LA4420	140p	LA7910	150p	M49481	700p	SAA1075	350p	STK0070	1100p	STK4272	500p	STK7575	1500p	STR6654S	900p	TA7372P	150p
LA185V	250p	LA4422	130p	LA7913	30p	M5265P	200p	SAA1086	175p	STK0080	580p	STK4273	550p	STK7703	700p	STR6654S	900p	TA7373P	150p
L200	200p	LM4425A	200p	LA7930	350p	M50115P	320p	SAA1089	325p	STK011	330p	STK4301	500p	STK8050	1050p	STR6541	700p	TA7376P	100p
L272	200p	LA4430	130p	LA7940	200p	M50117P	500p	SAA1101	700p	STK015	440p	STK4311	650p	STK8250	1200p	STR6541	700p	TA7378P	60p
L272M	110p	LA4440	200p	LA7953	300p	M50119P	525p	SAA1124	200p	STK016	760p	STK4332	365p	STK8260	1200p	STR65307	600p	TA7401	250p
L290B	250p	LA4445	200p	LA9200	300p	M50422P	750p	SAA1130	550p	STK025	650p	STK4352	500p	STK8280	1850p	STR65308	600p	TA7402P	200p
L291B	75p	LA4446	120p	LA9205	300p	M50423	750p	SAA1135	550p	STK026	710p	STK4353	500p	STK8280 II	1850p	STR65309	600p	TA7403P	200p
L292	225p	LA4460	120p	LA9216	150p	M50784	300p	SAA1251	380p	STK027	580p	STK4372	600p	STK7340	500p	STR65707	1000p	TA7403	325p
L293B	225p	LA4461	120p	LA9258	100p	M50786	500p	SAA1271	400p</										

LINEAR ICs/JAPANESE TRANSISTORS

Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price
T8164P	100p	TD1180	120p	TD2760	400p	TD4661	225p	TD8391	675p	UPC1004C	130p	2SA771	90p	2SA1177	25p	2SB561	30p	2SC738	15p
T8184P	350p	TD1185A	190p	TD2780	600p	TD4670	475p	TD8395	360p	UPC1009	950p	2SA773	50p	2SA1179	20p	2SB562	20p	2SC739	150p
T8189P	130p	TD1190	80p	TD2791	275p	TD4680	350p	TD8405	550p	UPC1018	170p	2SA777	35p	2SA1182	20p	2SB564	15p	2SC761	110p
T8200AH	325p	TD1200B	80p	TD2795	150p	TD4685	275p	TD8415	650p	UPC1020	200p	2SA778	100p	2SA1184	120p	2SB565	90p	2SC762	150p
T8201AK	300p	TD1220	50p	TD2822M	60p	TD4700A	750p	TD8416	625p	UPC1023	60p	2SA781	150p	2SA1185	200p	2SB596	50p	2SC783	85p
T8205	220p	TD1235	300p	TD2824	85p	TD4714C	350p	TD8417	550p	UPC1024H	270p	2SA786	25p	2SA1186	500p	2SB598	30p	2SC790	50p
T8207K	175p	TD1236	240p	TD2840	200p	TD4716C	450p	TD8421	300p	UPC1025	75p	2SA794	50p	2SA1198	40p	2SB600	500p	2SC792	380p
T8210	260p	TD1251	160p	TD3047	100p	TD4718A	250p	TD8425	500p	UPC1026	95p	2SA798	30p	2SA1201	40p	2SB601	60p	2SC805	225p
T8211AH	130p	TD1270	150p	TD3048	200p	TD4725	750p	TD8433	550p	UPC1026	95p	2SA812	15p	2SA1202	25p	2SB602	40p	2SC826	25p
T8214K	260p	TD1327	200p	TD3082	200p	TD4800	300p	TD8433	550p	UPC1031H	50p	2SA814	60p	2SA1204	225p	2SB631	40p	2SC829	15p
T8215	300p	TD1405	50p	TD3083	200p	TD4810	500p	TD8440	300p	UPC1032	60p	2SA816	70p	2SA1206	60p	2SB632	45p	2SC839	20p
T8216H	300p	TD1410	220p	TD3190	100p	TD4814A	300p	TD8442	200p	UPC1035C	110p	2SA817	20p	2SA1207	25p	2SB633	80p	2SC867	900p
T8217P	120p	TD1412	35p	TD3301B	400p	TD4850	475p	TD8443	350p	UPC1043C	125p	2SA825	20p	2SA1208	70p	2SB641	12p	2SC870	170p
T8220AH	500p	TD1506	275p	TD3310	120p	TD4851	325p	TD8444	200p	UPC1043H	125p	2SA836	20p	2SA1209	100p	2SB647	20p	2SC898	150p
T8221AH	600p	TD1508	175p	TD3410	160p	TD4852	325p	TD8451	325p	UPC1018	170p	2SA837	200p	2SA1210	120p	2SB648	45p	2SC908	30p
T8225H	475p	TD1510	170p	TD3420	200p	TD4860	200p	TD4862	200p	UPC1167	125p	2SA839	110p	2SA1215	60p	2SB649	35p	2SC930	15p
T8225L	475p	TD1512	140p	TD3430	200p	TD4866	275p	TD4865	200p	UPC1170	150p	2SA841	20p	2SA1216	500p	2SB673	100p	2SC936	300p
T8227	250p	TD1514A	325p	TD3430	360p	TD4881	200p	TD4861	950p	UPC1173	200p	2SA844	20p	2SA1217	100p	2SB676	85p	2SC941	15p
T8229K	200p	TD1515A	250p	TD3450	300p	TD4893	300p	TD4849	225p	UPC1176C	120p	2SA847	25p	2SA1220	75p	2SB688	90p	2SC944	140p
T8400P	200p	TD1516Q	350p	TD3450	275p	TD4940	200p	TD4850	250p	UPC1178H	250p	2SA854	30p	2SA1221	70p	2SB703	90p	2SC945	10p
T8410K	200p	TD1517	150p	TD3506	260p	TD4972	200p	TD4870	275p	UPC1180C	200p	2SA861	45p	2SA1222	50p	2SB705	200p	2SC950	40p
T8410P	200p	TD1519	200p	TD3507	450p	TD4944	175p	TD4870	500p	UPC185H	420p	2SA872	25p	2SA1226	25p	2SB707	200p	2SC959	225p
T8432	200p	TD1519A	200p	TD3510	200p	TD4950	100p	TD4870	600p	UPC1186	80p	2SA872A	50p	2SA1227	250p	2SB716	20p	2SC980	40p
T8605N	350p	TD1520	275p	TD3520	250p	TD45030A	100p	TD4873	225p	UPC1187	150p	2SA879	100p	2SA1232	180p	2SB718	60p	2SC982	20p
T8606N	350p	TD1521	210p	TD3530	250p	TD45140A	200p	TD4873	300p	UPC1188H	350p	2SA884	100p	2SA1237	25p	2SB727	100p	2SC983	120p
T8607P	320p	TD1522	110p	TD3540	260p	TD4530T	300p	TD4873	175p	UPC1191	300p	2SA885	100p	2SA1238	30p	2SB733	75p	2SC1000	20p
T8611AN	200p	TD1524	110p	TD3541	275p	TD4531	200p	TD4873	200p	UPC1192A	250p	2SA892	100p	2SA1239	30p	2SB734	100p	2SC1001	950p
T8615N	480p	TD1526	225p	TD3560	260p	TD4532T	150p	TD4874	550p	UPC1198H	200p	2SA897	20p	2SA1240	45p	2SB737	20p	2SC1008	20p
T8628N	350p	TD1534	2000p	TD3561	300p	TD4550	400p	TD4880T	325p	UPC1210	150p	2SA893	15p	2SA1242	80p	2SB739	22p	2SC1010	225p
T8631	500p	TD1540	420p	TD3561A	300p	TD4560	450p	TD4880T	350p	UPC1215V	125p	2SA896	25p	2SA1244	120p	2SB744	55p	2SC1012	75p
T8632N	550p	TD1541	500p	TD3562	260p	TD4560P	250p	TD4904	300p	UPC1222	135p	2SA899	40p	2SA1245	55p	2SB750	60p	2SC1013	170p
T8644N	425p	TD1542	250p	TD3562TF	300p	TD4570	200p	TD4908	400p	UPC1225H	220p	2SA900	45p	2SA1246	80p	2SB753	100p	2SC1014	140p
T8645N	425p	TD1543	190p	TD3570	275p	TD4580	175p	TD4921	200p	UPC1226	250p	2SA902	45p	2SA1248	100p	2SB755	100p	2SC1015	150p
T8653N	1500p	TD1552Q	350p	TD3564	325p	TD45708	275p	TD4903	130p	UPC1228A	420p	2SA907	650p	2SA1249	100p	2SB764	30p	2SC1046	250p
T8659AN	900p	TD1553AQ	325p	TD3565	220p	TD45709	375p	TD4950	500p	UPC1230	200p	2SA909	500p	2SA1252	20p	2SB765	70p	2SC1047	20p
T8690N	700p	TD1555Q	375p	TD3566	280p	TD45800	850p	TD49503	550p	UPC1237A	70p	2SA912	70p	2SA1253	30p	2SB772	25p	2SC1050	280p
T8691N	450p	TD1557Q	300p	TD3567	350p	TD45820	370p	TD49513	225p	UPC1238	120p	2SA913	100p	2SA1256	30p	2SB774	50p	2SC1051	85p
T8701AN	275p	TD1558Q	300p	TD3568	300p	TD4582	120p	TD4980	225p	UPC1241H	150p	2SA914	100p	2SA1257	30p	2SB775	100p	2SC1061	25p
T8701N	275p	TD1559Q	300p	TD3569	300p	TD4585	175p	TD4982	200p	UPC1242H	150p	2SA915	100p	2SA1258	30p	2SB776	110p	2SC1062	175p
T8720	525p	TD1571	300p	TD3580	300p	TD45930	225p	TD4982	150p	UPC1245V	30p	2SA916	30p	2SA1261	150p	2SB788	35p	2SC1070	65p
T8739P	450p	TD1572	175p	TD3586	750p	TD46100Q	150p	TD4983T	80p	UPC1270H	250p	2SA921	40p	2SA1262	110p	2SB791	130p	2SC1079	300p
T8872N	450p	TD1574	125p	TD3590	250p	TD46101Q	120p	TD4985	300p	UPC1274V	250p	2SA928A	25p	2SA1263	280p	2SB794	40p	2SC1080	225p
TAA550	25p	TD1576	170p	TD3591	360p	TD46111Q	125p	TD4985	300p	UPC1277	240p	2SA933	30p	2SA1264	280p	2SB795	45p	2SC1086	45p
TBA120S	40p	TD1578A	210p	TD3592A	200p	TD46200	750p	TD4985	650p	UPC1278	240p	2SA934	30p	2SA1265	200p	2SB810	15p	2SC1098	120p
TBA339	30p	TD1579A	190p	TD3593Q	200p	TD46200-2	1100p	TD4985	650p	UPC1279	240p	2SA934	30p	2SA1266	200p	2SB810	15p	2SC1098	120p
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TBA530	100p	TD1591	275p	TD3611	450p	TD46612-2	900p	TD4985	650p	UPC1298	110p	2SA939	140p	2SA1286	60p	2SB819	60p	2SC1115	280p
TBA540	90p	TD1596	200p	TD3640	350p	TD47000	170p	TD4985	650p	UPC1313H	320p	2SA940	50p	2SA1289	50p	2SB822	40p	2SC1116	290p
TBA560	90p	TD1598	160p	TD3645	400p	TD47010T	120p	TD4985	650p	UPC1316C	70p	2SA942	60p	2SA1290	150p	2SB824	60p	2SC1124	270p
TBA601	40p	TD1599	200p	TD3651	175p	TD47020T	175p	TD4985	650p	UPC1318	300p	2SA949	70p	2SA1293	110p	2SB825	135p	2SC1161	110p
TBA810AS	40p	TD1602A	200p	TD3652	600p	TD47031T	200p	TD4985	650p	UPC1320H	40p	2SA951	60p	2SA1295	50p	2SB827	200p	2SC1162	40p
TBA820	55p	TD1670A	200p	TD3652-TX1600	85p	TD47050	100p	TD4985	650p	UPC1335V	320p	2SA951	60p	2SA1295	50p	2SB827	200p	2SC1164	600p
TBA820M	35p	TD1675	200p	TD3653	85p	TD47052	120p	TD4985	650p	UPC1350	115p	2SA952	30p	2SA1301	260p	2SB828	200p	2SC1165	700p
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TBA950	100p	TD1771	200p	TD3654SQ	85p	TD47056	200p	TD4985	650p	UPC1360	200p	2SA954	60p	2SA1303	400p	2SB835	75p	2SC1170	180p
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TC9125BP	410p	TD1910	160p	TD3740	400p	TD47222	100p	TD4985	650p	UPC1366C	130p	2SA968	55p	2SA1317	30p	2SB885	45p	2SC1214	15p
TC9130P	400p	TD1912A	160p	TD3740A	400p	TD47230A	150p	TD4985	650p	UPC1370C	300p	2SA968	55p	2SA1318	20p	2SB885			

JAPANESE TRANSISTORS

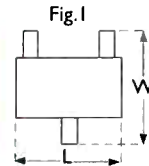
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C8	BCF30	G2	BF550	M4	BSR56	P2#	BFR92AW	U2	BCX20	Y10	BZX84-C27
C9	BCF30R	G3	BF536	M5	BSR57	P4	BFR92R	U3	BSS64	Y11	BZX84-C30
C91	BCV62	G4	BFS20R	M6	BSR58	P5	BFR92AR	U4	BCX19R	Y12	BZX84-C33
CA	BCX68	G5	BF550R	M62	PBMF4391	R1	BFR93	U5	BCX20R	Y13	BZX84-C36
CAC	BC868	G6	BF569	M63	PBMF4392	R2	BFR93A	U6	BSS64R	Y14	BZX84-C39
CE	BCX69	G7	BF579	M64	PBMF4393	R4	BFR93R	U7	BSR13	Y15	BZX84-C43
CEC	BC869	G8	BF660	M65	BF545A	R5	BFR93AR	U8	BSR14	Y16	BZX84-C47
D1	BCW31	G81	BF660R	M66	BF545B	S1	BBY31	U81	BSR14R	Y17	BZX84-C51
D2	BCW32	G9	BF767	M67	BF545C	S2	BBY40	U9	BSR17	Y18	BZX84-C56
D3	BCW33	H1	BCW69	M74	BSS83	S6	BF510	U91	BSR17R	Y19	BZX84-C62
D4	BCW31R	H2	BCW70	M8	BSN20	S7	BF511	U92	BSR17A	Y20	BZX84-C68
D5	BCW32R	H3	BCW89	M84	BF556A	S8	BF512	U93	BSR17AR	Y21	BZX84-C75
D6	BCW33R	H31	BCW89R	M85*	BF556B	S9	BF513	V2	BFQ67	Z1	BZX84-C4V7
D7	BCF32	H4	BCW69R	M86	BF556C	T1	BCX17	V3	BFG67	Z2	BZX84-C5V1
D77	BCF32R	H5	BCW70R	M87	BF990A	T2	BCX18	V4	BFT25R	Z3	BZX84-C5V6
D8	BCF33	H7	BCF70	M89	BF989	T3	BSS63	W1	BFT92	Z4	BZX84-C6V2
D81	BCF33R	H71	BCF70R	M90	BF990	T4	BCX17R	W4	BFT92R	Z5	BZX84-C6V8
D91	BCV61	K1	BCW71	M91	BF991	T5	BCX18R	X1	BFT93	Z6	BZX84-C7V5
DA	BF622	K2	BCW72	M92	BF992	T6	BSS63R	X4	BFT93R	Z7	BZX84-C8V2
DB	BF623	K3	BCW81	M94	BF994	T7	BSR15	Y1	BZX84-C11	Z8	BZX84-C9V1
DC	BF620	K31	BCW81R	M96	BF996	T71	BSR15R	Y2	BZX84-C12	Z9	BZX84-C10
DF	BF621	K4	BCW71R	M97	BFR101A	T8	BSR16	Y3	BZX84-C13	Z11	BZX84-C2V4
E1	BFS17	K5	BCW72R	M98	BFR101B	T81	BSR16R	Y4	BZX84-C15	Z12	BZX84-C2V7
E15	BF747	K7	BCV71	N1*	BFR53	T9	BSR18	Y5	BZX84-C16	Z13	BZX84-C3V0
E16	BF547	K71	BCV71R	N2	BFS520	T91	BSR18R	Y6	BZX84-C18	Z14	BZX84-C3V3
E2*	BFS17A	K8	BCV72	N28	BFR520	T92	BSR18A	Y7	BZX84-C20	Z15	BZX84-C3V6
E2#	BF547W	K81	BCV72R	N29	BFR540	T93	BSR18AR	Y8	BZX84-C22	Z16	BZX84-C3V9
E4	BFS17R	K9	BCF81	N3	BFG520W	U1	BCX19	Y9	BZX84-C24	Z17	BZX84-C4V3
E6	BFG17A	K91	BCF81R	N30	BFR505						
ED	BCV28	KM	BST80	N33	BFG505						
EE	BCV48	KN	BST84	N36	BFG520						
EF	BCV29	KO	BST66	N37	BFG540						
EG	BCV49	L20	BAS29	N38	BFG590						
F1	BFS18	L21	BAS31	N39	BFG505/X						
F2	BFS19	L22	BAS35	N4*	BFR53R						
F3	BF840	L30	BAV23	N4#	BFS540						
F31	BF841	L4	BAT54	N4	BFG520W/X						
F4	BFS18R	L41	BAT74	N6#	BFS25A						
F5	BFS19R	L51	BAS56	N70	BFG10						
F8	BF824	LM	BST120	N71	BFG10/X						
FA	BFQ17	LN	BST122	N72	BFG11						
FB	BFQ19	M1	BFR30	N73	BFG11/X						
FD	BCV26	M2	BFR32	NC	BF840						
FF*	BCV27	M3	BFT46	ND	BF841						
FF+	BFQ18A	M31	BSD20	O2	BST82						
G1	BFS20	M32	BSD22	P1*	BFR92						

Japanese (ROHM) Types

Most Japanese device encapsulation descriptions and sizes differ from European or American ones. The same code markings may be used with different encapsulations, so it is first necessary to identify the encapsulation by its size. Refer to Fig. 1 and the following table, which includes reference to the European SC70 and SOT-23 encapsulations.

Pack	EM3	UMT/SC70	SMT	SOT-23
L mm	1.6	2	2.9	2.9
W mm	1.6	2.1	2.8	2.5



There are also five- and six-leg encapsulations.

Some identification codes may be followed by a gain (hfe) marking.

EM3 Pack

A 2SC4618
AC 2SC4725
AD 2SC4726
B 2SC4617
BD 2SA1821
CA 2SA1885
CB 2SC4997
E11 DTA113ZE
E13 DTA143ZE
E21 DTC113ZE
E23 DTC143ZE
E32 DTA123JE
E42 DTC123JE
E56 DTA144VE
E66 DTC144VE
F 2SA1774
J 2SC4649
K3B DTA1D3RE
K4B DTC1D3RE
K19 DTA115GE
K29 DTC115GE
S 2SC4619
03 DTC143TE
04 DTC114TE
05 DTC124TE
06 DTC144TE
12 DTA123EE
13 DTA143EE
14 DTA114EE
15 DTA124EE
16 DTA144EE
19 DTA115EE
22 DTC123EE
23 DTC143EE
24 DTC114EE
25 DTC124EE
26 DTC144EE
29 DTC115EE
33 DTA143XE
35 DTA124XE
43 DTC143XE
45 DTC124XE
52 DTA123YE
53 DTA143YE
54 DTA114YE

62 DTC123YE
63 DTC143YE
64 DTC114YE
69 DTC115TE
74 DTA114WE
76 DTA144WE
84 DTC114WE
86 DTC144WE
91 DTA113TE
93 DTA143TE
94 DTA114TE
95 DTA124TE
96 DTA144TE
99 DTA115TE

UMT Pack

A 2SC4098
B 2SC4081
BD 2SA1808
BF 2SC4723
BH 2SC4700
BJ 2SD2351
BL 2SC4772
BM 2SC4774
C 2SC4097
CA 2SA1886
CB 2SC4998
F 2SA1576A
H 2SA1577
J 2SC4099
K14 DTA114GUA
K15 DTA124GUA
K16 DTA144GUA
K19 DTA115GUA
K24 DTC114GUA
K25 DTC124GUA
K26 DTC144GUA
K29 DTC115GUA
K3B DTA1D3RUA
K4B DTC1D3RUA
R 2SA1579
S 2SC4100
T 2SC4102
Y 2SD1949
0A DTC125TU
03 DTC143TUA

04 DTC114TUA
05 DTC124TUA
06 DTC144TUA
09 DTC115TUA
1C 2SC4082
1D 2SC4083
1E 2SC4084
1L 2SC4103
1M 2SC4128
1T 2SC4773
12 DTA123EUA
13 DTA143EUA
14 DTA114EUA
15 DTA124EUA
16 DTA144EUA
19 DTA115EUA
22 DTC123EUA
23 DTC143EUA
24 DTC114EUA
25 DTC124EUA
26 DTC144EUA
29 DTC115EUA
33 DTA143XUA
35 DTA124XUA
43 DTC143XUA
45 DTC124XUA
52 DTA123YUA
53 DTA143YUA
54 DTA114YUA
62 DTC123YUA
63 DTC143YUA
64 DTC114YUA
74 DTA114WUA
76 DTA144WUA
84 DTC114WUA
86 DTC144WUA
9A DTA125TUA
91 DTA113TUA
93 DTA143TUA
94 DTA114TUA
95 DTA124TUA
96 DTA144TUA
99 DTA115TUA
111 DTA113ZUA
113 DTA143ZUA
121 DTC113ZUA

4FR BC860BR
4G BC860C
4GR BC860CR
4Y3 BVZ49-C4V3
4Y7 BVZ49-C4V7
5A BC807-16
5AR BC807-16R
5B BC807-25
5BR BC807-25R
5C BC807-40
5CR BC807-40R
5E BC808-16
5ER BC808-16R
5F BC808-25
5FR BC808-25R
5G BC808-40
5GR BC808-40R
5Y1 BVZ49-C5V1
5Y6 BVZ49-C5V6
6A BC817-16
6AR BC817-16R
6B BC817-25
6BR BC817-25R
6C BC817-40
6CR BC817-40R
6E BC818-16
6ER BC818-16R
6F BC818-25
6FR BC818-25R
6G BC818-40
6GR BC818-40R
6Y2 BVZ49-C6V2
6Y8 BVZ49-C6V8
7Y5 BVZ49-C7V5
8Y2 BVZ49-C8V2
9Y1 BVZ49-C9V1
10Y BVZ49-C10
11Y BVZ49-C11
12Y BVZ49-C12
13Y BVZ49-C13
15Y BVZ49-C15
16Y BVZ49-C16
18Y BVZ49-C18
20Y BVZ49-C20
22Y BVZ49-C22
24Y BVZ49-C24

27Y BVZ49-C27
30Y BVZ49-C30
33Y BVZ49-C33
36Y BVZ49-C36
39Y BVZ49-C39
43Y BVZ49-C43
47Y BVZ49-C47
51Y BVZ49-C51
56Y BVZ49-C56
62Y BVZ49-C62
68Y BVZ49-C68
75Y BZY49-C75
A1 BAW56
A2 BAT18
A3 BAT17
A4 BAV70
A5 BRY61
A51 BRY62
A6 BAS16
A61 BAS28
A7 BAV99
A8 BAS19
A81 BAS20
A82 BAS21
A91 BAS17
AA* BCW60A
AA+ BCX51
AB* BCW60B
AB+ BCX51-6
AC* BCW60C
AC+ BCX51-10
AD* BCW60D
AD+ BCX51-16
AE BCX52
AF BCX52-6
AG BCX70G
AH* BCX70H
AH+ BCX53
AJ* BCX70J
AJ+ BCX53-6
AK* BCX70K
AK+ BCX53-10
AL BCX53-16
AM BCX52-16
AR1 BSR40
AR2 BSR41

AR3 BSR42
AR4 BSR43
AS1 BST50
AS2 BST51
AS3 BST52
AT1 BST39
AT2 BST40
B2 BSV52
B4 BSV52R
B5 BSR12
B8 BSR12R
BA* BCW61A
BA+ BCX54
BB* BCW61B
BB+ BCX54-6
BC* BCW61C
BC+ BCX54-10
BD* BCW61D
BD+ BCX54-16
BE BCX55
BF BCX55-6
BG* BCX71G
BG+ BCX55-10
BH* BCX71H
BH+ BCX56
BJ* BCX71J
BJ+ BCX56-6
BK* BCX71K
BK+ BCX56-10
BL BCX56-16
BM BCX55-16
BR1 BSR30
BR2 BSR31
BR3 BSR32
BR4 BSR33
BS1 BST60
BS2 BST61
BS3 BST62
BT1 BST15
BT2 BST16
C1 BCW29
C2 BCW30
C4 BCW29R
C5 BCW30R
C7 BCF29
C77 BCF29R

SURFACE-MOUNTED DEVICE MARKINGS

Because of their small size, it's not possible to show types/values on most surface-mounted components. The following tables show the code markings used to identify most common surface-mounted transistors and diodes. Note that the same code marking may be used for different devices, depending on the device encapsulation (SOT-23, SOT-89 etc.).

European (Philips) Devices

Types in SOT-23, SOT-89 and SOT-143 encapsulations are marked as below. The actual type number and data code are shown on the packing. SOT-89 types usually have the type number marked in full on the encapsulation: the BZV49 series is an exception. Code markings followed by * apply to SOT-23 devices, those followed by + apply to SOT-89 devices and those by # to SOT-323 devices.

1A	BC846A	2BR	BC849BR	3J	BC858A
1BR	BC846AR	2C	BC849C	3JR	BC858AR
1E	BC847A	2CR	BC849CR	3K	BC858B
1ER	BC847AR	2F	BC850B	3KR	BC858BR
1F	BC847B	2FR	BC850BR	3L	BC858C
1FR	BC847BR	2G	BR850C	3LR	BC858CR
1G	BC847C	2GR	BC850CR	3Y0	BZV49-C3V0
1GR	BC847CR	2Y4	BZV49-C2V4	3Y3	BZV49-C3V3
1J	BC848A	2Y7	BZV49-C2V7	3Y6	BZV49-C3V6
1JR	BC848AR	3A	BC856A	3Y9	BZV49-C3V9
1K	BC848B	3AR	BC856AR	4A	BC859A
1KR	BC848BR	3B	BC856B	4AR	BC859AR
1L	BC848C	3BR	BC856BR	4B	BC859B
1LR	BC848CR	3E	BC857A	4BR	BC859BR
1V	BF820	3ER	BC857AR	4C	BC859C
1W	BF821	3F	BC857B	4CR	BC859CR
1X	BF822	3FR	BC857BR	4E	BC860A
1Y	BF823	3G	BC857C	4ER	BC860AR
2B	BC849B	3GR	BC857CR	4F	BC860B

123	DTC143ZUA	E93	DTB142TK	R	2SA1514K
132	DTA123JUA	E94	DTB114TK	S	2SC3082K
142	DTC123JUA	E97	DTB163TK	T	2SC3906K
156	DTA144VUA	F	2SA1037AK	U	2SB852K
166	DTC144VUA	F02	DTD123TK	W	2SD1383K
179	DAT115UU	F03	DTB143TK	Y	2SD1484K
183	DTC115UU	F04	DTD114TK	ZA	RU101

SMT Pack

A	2SC2413K	F07	DTD163TK	0A	DTC125TK
AA	2SD1757K	F11	DTB113EK	03	DTC143TKA
AC	2SC3837K	F12	DTB123EK	04	DTC114TKA
AD	2SC3838K	F13	DTB143EK	05	DTC124TKA
AE	2SC3839K	F14	DTB114EK	06	DTC144TKA
AF	2SD1781K	F21	DTD113EK	09	DTC115TKA
AH	2SB1197K	F22	DTD123EK	12	DTA123EKA
AJ	2SD1782K	F23	DTD143EK	13	DTA143EKA
AK	2SB1198K	F24	DTD114EK	14	DTA114EKA
AL	2SC3802K	F52	DTB123YK	15	DTA124EKA
AM	2SC4018K	F62	DTD123YK	16	DTA114EKA
AN	2SC4061K	G	2SA1455K	19	DTA115EKA
AP	2SC4074K	G08	DTD133HK	22	DTC123EKA
AQ	2SB0151K	G11	DTB113ZK	23	DTC143EKA
AT	2SC4326K	G21	DTD113ZK	24	DTC114EKA
B	2SC2412K	G3C	DTB122JK	25	DTC124EKA
BB	2SD2114K	G4C	DTD122JK	26	DTC144EKA
BD	2SA1733K	G98	DTB133HK	29	DTC115EKA
BF	2SC4642K	H	2SA1036K	33	DTA143XKA
BH	2SC4699K	H02	DTC323TK	35	DTA124XKA
BJ	2SD2226K	H03	DTC343TK	43	DTC143XKA
BL	2SC4771K	H04	DTC314TK	45	DTC124XKA
BM	2SC4713K	H07	DTC363TK	52	DTA123YKA
C	2SC2411K	H27	DTC363EK	53	DTA143YKA
D	2SA1037AKLN	I	2SC3722K	54	DTA114YKA
E11	DTA113ZKA	J	2SC2059K	62	DTC123YKA
E13	DTA143ZKA	K14	DTA114GKA	63	DTC143YKA
E21	DTC113ZKA	K15	DTA124GKA	64	DTC114YKA
E23	DTC143ZKA	K16	DTA144GKA	74	DTA114WKA
E32	DTA123JKA	K19	DTA115GKA	76	DTA144WKA
E42	DTC123JKA	K24	DTC114GKA	84	DTC114WKA
E56	DTA144VKA	K25	DTC124GKA	86	DTC144WKA
E66	DTC144VKA	K26	DTC144GKA	9A	DTA125TK
E79	DTA115UK	K29	DTC115GKA	91	DTA113TKA
E89	DTC115UK	K3B	DTA1D3RKA	93	DTA143TKA
E92	DTB123TK	K4B	DTC1D3RKA	94	DTA114TKA
		L	2SC2412KLN	95	DTA124TKA
		L14	DTB114GK	96	DTA144TKA
		L24	DTD114GK	99	DTA115TKA

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Acknowledgement

Our thanks to
Keith Cunliffe, Ray Porter, M.Sc., C.Eng.
and
Alan J. Roberts
who supplied data used in this compilation.

SURFACE- MOUNTED DEVICE MARKINGS

FREE WITH
TELEVISION

POCKET SIZE REFERENCE

PINCH ROLLERS

Model	Price	Model	Price	Model	Price	Model	Price
AKAI VS10, VS9300, VS9500, VS9700, VS9800, VP7100, VP77 VS1, VS2, VS3, VS4, VS5, VS6, VS8, VS9, VS12, VS15 VS105, 112, 115, 116, 120, 125, 126, 155, 165, 205, 220, 240, 244, 245, VS247, 248, 250, 512, VS515, 516, VSX9 VS201, 301, 303, 304, 603, 606, 607, VSP8, VSP82, VP58, VP82 VS125, VS155, VS165, VS220, VS240, VS250, VS512 VS22, 23, 25, 35, 37, 38, 53, 66, 75, 422, 425, 426, 427, 462, 465, 467, 468, 469, 470, VS485, 765, 766, 767, 768, 865, 867, 965, 967, VS477, VSA650 VSF10, 11, 12, 15, 180, 190, 200, 210, 220, 221, 222, 230, 240, 30, 33 VSF330, 4, 5, 500, 550, VSP88, VSR100, VSX400, 450, 470 VSF260, 261, 262, 265, 270, 274, 275, 280, 290, 340, 350, 410, 420, 43C VSR441, 440, 450, 455, 480, 490, 497, 510, 560, 580, 590, 599, 600 VSG20, 21, 23, 24, 25, 30, 33, 34, 35, 51, 54, 55, 60, 64, 65, 70, 73, 74, 75 VSP110, VSK560, VSK580 VS17, 20, 22, 23, 24, 25, 26, 27, 35, 37, 38, 53, 55, VSA77 PINCH ROLLER ASSEMBLY VS422, 425, 426, 427, 462, 465, 467, 485, 498, 765, 766, 767, 768, 865, 867, 965, 967, VSA650, VSF10, 11, 12, 14, 15, 180, 190, 200, 210, 220, 221, 222, 230, 240, 30, 33 VSR100, VSX100, 400, 450, 470 PINCH ROLLER ASSEMBLY VSS99 ALBA VCR3000X, VCR4000 VCR5000, VCR6000 VCR161, VCR222 VCR7000, VCR7800, VCR8000 VCR8000 VT10 AMSTRAD VCR1000, 2000, 4500, 4600, 4700, 5200, 6000, 6100, 6200, 8600 VCR8602, 8603, 8604, 8700, 8704, 8714, 8800, 8804, 9000, 9005 VCR9244, 9340, DD8900, 8904, TVR1, 2, 3, 4 VCR7000 DD8900, DD8904, VCR6000, 6100, 6200, 8600, 8602, 8603, 8604 VCR8700, 8800, 900>9, 9140, 9244, 9340 PINCH ROLLER ASSEMBLY PART NO: 153148 TX3650, UF20, VCR3000, VCR3002, VCR4000, VCR9500 PINCH ROLLER ASSEMBLY PART NO: 254966 DD8900, 9004, TX3650, UF20, 22, 24, VCR3000, 3002, 9500 VS1004 VS1014 FERGUSON 3V00, 3V01, 3V16, 3V22, 3V23, 3V24, 3292, 8900, 8901, 8902, 8903, 8904, 8906, 8909, 8912, 8922, 8923, 8924, 8925, 8929 3V29, 3V30, 3V31, 3V32, 3V52, 8930, 8931, 8935, 8940, 8941, 8942 3V35, 3V36, 3V38, 3V39, 3V42, 3V43, 3V44, 3V45, 3V48, 3V49, 3V53, 3V54, 3V55, 3V56, 3V57, 3V58, 3V59, 3V65, FV10, FV11, FV12, FV14, 8943, 8944, 8945, 8947, 8948 3V52 8950, 8951, FV10B, 11R, 13H, 14T, 20B, 21R, 22L, 26D, 31R, 32L, FV33H, 39S, 41R, 42L, 50B, 51R, 52L, VC141L FV37H, FV44L, FV46T, FV43H, FV57H 3V35, 3V36, 3V38, 3V39, 3V49, 8943, 8944 PINCH ROLLER ASSEMBLY 3V42, 3V43, 3V44, 3V45, 3V48, 3V53, 3V54, 3V55, 3V56, 3V57, 3V58, 3V59, 8943, 8947, 8948 PINCH ROLLER ASSEMBLY FV37, FV57, FV58 PINCH ROLLER ASSEMBLY FV31R FV41L, FV42L PINCH ROLLER ASSEMBLY 3V58, 3V59, 3V64, 3V65, FV10, 11, 12, 13, 14, 20, 21, 22, 26, 30, 32, 33 FV39, VC141L PINCH ROLLER ASSEMBLY FV43H, FV44L, FV45X, FV46T PINCH ROLLER ASSEMBLY FV61, FV62, FV67, FV68, FV70, FV71, FV72, FV74, FV77 PINCH ROLLER ASSEMBLY FISHER FVHP420, 520, 530 BRSE600 , 605, 747, 777, 920, 925 HR510 BRS500, HRD110, 111, 120, 220, 225, 455 PINCH ROLLER ASSEMBLY HRD140, 141, 142, 143, 150, 152, 157, 158, 160, 565, 566, 725, 755, HRP50 HRP50 PINCH ROLLER ASSEMBLY HRD1520, 510, 520, 521, 522, 525, 527, 560, 600, 610, 620, 637, 641, HRD580, 720, 830, 840, 910, HRJ205, HR5800 PINCH ROLLER ASSEMBLY BR7030, BR5800, HRD160, 170, 171, 180, 190, 210, 211, 217, 227, HRD230, 271, 300, 310, 320, 321, 330, 337, 350, 400, 430, 440, 441, HRD470, 500, 530, 700, 750, 950, HRSS5000, 5500, 9000 PINCH ROLLER ASSEMBLY HRD540, HRD550, HRD580, HRD660, HRD680, HRD960 PINCH ROLLER ASSEMBLY HRJ600, HRJ605, HRJ815, HRJ9200 MITSUBISHI HS12, 5300, 5424, 5600, HSB11, 12, 16, 21, 27, 31, 32, 41, 51, 52, 82, HSM1000, 110, 120, 150, 160, 170, 180, 190, 210, 220, 250, 27, 33, 34, 35, 36, 37, 370, 380, 415, 450, 5, 45, 555, 57, 58, 59, 68, HSM2, 9, HSS11, 14, 15, 17, 19, 25, 250, 260, HV F125, 150, 303, 85, SV8900, 8930 PINCH ROLLER ASSEMBLY PART NO: 9480020010 HSE11, 12, 16, 17, 21, 22, 27, 31, 32, 41, 51, 52, 53, 500, 5424, 5600, HSB11, 12, 16, 21, 27, 31, 32, 41, 51, 52, 82, HSM1000, 110, 120, 150, HSM16, 170, 180, 190, 210, 220, 250, 27, 30, 32, 34, 35, 36, 37, 370, 380, HSM380, 40, 45, 460, 50, 54, 55, 555, 57, 58, 59, 60, 68, HSM2, 9, HSMX11, 18, 19, 2, HSS11, 12, 14, 15, 17, 19, 25, 250, HVF125, HVF150, 303, 85, SV8900, 8930 HS200, HS300, HS301, HS302, HS303, HS304, HS310, HS320, HS330, HS360, HS700 HS306, HS307, HS318, HS319, HS337, HS338, HS347, HS349, HS410, HS411, HS411, HS412, HS421, HS480, HS710, HSB 10, HSB20, 30, HSE 10, 20 NATIONAL PANASONIC NV100, 180, 300, 300XP, 332, 333, 340, 366, 600, 688, 777, 788, 3321, AG6010, 6015, 6100, 6200, 6400, 6800, 7450 NV230, 250, 260, 280, 370, 380, 430, 431, 433, 450, 460, 465, 470, 480 NV830, 650, 730, 770, 880, 810, 830, 850, 870, 890, 2000, 2010, 3000, NV7000, 7200, 7800, 8050, 8150, 8170, 8200, 8500, 8400, 8500, 8600 NV6810, 6920, NVG11, 14, 16, NVG7, 10, 12, 15, 18, 30, 130, 400, AG 1000, 1050, 1200, 1500, 2100, 2200, 6500, 6810, 7500, 7510, NVH70 NVG69, NVG120 NVG88, NVG120, 7150, 7330, 7350, 7355, 7650, NVH65, 75, NVJ30, NVL20, 23, 25, 28, NVG300, NVF65, NVF70, NVF51, NVF52, 100, NVG 19, 20, 25, 33, 40, 50, NVV8000 NVH40, NVH80, NVG21 NVG45 NVJ700XP NVHD100, NVHD110, NCHD90, NVSD30, NVSD40 PINCH ROLLER ASSEMBLY AGS150, 5250, 5700, 6024, NVH38, 48, 80, NVF55, 65, 70, 75, 77 NVF51, 100, 200, 88, 90, NVG 19, 20, 21, 22, 25, 28, 30, 33, 40, 45, 46, NVG50, NVH65, 75, 77, NVJ30, 33, 35, 37, 40, 42, 45, 47 NVL20, 23, 25, 28, NVV 1 PINCH ROLLER ASSEMBLY N.E.C. N800, 831, 832, 833, 895 PVC2300, 2400, 740, 744, 746, 760, 764, 766 9X1000, 1600, 1800, 2000, 3000, N9012, 9013, 9014, 9016, 9033 N9034, 9053, 9054, 9055, 9056, 9066, 9096, 9100, 9120, 9510, 9520, N9530, 9610, PK 1200 NSD6000, DX4000, N9077 ORION VH1, VH2 VC150, 180, VH3, 33, 200, 201, 205, 212, 250, 254, 288, 300, 303, 312, VH404, 555, 700, 704, 712, 770, 780, 844, 900, 1000, 2948, 3030, 3312 VHF2A, VP2948 CMF2 15000, 16000, HV03, LVH50, NEVH, NEVHM, NEVHML TVP230RC, VCP VH04, 30, 103, 300, 358, 360, 362, 400, 416, 512, VH530, 532, 535, 536, 600, 630, 635, 640, 666, 730, 735, 744, 774, 790 VH800, 820, 850, 888, 893, 900, 930, 940, 942, 974, 1012, 1040, 1050, VH1060, 1070, VH1100, 1120, 1204, 1440, 1500, 1660, 1800, 2004, VH2151, 2308, 22042400, 2500, 2600, 2700, VH2960, 2970, 3050, HX3060, 4000, 4008, 4010, 4012, 4015, 4015, 4020, 4500, 5020, VR 1200, 220, 225, 245, VR821, 925, 1032, 2945, 2959, 2957, 2966, 2979, 2980, VTV300, VXL20, 25, 30 PHILIPS VR6460 VR6920 VR2020, VR2021, VR2022, VR2023, VR2027 VR6711 VR6711 VR6540 DV856, 586, VR702, 703, 6485, 6585, 6589, 6785, 6880, 6948 VR445, VR6442, VR6542, VR6643, VR6843, VR6943, 44S89 DV464, 662, VR2220, 2300, 2324, 2330, 2334, 2340, 2350, 2414, VR2480, 2485, 2486, 2489, 2490, 2498, 2840, 6462, 6463, 6464, 6560, VR6660, 6860, 6861, 6862, 6863 N-1700, VR2870 VR2025, VR6580, VR6581 VR3260, 6349, 6448, 6449, 6548, 6648 PRESSURE ROLLER ASSEMBLY PS403-40205 DV186, 190, VR211, 2115, 212, 213, 223, 286, 291, 292, 311, 312, 313, VR3210, 3218, 322, 3229, 323, 3350, 486, 471, 582, 582, 571, 761, VR1201, 202, VR203, 302, 303, 305, 6180, 6182, 6185, 6285, 6290, VR6291, 6293, 6362, 6367, 6390, 6391, 6393, 6467, 6468, 6470, 6661 VR6570, 6581, VR6670, 6676, 6710, 6760, 6761, 6762, 6870, 6970, VR6956, 8681, 63S87, 685B4, 715B4, 71S85, 72S88, 72S88, 92S831, 20DV1, 20DV2, 20RW7, 21DV1, 21DV2, 25B01, 25B02, 25B11, 25B12, 30DV2, 31DV1, 31DV2, 31DV3, 33S80, 35B03, 35B05, 35B11, 35B12, 35B13 VR231, 232, 332, 422, 422P, 512, 5229, 722, 7229, 723 VR501 SANYO VHR1100, 1110, 1150, 1200, 1300, 1500, 2100, 2300, 2370, 2500, VHR2700, 3300, MVR220 VTC5000, 5150, 5300, 5350, 5400, 5500, 6000, 6010, 6500, 9100, VTC9300, VTCM10, 20, 11, 21, 30, 31, 40, 50, VPR5800 VHR3000, 3300, 3310, 3400, 3500, 3700, 3800, VHRD500, 700 VTC3000 VHR120, 130, 14, 141, 143, 14, 150, 151, 153, 154, 15, 16, 171, 194, 22, 229, 230, 235, 240, 244, 250, 251, 274, 27, 297, 310, 330, 335, 350, 390, VHR410, 4105, 4150, 4200, 430, 4300, 4350, 4400, 474, 4770, 5080, VHR5100, 5200, 5300, 5350, 5600, 5700, 6850, 7100, 7200, 7250, VHR7260, 7300, 7400, 7440, 7500, 7520, 7530, 7540, 7700, 774, 780, 0VHR7810, 8000, 8070, 8100, 8200, 8250, 8500, 8800, VHRD4400, 4410, 4500, 4600, 4610, 4710, 4890, 6700, VHR5700 VCR100 VHR120, 135, 150, 190, 4150, 4160, 4350, 5200, 5240, 5350, 7200, 7250, 7260, 7700, VHRD4400, 4610, 4710, 4890, 5450, VHR5700 PINCH ROLLER ASSEMBLY VHR3100, 3200, 3300, 3310, 3400, 3700, 3800, VHRD500, 700 PINCH ROLLER ASSEMBLY SHARP VC200, 381, 383, 384, 385, 386, 388, 390, 393, 800, 2300, 3300, 6000, VC6200, 6300, 7300, 7700, 7750, 7800, 8300, 838, 9100, 9300, 9400, VC9500, 9600, 9700, 9800 VC300, 387, 402, 471, 473, 477, 481, 482, 483, 486, 488, 496, 500, 571, 573, 581, 582, 583, 584, 585, 8481, VCF5F, VCSW20E, VCA1031 VC108, 208, 405, 408, 550, 600, 651, 671, 674, 681, 682, 684, 685, 693, VC699, 700, 772, 750, 779, 780, 781, 7810, 782, 782MK2, 7822, 783, VCF785, 786, 787, 793, 800, 7810, 7822, VCF772, VCF673, VCF673, VCA100, 102, 104, 131, 140, 170, 202, 203, 211, 234, 303, 501, 502, VCA602, 5101, VCD801, 802, 851, 852, 881, 882, VCM73, VCT73, VCT72, VCD8361 VCA100, 30G, 60, 103, 105, 106, 111, 113, 131, 211, 244, 254, 33, 35, 36, VCA37, 39, 40, 42, 454, 46, 47, 48, 50, 505, 51, 52, 53, 54, 55, 57, 58, 505, VCA60, 605, 616, 62, 63, 67, 68, 1031, 11613, VCB311, 320, VCB597, VCD805, 806, 810, 815, VCH80, 81, 865, 910, VCS 1000, VCT310, VCT410, 610, VCT 1314, 5313, VCF790 VCF790, 790, VCA10, 103, 1031, 105, 106, 211, 244, 254, 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VIDEO SERVICE KITS

<p>AMSTRAD VCR700 <i>Contents</i> BELT SET, PINCH ROLLER, REEL IDLER, VIDEO LAMP Order Code: SK41</p> <p style="text-align: right;">£5.50</p>	<p>HITACHI VT11/VT33 <i>Contents</i> BELT SET, PINCH ROLLER, TENSION BAND, IDLER TYRES Order Code: SK08</p> <p style="text-align: right;">£5.00</p>	<p>NV600/NV688 <i>Contents</i> BELT SET, PINCH ROLLER, PLAY IDLER, FF/REW IDLER, TENSION BAND Order Code: SK25</p> <p style="text-align: right;">£12.00</p> <p><i>Economy Kit Contents</i> BELT SET, PINCH ROLLER, PLAY IDLER TYRE, FF/REW IDLER TYRE Order Code: SK26</p> <p style="text-align: right;">£5.00</p>
<p>FERGUSON & JVC 3V42/43 HRD455/HRD725 <i>Contents</i> BELT SET, PINCH ROLLER, CLUTCH MECHANISM, TENSION BAND Order Code: SK37</p> <p style="text-align: right;">£9.00</p> <p><i>Economy Kit Contents</i> BELT SET, PINCH ROLLER, SUPPLY CLUTCH, TAKE UP CLUTCH Order Code: SK38</p> <p style="text-align: right;">£16.00</p>	<p>VT11/VT33 <i>Contents</i> BELT SET, T/UP REEL TABLE TYRE, SUPPLY REEL TABLE TYRE, PINCH ROLLER, FF/REW IDLER, CLUTCH PLATE, TENSION BAND Order Code: SK45</p> <p style="text-align: right;">£13.00</p> <p><i>Economy Kit Contents</i> BELT SET, PINCH ROLLER, FF/REW IDLER TYRE, T/UP REEL TABLE TYRE, SUPPLY REEL TABLE TYRE Order Code: SK46</p> <p style="text-align: right;">£3.75</p>	<p>NV730/NV770 <i>Contents</i> SLOT IN BELT LOADING BELT, PINCH ROLLER, IDLER UNIT, TENSION BAND Order Code: SK19</p> <p style="text-align: right;">£5.50</p> <p><i>Economy Kit Contents</i> SLOT IN BELT LOADING BELT, PINCH ROLLER, IDLER TYRE Order Code: SK20</p> <p style="text-align: right;">£3.00</p>
<p>3V58/59/64/65 HRD170/180/210/230/300/320/370/400/430/530/700/750 HRS5000 <i>Contents</i> BELT SET, PINCH ROLLER, IDLER ARM, TENSION BAND Order Code: SK44</p> <p style="text-align: right;">£7.00</p>	<p>VT52/61/62/63/64/65/66/640 <i>Contents</i> BELT SET, PINCH ROLLER, FF/REW ARM, CLUTCH PLATE, TENSION BAND Order Code: SK49</p> <p style="text-align: right;">£14.00</p> <p><i>Economy Kit Contents</i> BELT SET, PINCH ROLLER, FF/REW IDLER Order Code: SK50</p> <p style="text-align: right;">£3.00</p>	<p>NV370/NV380/480/630/780/830/850/AG2100PK/AG2200PK <i>Contents</i> BELT SET, PINCH ROLLER, IDLER TENSION BAND Order Code: SK21</p> <p style="text-align: right;">£5.00</p> <p><i>Economy Kit Contents</i> BELT SET, PINCH ROLLER, IDLER TYRE Order Code: SK22</p> <p style="text-align: right;">£2.75</p>
<p>3V29/3V30 HR7200/7300/7350 <i>Contents</i> BELT SET, PINCH ROLLER, TENSION BAND, IDLER TYRES Order Code: SK05</p> <p style="text-align: right;">£5.00</p>	<p>VT400/405/410/13/14/15/18/420/25/26/28/430/31/35/48/450/498/510/520/25/26/530/35/36/540/545/46/48/570/75/576/580/85/88 <i>Contents</i> TIMING BELT, PINCH ROLLER, FF/REW ARM, CLUTCH BASE, TENSION BAND Order Code: SK52</p> <p style="text-align: right;">£3.75</p>	<p>NV777/NV788 <i>Contents</i> BELT SET, PINCH ROLLER, IDLER UNIT, TENSION BAND Order Code: SK17</p> <p style="text-align: right;">£5.00</p> <p><i>Economy Kit Contents</i> BELT SET, PINCH ROLLER, IDLER TYRE Order Code: SK18</p> <p style="text-align: right;">£4.00</p>
<p>3V35/36, 38/39/49 HRD110/111/120/225 <i>Contents</i> BELT SET, PINCH ROLLER, TENSION BAND, IDLER TYRES Order Code: SK04</p> <p style="text-align: right;">£5.00</p>	<p>VT100/110/111/113/115/118/120/125/128/130/135/138/145/150/175/220/225/250/255/258/260/VTL30 <i>Contents</i> BELT SET, PINCH ROLLER, FF/REW ARM, CLUTCH PLATE, TENSION BAND Order Code: SK51</p> <p style="text-align: right;">£14.00</p>	<p>SHARP VC381 <i>Contents</i> BELT SET, PINCH ROLLER, REEL IDLER, TENSION BAND, VIDEO LAMP Order Code: SK47</p> <p style="text-align: right;">£8.00</p> <p><i>Economy Kit Contents</i> BELT SET, PINCH ROLLER, REEL IDLER TYRE Order Code: SK48</p> <p style="text-align: right;">£3.25</p>
<p>3V31/3V42 HR7900/7610/7650/7655 <i>Contents</i> BELT SET, T/UP REEL TABLE TYRE, PINCH ROLLER, REEL IDLER, T/UP CLUTCH, T/UP IDLER, TENSION BAND, VIDEO LAMP Order Code: SK33</p> <p style="text-align: right;">£11.00</p> <p><i>Economy Kit Contents</i> BELT SET, T/UP REEL TABLE TYRE, PINCH ROLLER, REEL IDLER TYRE, T/UP IDLER TYRE, T/UP CLUTCH Order Code: SK34</p> <p style="text-align: right;">£5.00</p>	<p>PANASONIC NV2000/NV2010/NV7000/NV7200/NV7800 <i>Contents</i> BELT SET, PINCH ROLLER, TENSION BAND, IDLER TYRES Order Code: SK03</p> <p style="text-align: right;">£5.00</p> <p><i>Economy Kit Contents</i> BELT SET, PINCH ROLLER, TENSION BAND, IDLER TYRES Order Code: SK02</p> <p style="text-align: right;">£5.00</p>	<p>VC500/VC571/VC581/VC582/VC583/VC584/VC5F3 <i>Contents</i> BELT SET, PINCH ROLLER, REEL IDLER, TENSION BAND Order Code: SK60</p> <p style="text-align: right;">£9.50</p> <p><i>Economy Kit Contents</i> BELT SET, PINCH ROLLER, REEL IDLER Order Code: SK61</p> <p style="text-align: right;">£5.00</p>
<p>3V35/36/38/39/49 HRD110/111/120/121/225 <i>Contents</i> BELT SET, T/UP REEL TABLE TYRE, SUPPLY REEL TABLE TYRE, PINCH ROLLER, T/UP CLUTCH, T/UP IDLER, REEL IDLER, TENSION BAND, VIDEO LAMP Order Code: SK35</p> <p style="text-align: right;">£10.00</p> <p><i>Economy Kit Contents</i> BELT SET, T/UP REEL TABLE TYRE, SUPPLY REEL TABLE TYRE, PINCH ROLLER, T/UP CLUTCH, T/UP IDLER TYRE, REEL IDLER TYRE Order Code: SK36</p> <p style="text-align: right;">£5.50</p>	<p>NV300/NV330/NV333/NV340/NV366 <i>Contents</i> BELT SET, PINCH ROLLER, TENSION BAND, IDLER TYRE Order Code: SK01</p> <p style="text-align: right;">£5.00</p> <p><i>Economy Kit Contents</i> BELT SET, PINCH ROLLER, FF IDLER, PLAY IDLER, TENSION BAND, VIDEO LAMP Order Code: SK13</p> <p style="text-align: right;">£6.00</p> <p><i>Economy Kit Contents</i> BELT SET, PINCH ROLLER, IDLER TYRE, PULLEY TYRE Order Code: SK14</p> <p style="text-align: right;">£3.50</p>	<p>VC781/VC781Q/VC7822/VC785/VC786/VC793/VC800/VC810/VC810Q/VC810A/VC820 <i>Contents</i> BELT SET, PINCH ROLLER, REEL DRIVE UNIT, TENSION BAND Order Code: SK64</p> <p style="text-align: right;">£13.50</p> <p><i>Economy Kit Contents</i> BELT SET, PINCH ROLLER, REEL DRIVE UNIT TYRE Order Code: SK65</p> <p style="text-align: right;">£3.75</p>
<p>3V29/3V30 HRD7200/7300/7350 <i>Contents</i> BELT SET, T/UP REEL TABLE TYRE, SUPPLY REEL TABLE TYRE, PINCH ROLLER, REEL IDLER, T/UP CLUTCH, T/UP IDLER, TENSION BAND, VIDEO LAMP Order Code: SK31</p> <p style="text-align: right;">£10.00</p> <p><i>Economy Kit Contents</i> BELT SET, T/UP REEL TABLE TYRE, SUPPLY REEL TABLE TYRE, PINCH ROLLER, REEL IDLER TYRE, T/UP IDLER TYRE, T/UP CLUTCH Order Code: SK32</p> <p style="text-align: right;">£5.00</p>	<p>NV2000/NV2010 <i>Contents</i> BELT SET, PINCH ROLLER, FF IDLER, PLAY IDLER, TENSION BAND, VIDEO LAMP Order Code: SK13</p> <p style="text-align: right;">£6.00</p> <p><i>Economy Kit Contents</i> BELT SET, PINCH ROLLER, IDLER TYRE, PULLEY TYRE Order Code: SK14</p> <p style="text-align: right;">£3.50</p>	<p>VC681/VC682/VC684/VC685/VC693/VC699/VC6F3/VC700 <i>Contents</i> BELT SET, PINCH ROLLER, REEL DRIVE UNIT, TENSION BAND Order Code: SK62</p> <p style="text-align: right;">£13.50</p> <p><i>Economy Kit Contents</i> BELT SET, PINCH ROLLER, REEL DRIVE UNIT TYRE Order Code: SK63</p> <p style="text-align: right;">£5.00</p>
<p>3V44/45/48/53/54/55/57 HRP50/HRD140/150/158/180 HRD250/257/565/566/755 <i>Contents</i> BELT SET, PINCH ROLLER, CLUTCH MECHANISM, TENSION BAND Order Code: SK39</p> <p style="text-align: right;">£15.00</p> <p><i>Economy Kit Contents</i> BELT SET, PINCH ROLLER Order Code: SK40</p> <p style="text-align: right;">£9.50</p>	<p>NV7000/NV7200/NV7800 <i>Contents</i> BELT SET, PINCH ROLLER, IDLER UNIT, PLAY IDLER, TENSION BAND Order Code: SK11</p> <p style="text-align: right;">£8.50</p> <p><i>Economy Kit Contents</i> BELT SET, PINCH ROLLER, IDLER TYRE, CLUTCH TYRE Order Code: SK12</p> <p style="text-align: right;">£3.25</p>	<p>VC781/VC781Q/VC7822/VC785/VC786/VC793/VC800/VC810/VC810Q/VC810A/VC820 <i>Contents</i> BELT SET, PINCH ROLLER, REEL DRIVE UNIT, TENSION BAND Order Code: SK64</p> <p style="text-align: right;">£13.50</p> <p><i>Economy Kit Contents</i> BELT SET, PINCH ROLLER, REEL DRIVE UNIT TYRE Order Code: SK65</p> <p style="text-align: right;">£3.75</p>
<p>FISHER FVHP905/906/907/908/910/911/916/918 <i>Contents</i> BELT SET, PINCH ROLLER, IDLER, GEAR IDLER UNIT, TENSION BAND Order Code: SK57</p> <p style="text-align: right;">£13.00</p> <p><i>Economy Kit Contents</i> BELT SET, PINCH ROLLER, IDLER TYRE Order Code: SK58</p> <p style="text-align: right;">£5.00</p>	<p>NV300/NV330/NV333/NV340/NV366 <i>Contents</i> BELT SET, PINCH ROLLER, IDLER UNIT, PLAY IDLER, TENSION BAND Order Code: SK15</p> <p style="text-align: right;">£7.00</p> <p><i>Economy Kit Contents</i> BELT SET, PINCH ROLLER, IDLER TYRE, PLAY IDLER Order Code: SK16</p> <p style="text-align: right;">£3.25</p>	<p>VC781/VC781Q/VC7822/VC785/VC786/VC793/VC800/VC810/VC810Q/VC810A/VC820 <i>Contents</i> BELT SET, PINCH ROLLER, REEL DRIVE UNIT, TENSION BAND Order Code: SK64</p> <p style="text-align: right;">£13.50</p> <p><i>Economy Kit Contents</i> BELT SET, PINCH ROLLER, REEL DRIVE UNIT TYRE Order Code: SK65</p> <p style="text-align: right;">£3.75</p>
<p>FVHP615/618/620/622/710/711/715/716/720/721/722/725/730/830/840 <i>Contents</i> BELT SET, PINCH ROLLER, IDLER, GEAR IDLER UNIT, TENSION BAND Order Code: SK68</p> <p style="text-align: right;">£11.00</p> <p><i>Economy Kit Contents</i> BELT SET, PINCH ROLLER, IDLER TYRE Order Code: SK69</p> <p style="text-align: right;">£3.00</p>	<p>NV230/250/260/280/430/450/460/470/650/810/890/AG1200PK/AG1500PK <i>Contents</i> BELT SET, PINCH ROLLER, IDLER, TENSION BAND Order Code: SK23</p> <p style="text-align: right;">£5.00</p> <p><i>Economy Kit Contents</i> BELT SET, PINCH ROLLER, IDLER TYRE Order Code: SK24</p> <p style="text-align: right;">£3.25</p>	<p>VC781/VC781Q/VC7822/VC785/VC786/VC793/VC800/VC810/VC810Q/VC810A/VC820 <i>Contents</i> BELT SET, PINCH ROLLER, REEL DRIVE UNIT, TENSION BAND Order Code: SK64</p> <p style="text-align: right;">£13.50</p> <p><i>Economy Kit Contents</i> BELT SET, PINCH ROLLER, REEL DRIVE UNIT TYRE Order Code: SK65</p> <p style="text-align: right;">£3.75</p>
<p>FVHP615/618/620/622/710/711/715/716/720/721/722/725/730/830/840 <i>Contents</i> BELT SET, PINCH ROLLER, IDLER, GEAR IDLER UNIT, TENSION BAND Order Code: SK68</p> <p style="text-align: right;">£11.00</p> <p><i>Economy Kit Contents</i> BELT SET, PINCH ROLLER, IDLER TYRE Order Code: SK69</p> <p style="text-align: right;">£3.00</p>	<p>NV230/250/260/280/430/450/460/470/650/810/890/AG1200PK/AG1500PK <i>Contents</i> BELT SET, PINCH ROLLER, IDLER, TENSION BAND Order Code: SK23</p> <p style="text-align: right;">£5.00</p> <p><i>Economy Kit Contents</i> BELT SET, PINCH ROLLER, IDLER TYRE Order Code: SK24</p> <p style="text-align: right;">£3.25</p>	<p>VC781/VC781Q/VC7822/VC785/VC786/VC793/VC800/VC810/VC810Q/VC810A/VC820 <i>Contents</i> BELT SET, PINCH ROLLER, REEL DRIVE UNIT, TENSION BAND Order Code: SK64</p> <p style="text-align: right;">£13.50</p> <p><i>Economy Kit Contents</i> BELT SET, PINCH ROLLER, REEL DRIVE UNIT TYRE Order Code: SK65</p> <p style="text-align: right;">£3.75</p>

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TYPES OF SERVICE KITS ...
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SERVICE KIT & UPGRADE FOR ONWA TV CHASSIS

FAILURE OF ZD401 (ZD401 ON THE 20/21 CHASSIS) IS NOT UNCOMMON.

THIS KIT HAS BEEN ASSEMBLED AS A REPAIR KIT FOR COMPONENT FAILURES AND AS AN UPGRADE FOR THE POWER SUPPLY.

THE KIT CONSISTS OF ALL THE REQUIRED COMPONENTS AND COMES COMPLETE WITH FULL INSTRUCTIONS AND CIRCUIT DIAGRAM.

THE KIT IS DESIGNED TO FIT THE FOLLOWING MAKES AND MODELS.

- * ALBA / BUSH
- * AKAI
- * GOODMANS
- * HINARI
- * JVC
- * MATSUI

ORDER CODE : ONWAKIT PRICE: 1200p

* SOME MANUFACTURERS HAVE ALREADY TAKEN STEPS TO UPGRADE THE POWER SUPPLY

REPLACEMENT VIDEO CASSETTE HOUSINGS

Name	Models	Code	Price	Name	Models	Code	Price	Name	Models	Code	Price
AKAI	V535, V553, V555, V556, V575	CH18	3200p	FV31R	CH19	4300p		VCA103, 103GV, 106, 106GVM, 254GVM	CH23	2500p	
GRANADA	VHSDF1, VHSJ2	CH05	1100p	HRD515, 520, 527, 540, 550, 560, 600, 610, 620, 660, 670, HRO630, 840, 850, 860, 4050, 6600, FV37H	CH20	2200p		VCS271, 244, 5055, 605, VCB230, VCD086G, 810G, VCT1212, 310, 410G, 610	CH24	2500p	
GOLDSTAR	GHV1290P, 1291P, 1295P, 9400, 73401, GSE1295P, GSE1891P, 20001Q, 20051Q, VCP4200, 4300, 4301, 4305, VCP4306, 4311, 4315, 4316, 4320, 4321, 4325	CH25	2000p	HRD540, 580, 830, 860, 910, 960, HRD970, HRD2X0,				VR2970	CH02	2800p	
	GHV151, 1221, 1232, 1240, 1241, 1242, 1244, 1246, 1248, GHV8000, 8200	CH26	2900p					V320, 321, 323, 326, 4200, 4300	CH01	2800p	
FERGUSON & J.V.C.	3V38, 3V39, 8943, 8944, 8951, 3V35, 3V36, 3V49, HRD 110, 111, 120, 121, 225	CH01	2800p					V342, 343, 352, 353, 360, 364, 368, 4210, 4230, 4260, 4400, V5500, 6000, 8540	CH02	2800p	
	3V42, 3V43, 3V44, 3V45, 3V48, 3V53, 3V54, 3V55, 3V57, 8945, 8947, 8948, HRD 140, 141, 150, 157, 158, 160, 250, HRD257, 455, 565, 566, 725, 755	CH02	2800p					V55, V57	CH01	2800p	
	8948, 8950, FV108, 12L, 13H, 14T, 20B, 21R, 22L, 26, 395, HRD230, 430, 530	CH03	2800p					V65, V66	CH02	2800p	
	3V58, 3V59, 3V64, 3V65, FV11R, 8950, 8951, HRD170, HRD180, HRD370	CH04	2800p								
				FERGUSON	VR3605, VR3905	CH01	2800p				
				I.T.T.	VR3916, 3926, 3946, 3948, 3976, 3986, 3995, 3997, 6948	CH02	2800p				
					VR3916, 3926, 3946, 3948, 3976, 3986, 3995, 3997, 6948	CH02	2800p				
				NATIONAL PANASONIC	NV730	CH06	4300p				
				N.E.C.	N830EG, N831EG, N831EG, N832, N833EG, N855	CH01	2800p				
					N855	CH02	2800p				
				PHILIPS	CASSETTE LIFT ASSEMBLY (69120366)						
					DV186, 190, 286, 471, 562, 761, VR6180, 6182, 6185, 6285, VR6290, 6291, 6293, 6362, 6367, 6393, 6467, 6468, 6470, VR6561, 6670, 6760, 6761, 6870, 6970	CH05	1100p				
					VR6443	CH22	2900p				
					VR6448	CH23	2500p				
					49S56	CH24	2500p				
				SHARP	VCA100, VCH851, VCH852	CH22	2900p				

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☆☆ **AMSTRAD MOD KIT** ☆☆

☆☆ FITS : ☆☆ VCR 4500, 4600, 4700, 5200, TVR 1,2,3 ☆☆

☆☆ **PRICE : £2.25 + VAT each** ☆☆

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MODE SWITCH

NV2000, 2010, 7000, 7200, 7800 (VS50048)	
NV230, 260, 430, 810, 870, 2300, 4300 (VSS0110)	£3.50
NV830 (VSS0091)	£2.25
NV300, 333, 340, 366, 688, 777, 778 (VSS0060)	£2.10
NVG21, 25, NVH65, NVD80 (VSS0175A)	£3.75
	£2.00

AUDIO CONTROL HEADS

AMSTRAD ORIGINAL NO: 150751
 Used on: AMSTRAD TVR1, 2, 3, VCR4600, 4600MKII, 4700, FUNAI VS2, VCR4600, 4800, 5200, 5600, 6600, VIP3000, 5000
 Also fits: FIDELITY, FUNAI, HINARI, PROLINE, SCHNEIDER, TOWADA, UNIVERSUM
ORDER CODE: AH01 PRICE: 1350p

AMSTRAD ORIGINAL NO: 153134
 Used on: AMSTRAD DD8900, 8904, VCR2000, 6000, 6100, 8600, 8602, 8603, VCR8604, 8700, 8704, 8714, 8800, 9005, 8244
 Also fits: ANTECH, BONDSTEC, CASIO, CROWN, FIDELITY, GOLD-HAND, GRANADA, HINARI, MARQUANT, OMEGE, PROFEX, SCHNEIDER, SEG, SENTRA, SHINTOM, TASHIKO, TATUNG, TOWADA, UNIVERSUM
ORDER CODE: AH02 PRICE: 1450p

Replacement Audio Control Video Sound Head for National Panasonic

PART NUMBER	MODELS	PRICE
VBR 0091	NV67 etc	875p
VBR0050	NV300, NV340 etc	875p
VBR0061	NV777 etc	875p
VBR0103A	NV250, NV450 etc	625p
VBR0125		625p

VIDEO TOOLS

VIDEO CLEANING STICKS

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

VIDEO MAINTENANCE TOOLS

Set of 8 Allen keys packed in a plastic wallet
Order code: TOOL 9, Price 125p
 Specifically designed for video maintenance

UNIVERSAL HEAD EXTRACTOR

Hand tool designed for extracting hard to remove heads without damage to either the head or the mounting assembly. Adjustable so as to suit various heads.
Order code: TOOL 8, Price 600p

VCR ALIGNMENT KIT

CONTAINS: SET OF 7 HEAD & TAPE PATH ALIGNERS

- RCA TYPE AUDIO & CONTROL HEAD POSITIONING TOOL
- RCA ADJUSTMENT TOOL FOR TAPE GUIDE POSTS
- RCA TYPE BACK TENSION TOOL
- TENSION ADJUSTMENT TOOL FOR VARIOUS USES
- VCR ADJUSTMENT TOOL

**3 REVERSIBLE SCREWDRIVERS
 SPRING HOOK**

SET OF 8 ALLEN KEYS

0.77mm 0.90mm
 1.27mm 1.50mm
 1.60mm 2.00mm
 2.40mm 3.00mm

**CIRCLIP PLIERS
 MICRO SCREWDRIVER**

**VCR HEAD EXTRACTOR
 Order code: TOOL 10, Price 2900p**

TRANSPARENT REPAIR/ADJUSTMENT CASSETTE

This transparent videocassette replaces a normal videotape during measurements, adjustments and inspection. The mechanical parts come into sight and become accessible.
Order code: TOOL 23, Price 500p

BACK UP BATTERIES

PHILIPS

Part Nos: 138 - 101138, 138 - 10313 1.2v 90mAH
 Order Code: BB01
 Part Nos: 138 - 10229, 2.4v 100mAH
 Order Code: BB02

Price: 75p

Price: 135p

FERGUSON

Part No: 00E6 - 067 - 001 1.2V 100mAH
 Order Code: BB03
 Part Nos: 00E6 - 606 - 8001 2.4V 100mAH
 Order Code: BB04

Price: 90p

Price: 150p

SATELLITES

MAKE & MODEL	CODE	PRICE
PACE PRD800, PRD900	SATPSU1	600p
PACE SS9000, 9200, 9010, 9210, 9220	SATPSU2	550p
AMSTRAD SRD510, SRD520	SATPSU3	600p
AMSTRAD SRD500	SATPSU4	600p
AMSTRAD SRX340, SRX345, SRX350	SATPSU5	600p
PACE D100/150	SATPSU6	650p
CHURCHILL D2MAC	SATPSU7	650p
PACE MSS100	SATPSU8	730p

MAKE & MODEL	CODE	PRICE
PACE MSS200/300 APPOLL	SATPSU9	900p
PACE MSS500/1000	SATPSU10	1230p
FERGUSON SRD4	SATPSU11	650p
ECHOSTAR SR5500	SATPSU12	1600p
ECHOSTAR 6500/7700/8700	SATPSU13	2750p
AMSTRAD SRD600	SATPSU14	2600p
MIMTEC (Surensen)	SATPSU15	700p
AMSTRAD SRD700, SR950, SRX100, 301, 501, 502, 1002, 2001, SRD2000 SAT250	SATPSU16	650p

SATELLITE TUNERS

PACE PRD800/MSS200 2Ghz (221-2077062)
ORDER CODE: TUNER01 PRICE: 1400p + VAT

PACE PRD900/MSS1000 2Ghz (221-21770112)
ORDER CODE: TUNER02 PRICE: 1400p + VAT

SWITCH MODE TRANSFORMERS

PACE 9000
ORDER CODE: PACE9000 PRICE: 800p

PRD800/PRD900
ORDER CODE: PRD800 PRICE: 550p

SATMETER

The Satmeter is a professional portable satellite strength meter designed for the installation and maintenance of satellite TV systems. The Satmeter can be used as stand alone with powering the LNB as well as in loop.

Through operation with satellite RX powering the LNB.

- * Acoustical signal: On signal strength *LED indicator: Vert/Hori
- * Frequency Range: 900 to 2050 Mhz *Input impedance: 70 Ohm
- * Power amplifier: 18db *Detection Range: -60 to -10 DBM
- * Max. input signal: -10 DBM

ORDER CODE: TOOL22

PRICE: 8500p

REPLACEMENT TV SWITCHES

GRUNDIG

PART No: 29703, 29102
 USED ON:
 C7500, C8500, C8502, C8712 . . . ETC
Order Code: SW1 Price: 140p

PHILIPS

USED ON:
 K30, K35, K40, KT3, KT4
Order Code: SW13 Price: 95p

SONY

USED ON:
 KV1612, KB1612, KV1614, KV2052, V2056
 KV2062, KV2067, KV2212 . . . ETC
Order Code: SW5 Price: 150p

USED ON:
 KV1400, KV1440, KV2040, KV2060
 (POWER SWITCH 26mm)
Order Code: SW12 Price: 125p

SONY

USED ON:
 KV2020
 (POWER SWITCH 21mm +Remote)
Order Code: SW6 Price: 200p

SONY 2 PIN FUNCTION SWITCH

Order Code: SW9 Price: 35p

FUSES

TIME LAG (20mm)			QUICK BLOW (20mm)		
CURRENT RATING	ORDER CODE	PRICE	ORDER CODE	PRICE	
100mA	FUSE36	75p	FUSE37	60p	
160mA	FUSE01	75p	FUSE17	60p	
250mA	FUSE02	75p	FUSE18	60p	
315mA	FUSE03	75p	FUSE19	60p	
400mA	FUSE04	75p	FUSE20	60p	
500mA	FUSE05	75p	FUSE21	60p	
630mA	FUSE06	75p	FUSE22	60p	
800mA	FUSE07	60p	FUSE23	60p	
1A	FUSE08	60p	FUSE24	60p	
1.25A	FUSE09	60p	FUSE25	60p	
1.6A	FUSE10	60p	FUSE26	60p	
2A	FUSE11	50p	FUSE27	60p	
2.5A	FUSE12	50p	FUSE28	60p	
3.15A	FUSE13	55p	FUSE29	50p	
4A	FUSE14	55p	FUSE30	50p	
5A	FUSE15	60p	FUSE31	50p	
6.3A	FUSE16	60p	FUSE32	50p	

CERAMIC PLUG TOP

CURRENT RATING	ORDER CODE	PRICE
3A	FUSE33	100p
5A	FUSE34	100p
13A	FUSE35	100p

20mm CERAMIC TIME LAG

CURRENT RATING	ORDER CODE	PRICE
6.3A	FUSE38	100p
8A	FUSE39	100p
10A	FUSE40	100p
3 15A	FUSE41	85p
4A	FUSE42	85p
5A	FUSE43	85p

38mm CERAMIC TIME LAG

CURRENT RATING	ORDER CODE	PRICE
10A	FUSE48	825p

**** ALL THE ABOVE PRICES ARE FOR PACKS OF 10 FUSES ****

32 mm CERAMIC SLOW BLOW

CURRENT RATING	ORDER CODE	PRICE
8A	FUSE44	185p
10A	FUSE45	185p
15A	FUSE46	185p
20A	FUSE47	210p

NB. All fuses are made in the UK and fully meet BS4265 & BS1362 safety standards and should not be compared with cheap imported types

VOLTAGE TESTER

A terminal screwdriver incorporating continuity & voltage with Euroslot

ORDER CODE: TOOL11

PRICE: 220p

SPRING HOOK

Spring Hook, to unlock springs in audio tape recorders & VCRs

ORDER CODE: TOOL20

PRICE: 265p

FAULT FINDING / COMPARISON BOOKS

Satellite Fault Finding Guide Issue 1.

Listing about 1,000 faults for over a range of 24 different brands.

Order Code: BOOK05.

Price £8.50 - No VAT.

TELEVISION

Edition 6

Lists more than 8,450 faults with 460 pages covering 58 different brands

Price: 1600p only - no VAT. Order Code: BOOK02

Satellite Repair Manual Edition 4

A comprehensive guide to receiver reviewing, featuring stock faults and installation tips.

Price £15.00 Only No VAT Postage 100p
Order Code: BOOK03

SEMICONDUCTOR COMPARISONS 1997/8

Listing more than 31,600 Semiconductors with suitable alternative complete with descriptions and base information.

Price: £15.50 - No VAT. Order Code: BOOK04

SEMICONDUCTOR COMPARISONS 1997

The new 1997 Jaeger Semiconductor with 952 pages packed with information on over 80,000 semiconductors in much greater detail plus marketing data on SMD devices and a separate generic table of all type designations.

Price: £40.00 only - No VAT (+ £5 Postage).
Order Code: BOOK06

Video Recorders Edition 5 1997

Over 300 pages packed with more than 5500 faults for different brands

Price £15.00 - No VAT. Order Code: BOOK01

SERVICE AIDS

DESCRIPTION	VOLUME	CODE	PRICE
VIDEO HEAD CLEANER	75ML	SP01	145p
SWITCH CLEANER	176ML	SP02	155p
SILICONE GREASE	200ML	SP03	180p
FREEZE IT	170ML	SP04	295p
FREEZE IT	400ML	SP16	580p
FOAM CLEANER	400ML	SP05	180p
ANTI-STATIC	200ML	SP06	180p
AEROKLEANE	200ML	SP07	200p
AERO DUSTER	200ML	SP08	340p
AERO DUSTER	400ML	SP17	580p
PLASTIC SEAL	200ML	SP09	250p
GLASS CLEANER	250ML	SP10	170p
COLDKLENE	250ML	SP13	235p
EXCEL POLISH 80	250ML	SP18	1180p
ADHESIVE 120	400ML	SP19	225p
LABEL REMOVER 130	200ML	SP20	260p
REFURB 140	400ML	SP21	260p
TUBE SILICON GREASE	50 GRAMMES	SP11	225p
TUBE SILICON SEALANT WHITE	75ML	SP22	250p
TUBE SILICON SEALANT CLEAR	75ML	SP23	250p
TUBE HEAT SINK COMPOUND	25 GRAMMES	SP12	150p
DRIVE CLEANER	200ML	SP24	150p
SCREEN CLEANER	200ML	SP25	145p
COMPUTER CARE KIT	-	SP26	2100p

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If you purchase more than one Servisol Product, postage & package will be charged as follows:

300p for 2-5 cans **500p** for more than 5 cans

SOLDERING ACCESSORIES

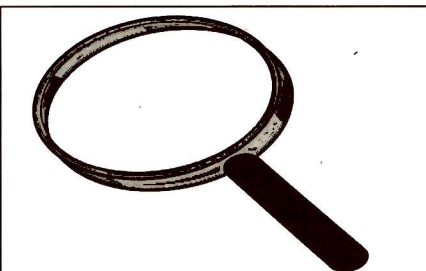
DESCRIPTION	CODE	PRICE
ANTEX SOLDERING IRONS		
25 WATT 240 VAC (XS25W 240V)	S101	900p
15 WATT 240 VAC (XS15W 240V)	S102	900p
25 WATT SPARE ELEMENT	S103	450p
15 WATT SPARE ELEMENT	S104	450p
SOLDERING STAND & SPONGES		
SOLDERING STAND (MADE BY ANTEX)	S108	350p
SPARE SPONGE	S109	55p
SOLDER		
18 SWG 500 GRAMMES	S110	500p
20 SWG 500 GRAMMES	S111	650p
22 SWG 500 GRAMMES	S112	700p
DESOLDERING AIDS		
SOLDER MOP STANDARD GAUGE 1.2MM X 1.5M	S107	100p
SOLDER MOP 1.2MM X 10M	S113	420p
DESOLDERING PUMP	S105	320p
SPARE NOZZLE	S106	60p

I.C. PROTECTORS

ICPF10, ICPF15, ICPF20,
ICPF25, ICPF38, ICPF50,
ICPF75

ICPN5, ICPN10, ICPN15,
ICPN20, ICPN25, ICPN 38,
ICPN50, ICPN75

PRICE: 30p EACH ONLY



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CASSETTE DC MOTORS

MOTOR	170p
MOTOR	170p
MOTOR	170p
MOTOR	170p
MOTOR	290p

CASSETTE TAPE HEADS

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

CD PICK UPS

Models & Description	Order Code	Price
AIWA XC007 DX990A, DX CX160, CX166, CXN50G, CXN9 LCX60, LCX66G, I NXS90, NX992, I XC550, XC750, XC90 CXAP1, CX17, CX18G, LCX8G, LCXAP1, XC00 XP31, XP33, XP55, XP80 XP6, XP7	KSS151A KSS152A	1900p 1600p
AKAI CD73, DC93 CD25, CD26, CD27, CD32, CD3 CDM480, CDM600, CDM670, CDE1	KSS151A KSS210A	1900p 1800p
DENON DCD1500II, DCD1520, DCD1520 DCD1400, DCD860, DCD860 DCD1420, DCD520, DCD610, DCD620 DCD1015, DCD1290, DCD2060, DCD206 DCD825, DCD890, DCD895, DN2000F	KSS151A KSS152A KSS210A KSS240A	1900p 1600p 1800p 3000p
GOLDSTAR CD952A, CD952AJ, CD952LJ, CD952SJ, FFH FFH333L, FFH373K, FJ606, FR606L CD320A/L, CD630S/L, FFH212A/L, FFH212E	KSS210A KSS210B	1800p 2000p
GRUNDIG CD360, CD435 CCD300, CD101MCD904, MC10, NEW ORLEANS CL KRC100, RR1900CD, RR3100CD, RR4000CD, RR610 CDP60, CDP90 CDP85 CD905	HOPM3 KSS210A KSS210B KSS220A KSS331A OPTIMA5	2150p 1800p 2000p 2500p 3400p 3000p
HITACHI DAW560 FX10 AXC10 J.V.C. 1990-1992, LATE 1987-1988 - XLE300BK, XLE31BK, XLE51BK, XL XLV211BK, XLV222BK, XLV311BK, XLV333BK, XZ1010N, XZ1411BK, XZ14 CDRADIO CASSETTE, MINI SYSTEMS - MODELS 1990-1992 CA-C33, CA-MX30BK, CA-MX33BK, UX-A5, UX-A6, XL-M309, XL-M40 XL-M504BK, XL-M505TN, XL-M508, XL-M509, XL-M705TN, XL-V131BK, XL-V211TN, XL-V222BK, XL-V251TN, XL-V252BK, XL-V250TN, XL-V251T 1994 ONWARDS - CAE48BK, CAMCG7, CAMXG9, CAS20BK, CAS30BK, V MXS20, MXS30, MXS50, PCX105, PCX130, PCX35, RCX230, RCX320, RCX RCX720, UX44, UX45, UX45S, UX7, UX71, UX73, XLF115, XLF116, XLF21 XLMC100M, XLMXG7, XLMXG9, XLV163TN, XLV164BK, XLV174, XLV263TN, XLV24BK, XLV263TN, XLZ464BK, XLZ574, XLZ674, XTMXG7, XTMXG9, XTS6	KSS210A KSS210B OPTIMA3 OPTIMA4S OPTIMA5 OPTIMA6S KSS152A KSS220A KSS210A KSS210B KSS240A KSS331A KSS360A	1800p 2000p 4000p 5000p 3000p 3300p 1600p 2500p 3000p 3400p 4500p
KENWOOD DP47, DP60SG, DP8020, DP87, L1000D DP1030, DP1510, DP2010, DP2030, DP3010, DP3030, DP3050, DP4030, DP491, DP50 DP5040, DP520, DP7030, DP7040, DP7050, DP730, DP920, DP930, DP950, DPM650, DF DPM7730, DPM850, DPM991, DX6620, M225, M25, M450, M850, DP3030, PDM991, RL RXDC3, RXDC3L, UD202, UD302 DPC42, DPC72, DPC77, DPC80, DPC92 DP1050, DP2050, DP3060, DP501, DP5060, DP722, DP76, DP85, DP85, M77A, PD3060, UD602, UD70, UD701, UD90, XE5 DPC321, DPC521, DPC531, DPC631K, DPC721, DPC731 DP1050, DP2050, PART No: RCTRH812AFZZ	KSS152A KSS220A KSS210A KSS210B KSS240A KSS331A KSS360A	1600p 2500p 3000p 3400p 4500p
PANASONIC SLP177A, SLP202A, SLP212A, SLP222A, SLP277A, SLP377A, SLP477AK, SLP477A, SLPG100A, SLP6200A, SLP6400A, SLP6500AK, SLP6500AS, SLPJ24A, SLPJ26A, SLPJ27A, SLPJ28A, SLPJ325A, SLPJ325A, SLPJ37A, SLPJ38A, SLPJ46A	KSS152A	5500p

Models & Description	Order Code	Price
SAD30, SLCH9, SLP150, SLP170, SLP200, SLP202, SLP222, SLP230, SLP250, SLP333, SLP370G, SLP400C, SLP555, SLP777, SLP999, SLP1A10, SLP2C20, SLP25, SLPJ25, SLPJ26, SLPJ27, SLPJ37, SLPJ45, SLPK25, SLPK26, SLPSS50, SLP570, SLP570G, SLP5840, SLP5900	SOAAD70A	2350p
PHILIPS AZ830A, CD070, CD080, 690, 910, 920, PART NO. 4822-691-20768 CD100, CD130, CD1380, CD1482, CD200, CD204, CD210, CD300, CD303, CD304, CD380, CD480, CD482, CD500, CD502, CD582, CD583, CD584, CD610, CD620, CD630, CD780, CD781, CD782, CD840, CD893, CD960, CDF104, CDM4/19, FCD185 AS440, AS445, AS540, AS640, AZ804B, AZ8640, CD070, CD080, CD091, CD163, CD165, CD690, CD710, CD720, CD732, CD740, CD750, CD910, CD920, CD935, FW17, FW21, FW26, FW330, FW36, FW360, FW380, FW40, FW41, FW46, FW56, FW66, FW68 CD1210/40 CD1210/4 AZ8006 FW11	4822-691 691-30209 CDM12.1 CDM12.4 KSS210B OPTIMA6S	3100p 5500p 1800p 2200p 2000p 3300p
PIONEER PDM400, PDM410, PDM500, PDM510, PDM600, PDM610, PDM700, PDM710, PDM730, PDT303, PDT403, PDT503, PDX940M, PDX950M, PDZ560T, PDZ72T, PDZ73T, PDZ81M, PDZ82M, PDZ83M, PDZ960M, XZ253T, XZ254T N32, N90M, PD101, PD201, PD32, PD41, PD450M, PD470, PD52PD570M, PD65, PD650M, PD670, PD770M, PD870M, PD970, PDCP420, PDCP520M, PDCP520T, PDJ400T, PDJ500T, PDJ800M, PDJ900M, PDM430, PDM450, PDM450, PDM650, PDM750, PDM901, PDPT10T, PDPT20T, PDPT910M, PO929M, POS501, POS801, POS701, POS701G, POS801, PDT310, PDT510, PDZ2, PDZ570T, PDZ74T, PDZ84M, PDZ970M, PXA1349, S125CDT, S135CDT, S303CDM, S303CDT, S505DM, S505DT, S707DM, S707DM, S909DM, S909DT, XCP410M, XCP410T, XZ254T, XZ255T, XZ25M, XZ82AT, XRP310, XRP320 PDM400, PDM410, PDM500, PDM510, PDM600, PDM610, PDM700, PDM710, PDM730, PDT303, PDT403, PDT503, PDX940M, PDX950M, PDZ560T, PDZ72T, PDZ73T, PDZ81M, PDZ82M, PDZ83M, PDZ960M, XZ253T, XZ254T, XZ255T, XZ262, XZ262M, XZ263, XZ282	KSS151A KSS151A KSS151A PEA1030 PWY1009	1900p 1900p 1900p 4400p 4800p
SAMSUNG CD20 CD1200, CD1310, SCM-6000, SCM6900 RCD1200, RCD1300, RCD1350, RCD1600, RCD2600, RCD990, RCD995, SCM6900	HOPM3 KSS210A SOH90T4N	2150p 1800p 3600p
SANYO DCFS3, DCFS5, DCX502, DCX701, DCX702, DCX802, DCX891, DCX891N, MCDZ10. PART No. 6142188855 DCFS5, MCD450K, 650K, MCDZ30L, 60F, PART No. 6142205061 DCX1000MD, DCX1003, DCX900MD, DCX903, DCX915 DCO10, DCD111U, DCD20, DCD30, DCD30AT, DCD6, DCD8U, DCM51, DCX110, DCX120, DCX210, DCX220, DCX93, DCX93A, MCDMS40L, MCDMS50L, MCDMS660L, MCDZ1L, MCDZ2L, MCDZ3L, PART No. 6142391303 DCD12, PART No. 645005966 MCDZ31L, MCDZ41L, MCDZ61L, MCDZ71L	614218 614220 KSS210A 614239 645005 KSS210B	2300p 5600p 1800p 3300p 3700p 2000p
SHARP CD-111, CD-301, CD-302, CD-304, CD-310, CD-C3, CD-L700, CD-L800, CD-U1, CD-U10, CD-X10, CD-X12, CD-X15, CD-X16, CD-X17, CD-X20, CD-X9, CLK650, CMS95CD, DX-150, DX-160, DX-450, DX-460, DX-461, DX-650, DX-660, DX-999, DX-A3, DX-N45, DX-R54, DX-R7, DX-R75, DX-R750, DX-R77, DX-R770, DX-R820, DX-R840, DX-Z100, DX-Z1000, DX-Z1500, GFC05S, QT-30CD, QT-33CD, QT-390CD, QT-37CD, QT-38CD, QT-CD20, QT-CD33, RS95, SC-77CD, SC-99CD, SC-R595, SG-A1, SG-W1CD, SG-W2CD, SVS302, ZCD/CD, PART No. RCTRH812AFZZ QT-50CD, QT-60CD, QT60CD, PART No. RCTRH8130AFZZ DXR-840B, PART No. RCTRH8130AFZZ CDS360E, 360H, 370, 450HE, CMS150CDH, CMSR400CDH, CP150, CPR400, CPS360, 370. PART No. RCTRH8136AFZZ	RH8122A RH8124AF RH130AF RH8136AF	5750p 2900p 2900p 4500p
SONY KSS240A KSS121A KSS151A KSS210A KSS210B KSS220A KSS331A KSS360A	KSS240A KSS121A KSS151A KSS210A KSS210B KSS220A KSS331A KSS360A	3000p 3500p 1900p 1800p 2000p 2500p 3400p 2600p
TECHNICS SLP200, SLP230, SLP250, SLP333, SLP555, SLP777, SLP999, SLP1A10, SLP2C20, SLPJ25, SLPJ45, SLP570, SLP5900	SOAD70A	2350p

REMOTE CONTROLS

Description	Code	Price	Description	Price	
AKAI RC-V10A RCV 37 B V25A	RC876 RC891 RC896	650p 650p 650p	A512120/230 A514790 A5088470 A518612 SCL002 C2096 A511940 655602H	650p 650p 650p 650p 650p 650p 650p	
DECCA RC70 FISHER RC905B	RC894 RC879	650p 650p	ITT IFB13, 14, 15 FS4 RG305 RG306 FS9/1-10/1 VS5 RUK VS4-1 LOEWE MULTICONTROL (17C20) OC11 MATSUI 010270601 VX770 NOKIA SATELLITE ORION RC53	RC143 RC148 RC305 RC306 RC307 RC308 RC308 RC311 RC146 RC889 RC892 RC550 RC892	650p 650p 650p 650p 650p 650p 650p 650p 650p 650p 650p 650p 650p
GRANADA UNIVERSAL TEXT MK4 TEXT, 70155G, 701155, 70133G 95288E 94490D GRUNDIG TP160E TP200, TP300 TP400 TP590-600 TP390, TP610 TP621 TP630, TP650 TP666 TP661 HITACHI CLE800-CLE830 A617402/655602	RC309 RC880 RC882 RC884 RC107 RC380 RC401 RC600 RC610 RC612 RC650 RC660 RC661 RC140 RC1920	650p 650p 650p 650p 650p 650p 650p 650p 650p 650p 650p 650p 650p 650p			

Description	Code	Price	Description	Code	Price
PANASONIC EUR51200 TC2200 VSQ0357/NV730 TNQ1621	RC200 RC204 RC202 RC203	650p 650p 650p 650p	PHILIPS RC5002.5154 KT3 NON TEXT 69117032 99117194 RC5991-UNIV RC38 KT3 TEXT RC5352 RC5375 RC5 STANDARD RC5903 SALORA SERIES L 86173 SANYO RC218, RC222, RC228, RC238 JXGE JXDE VHR2300 RC628 SHARP G0121CESA, 123CESA, 204, 251	RC134 RC135 RC178 RC180 RC300 RC301 RC301 RC301 RC5301 RC5352 RC5375 RC300 RC5903 RC190 RC882 RC140 RC878 RC884 RC890 RC865 RC140	650p 650p 650p 650p 650p 650p 650p 650p 650p 650p 650p 650p 650p 650p 650p 650p 650p 650p 650p 650p
SONY RM604, RM605, RM606 32 CHANNEL RM613 RM632, RM636	RC140 RC140 RC141 RC160	650p 650p 650p 600p	TATUNG FXA RC70 FX70 FASTTEXT TELEFUNKEN FB632 FB639 THORN/FERGUSON 3V35-42 3V31-32 3V57-58 TX10 TEXT TX10 STEREO TEXT RX9-90-100 3V55, FV11 TX100 FASTTEXT TX100 ST. FASTTEXT PROFESSIONAL TOSHIBA CT937 CT9117	RC877 RC883 RC894 RC632ST RC639 RC342 RC344 RC628 RC738 RC740 RC783 RC789 RC789 RC790 RC950 RC951	650p 650p 650p 650p 650p 600p 650p 650p 650p 650p 650p 650p 650p 650p 650p

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• Simple key arrangement
• Set-up by library review
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REPLACEMENT LINE OUTPUT TRANSFORMERS

Part No.	Code	Price	HITACHI	LOT44	1050p	4515 01 19	LOT169	1500p	TLF 14520 F	LOT40	1500p	094-01020/0.7	LOT59	1400p	1-439-303-31	LOT94	1300p
AKAI			2424593	LOT44	1050p	4515 01 24	LOT137	1600p	TLF 14521 F	LOT39	1850p	094-01021/0.6	LOT59	1400p	1-439-303-32	LOT94	1300p
45150344	LOT56	1650p	2432101	LOT79	1600p	4515 01 46	LOT136	1600p	TLF 14527 F	LOT39	1850p	094-01027/0.0	LOT186	1825p	1-439-311-00	LOT95	1550p
101-214017-03	LOT278	1300p	2432461	LOT169	1500p	4515 03 01	LOT169	1500p	TLF 14568 F	LOT40	1500p	094-01038/0.7	LOT245	1900p	1-439-311-11	LOT95	1550p
101-220005-03A	LOT72	1600p	2432611	LOT80	1800p	4515 03 02	LOT180	1550p	TLF 14584 F	LOT41	2000p	094-01052/0.8	LOT186	1825p	1-439-311-13	LOT95	1550p
D 05037	LOT207	1450p	2432651	LOT180	1800p	4515 03 04	LOT189	1500p	TLF 14586 F	LOT42	1800p	094-01057/1.1	LOT285	1450p	1-439-311-31	LOT95	1550p
D 05337	LOT207	1450p	2432761	LOT189	1500p	4515 03 05	LOT180	1550p	TLF 15806 F	LOT256	2000p	610.018.6620	LOT189	1650p	1-439-311-32	LOT95	1550p
D 05637	LOT56	1650p	2432981	LOT37	1200p	4515 03 06	LOT168	1550p	TLF 70012	LOT78	1500p	610.018.6637	LOT215	1800p	1-439-331-22	LOT96	1550p
D 05937	LOT200	1400p	2432981	LOT37	1200p	4515 03 08	LOT22	1250p	TLF 70012 F	LOT78	1500p				1-439-331-41	LOT96	1550p
D 05937	LOT200	1400p	2432982	LOT37	1200p	4515 03 09	LOT178	1500p	TLF 70012A	LOT78	1500p				1-439-332-00	LOT99	1600p
D 06937	LOT56	1650p	2433011	LOT171	1650p	4515 03 10	LOT168	1550p	TLF 70018	LOT274	1550p				1-439-332-11	LOT99	1600p
FCM 2015 AL	LOT78	1500p	2433012	LOT171	1650p	4515 03 13	LOT30	1250p	TLF 70018 F	LOT274	1550p				1-439-332-21	LOT99	1600p
FERGUSON			2433012	LOT171	1650p	4515 03 14	LOT174	1400p	TLF 70161	LOT278	1300p				1-439-332-42	LOT100	1500p
00 D-3-508-001	LOT38	1250p	2433014	LOT171	1650p	4515 03 15	LOT22	1250p	TLF 70162	LOT272	1600p				1-439-332-41	LOT101	1450p
00 D-3-508-002	LOT38	1250p	2433212	LOT172	1350p	4515 03 18	LOT192	1550p	TLF 70162A	LOT272	1600p				1-439-332-52	LOT100	1500p
00 D-3-508-003	LOT38	1250p	2433291	LOT172	1350p	4515 03 19	LOT30	1250p	TLF 70162B	LOT272	1600p				1-439-332-51	LOT100	1500p
00 D-3-515-001 PL1	LOT278	1400p	2433301	LOT246	1600p	4515 03 20	LOT190	1650p	TLF 70162B	LOT272	1600p				1-439-333-02	LOT100	1500p
00 D-4-208-001	LOT79	1600p	2433441	LOT188	1900p	4515 03 22	LOT196	1550p	TLF 70162G	LOT272	1600p				1-439-333-11	LOT100	1500p
00 D-4-208-002	LOT79	1600p	2433442	LOT191	1600p	4515 03 24	LOT194	1550p	TLF 70012 B	LOT274	1550p				1-439-333-12	LOT100	1500p
00 D-4-235-002	LOT240	1250p	2433451	LOT81	1350p	4515 03 25	LOT194	1550p	PHILIPS						1-439-333-11	LOT100	1500p
00 D-4-235-002 HTI	LOT81	1350p	2433452	LOT82	1250p	4515 03 26	LOT22	1250p	4822 140 10142	LOT142	1800p				1-439-333-12	LOT100	1500p
00 D-4-235-00201G	LOT81	1350p	2433453	LOT82	1250p	4515 03 28	LOT198	1550p	4822 140 10145	LOT134	1450p				1-439-333-11	LOT100	1500p
00 D-4-260-004 HTI	LOT38	1250p	2433455	LOT234	1600p	4515 03 26	LOT27	1450p	4822 140 10146	LOT112	1700p				1-439-333-12	LOT100	1500p
00 H-6-701-2400	LOT182	1450p	2433521	LOT85	1600p	4515 03 29	LOT193	1550p	4822 140 10151	LOT102	1700p				1-439-333-11	LOT100	1500p
06 D-3-083-001	LOT82	1250p	2433581	LOT22	1250p	4515 03 30	LOT179	1550p	4822 140 10161	LOT103	1250p				1-439-333-12	LOT100	1500p
06 D-3-083-002	LOT82	1250p	2433721	LOT83	1400p	4515 03 31	LOT207	1550p	4822 140 10171	LOT104	1500p				1-439-333-11	LOT100	1500p
06 D-3-084-001	LOT23	1400p	2433751	LOT01	1300p	4515 03 34	LOT56	1650p	4822 140 10176	LOT114	1150p				1-439-333-12	LOT100	1500p
06 D-3-087-001	LOT23	1400p	2433752	LOT01	1300p	4515 03 35	LOT193	1550p	4822 140 10194	LOT105	1500p				1-439-333-11	LOT100	1500p
06 D-3-088-001	LOT84	1450p	2433752	LOT250	1350p	4515 03 38	LOT27	1450p	4822 140 10198	LOT116	1600p				1-439-333-12	LOT100	1500p
06 D-3-083-001	LOT204	1600p	2433891	LOT23	1400p	4515 03 40	LOT200	1400p	4822 140 10201	LOT104	1500p				1-439-333-11	LOT100	1500p
06 D-3-095-001	LOT87	1000p	2433892	LOT84	1450p	4515 03 41	LOT56	1650p	4822 140 10236	LOT118	1550p				1-439-333-12	LOT100	1500p
06 D-3-095-002	LOT87	1000p	2433893	LOT23	1400p	4515 03 43	LOT196	1550p	4822 140 10246	LOT111	1500p				1-439-333-11	LOT100	1500p
06 D-333-512-001	LOT204	1600p	2433952	LOT33	1000p	4515 03 44	LOT56	1650p	4822 140 10247	LOT105	1500p				1-439-333-12	LOT100	1500p
FETX 100 90 DEG	LOT04	1500p	2434002	LOT200	1400p	4515 03 46	LOT201	1550p	4822 140 10254	LOT107	1450p				1-439-333-11	LOT100	1500p
FETX 90 WHITE	LOT06	1650p	2434141	LOT33	1000p	4515 03 50	LOT27	1450p	4822 140 10263	LOT117	1550p				1-439-333-12	LOT100	1500p
FETX 100 100 DEG	LOT34	1500p	2434141	LOT33	1000p	4515 03 51	LOT27	1450p	4822 140 10269	LOT210	1350p				1-439-333-11	LOT100	1500p
GRUNDIG			2434274	LOT44	1050p	4515 03 75	LOT56	1650p	4822 140 10271	LOT208	1650p				1-439-333-12	LOT100	1500p
29201.008.01	LOT153	1750p	2434453	LOT86	1600p	4515 16 01	LOT22	1250p	4822 140 10274	LOT123	1450p				1-439-256-11	LOT45	1650p
29201.014.01	LOT140	1500p	2434455	LOT234	1600p				4822 140 10282	LOT122	1300p				1-439-256-22	LOT45	1650p
29201.015.01	LOT149	1400p	2434583	LOT44	1050p				4822 140 10283	LOT104	1500p				1-439-256-22	LOT45	1650p
29201.017.01	LOT60	1250p	2435062	LOT296	1400p	731003	LOT51	1650p	4822 140 10294	LOT125	2150p				1-439-276-21	LOT230	1700p
29201.018.01	LOT163	1300p	2435121	LOT87	1000p	276-16399	LOT49	1500p	4822 140 10306	LOT110	1200p				1-439-280-00	LOT92	1600p
29201.018.02	LOT61	1700p	2435131	LOT251	1450p	334 B 07803	LOT50	1450p	4822 140 10325	LOT132	1500p				1-439-280-13	LOT92	1600p
29201.019.01	LOT62	1250p	2435141	LOT82	1300p	334 B 08104	LOT74	1600p	4822 140 10326	LOT122	1300p				1-439-286-00	LOT46	1300p
29201.019.02	LOT62	1250p	2435301	LOT88	1450p	334 B 08108	LOT295	1600p	4822 140 10328	LOT124	1450p				1-439-286-11	LOT46	1300p
29201.022.01	LOT63	1700p	2435671	LOT89	1600p	334 P 18506	LOT51	1550p	4822 140 10349	LOT106	1250p				1-439-286-12	LOT46	1300p
29201.022.02	LOT166	1600p	2436201	LOT109	1200p	334 P 18507	LOT75	1500p	4822 140 10353	LOT284	1450p				1-439-286-13	LOT46	1300p
29201.022.03	LOT165	1350p	2436202	LOT109	1200p	5908-05008A-AA	LOT70	1500p	4822 140 10356	LOT284	1400p				1-439-286-21	LOT46	1300p
29201.022.04	LOT165	1350p	2436202	LOT109	1200p	D 10837	LOT49	1500p	4822 140 10367	LOT286	1400p				1-439-288-00	LOT228	1750p
29201.024.01	LOT85	1500p	2433451H	LOT79	1600p	DCF1577	LOT273	1700p	4822 140 10369	LOT109	1200p				1-439-288-12	LOT228	1750p
29201.024.02	LOT85	1500p	2433453H	LOT81	1350p	DCF2077A	LOT272	1300p	4822 140 10371	LOT128	1300p				1-439-289-00	LOT47	1400p
29201.024.04	LOT164	1400p	2433891H	LOT82	1250p	KFS 60226B	LOT279	1550p	4822 140 10384	LOT127	1550p				1-439-289-21	LOT47	1400p
			2433892G	LOT23	1400p	MSH-1FBW08	LOT78	1500p	4822 140 10395	LOT116	1600p				1-439-289-22	LOT47	1400p
HINARI			I.T.T.	LOT113	1400p	NIKAI	LOT67	1450p	4822 140 10406	LOT73	1150p				1-439-289-31	LOT47	1400p
154 138 K	LOT24	1500p		LOT139	1675p	BABY10	LOT67	1450p	4822 140 10421	LOT109	1200p				1-439-294-00	LOT93	1450p
51 13914 1	LOT24	1500p		LOT136	1600p	ORION	LOT02	1500p	4822 140 10708	LOT103	1250p				1-439-294-11	LOT93	1450p
51 14184 1	LOT24	1500p		LOT139	1675p	3714002	LOT02	1500p							1-439-294-21	LOT269	1550p
CF 44 A	LOT24	1500p		LOT139	1675p	PANASONIC	LOT02	1500p	094-00020/0.9	LOT113	1400p				1-439-303-00	LOT94	1300p
HM51-1411834-1	LOT24	1500p		LOT139	1675p	TLF 14512 F	LOT39	1850p	094-00035/0.2	LOT162	1350p				1-439-303-11	LOT94	1300p



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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: LCD remote control unit for the Hitachi Model VT430 VCR. Vincent Stanley, 36 Meadow Court, Littleport, Ely, Cambs CB6 1JW. 01353 862 076.

Wanted: Power supply board for the Finlux 1000 series chassis. H. Foyne, 7 Ennerdale, Tanhouse, Skelmersdale, Lancs WN8 6AG. 01695 557 079.

Wanted: A 7515 or equivalent IC. The device is used in the power supply in the Axion CV1028P 9in. colour monitor. S.F. Barton, Computeraid Ltd., Unit 5, Greenwich Road, Measglas Industrial Estate, Newport, Gwent NP9 2NN.

Wanted: Volume control for the Grundig C3200 radio-cassette and a complete sound panel for the Pye Model 56KS3457/05T. V. Jeremy, 7 Tai Penyard, Penyard, Merthyr Tydfil, Mid-Glamorgan CF47 0LP.

Wanted: Information on the basic 486 PC motherboard, including power supply connections, audio card, CD-ROM drive etc. Photocopy OK. D. Brown, 3 Cope Hill, Filey, N. Yorks YO14 9NG. 01723 514 283.

Wanted: Sony SLHF model stereo Betamax VCR or faulty machine for spares, also a Sony RMT223 analogue-digital converter. Telephone Graham Parker on 01604 843 536.

Wanted: Instruction manual for the Tektronix 547 oscilloscope (with 1A4 four-channel amplifier). S. Doherty, 30 Wilpshire Avenue, Longsight, Manchester M12 5TL. 0161 225 2991 (after 6 p.m.).

Wanted: Plastic top cover for the Philips FCD562 hi-fi CD player. L.J. Green, 55 Balunie Terrace, Dundee DD4 8TD. 01382 775 548.

Wanted: CP/M boot disc for the Amstrad PCW10. Tuner (or complete IF panel) for the Panasonic NVL25B VCR. BDT61C Darlington transistor. Power supply for a Philips VR6285 VCR (early version, ex-rental). EEPROM codes for the Akura CX12 portable TV and how to program them - the set seems to be confused.

Colin McCormick, 01752 405 201 (evenings) or e-mail colinmc@mail.eurobell.co.uk

Wanted: Service manual and circuit diagram for the Minoka CX26 (photocopy OK). Or solution to the fault: sound at the speakers but just audible with your ear to them at full volume setting. David P. Marsh, 52 Ashurst Road, Cosham, Portsmouth PO6 3HZ.

Wanted: Copies of the parts lists for Canon camcorders from the E60 onwards. Phil Barry, 6 Cowling Road, Burrill, Bedale, N. Yorks DL8 1RN.

Wanted/for disposal: Require tripler for the Sanyo projection TV Model CVP9111T. Have for disposal professional workbenches made for Visionhire workshops. Service TV, 18 Benfleet Road, Hadleigh, Essex. 01702 558 444.

For sale: Following issues of *Television*. 1991 complete; 1992 Apr., May, July, Sep., Oct., Nov., Dec.; 1993 Jan., Mar.; 1994 Dec.; 1995 Apr., Oct., Dec., 1996 Jan. 26 copies in all. £25 plus carriage. F.S. Yarham, 18 Ivel View, Sandy, Beds SG19 1AU. 01767 680 154.

Wanted: Service manuals for the following TV sets/monitors: Hitachi CPT2038; Samsung CI5412G; Barco 3200 series rec./mon.; Teleton CPL142; Hitachi CWP132; Panasonic TC293NSP (multi-system set). Terry Martini, 122 Cannon Street Road, Whitechapel, London E1 2LH. 0171 702 8774, fax 0171 702 8216.

For disposal: B&O CTV Model 2600K type 3619 series 07. D.E. Pritchard, 53 Bellecroft Gardens, Wolverhampton WV3 8DU. 01902 762 810.

Wanted: Circuit diagram for the Orla Prestige organ. Or would the kind gentleman in Ireland who replied to my previous request please write - his original letter was destroyed by a young relative. Donald McIntosh, 11F Colonsay Terrace, Soroba, Oban PA34 4YN.

oscilloscope (loan or photocopy OK). Aid in repairing a Datong Model D70 morse tutor. Any copies of *Television* before June 1996. C.J. Wadey, 9 Ridgeway Close, Southwick, Sussex BN42 4QQ. 01273 591 304.

Wanted: Nikkai TLG140 and Ferguson 3816 TVs working or not, also circuit diagrams. Mr. Powell, 54 Wood Avenue, Wood End, Wednesfield, Wolverhampton. 01902 861 439.

Wanted: Rec/playback head for the Grundig Model TK20, new or in good condition. Part no. 123/33 - two-track. A. Mansfield, Lederbach 32, Herisau 9100, Switzerland.

Wanted: Fluorescent display and plug-in PCB for the Amstrad VCR9500, or possibly a scrap machine. T. Soper, 39 Barley Farm Road, Exeter EX4 1NN. 01392 254 891.

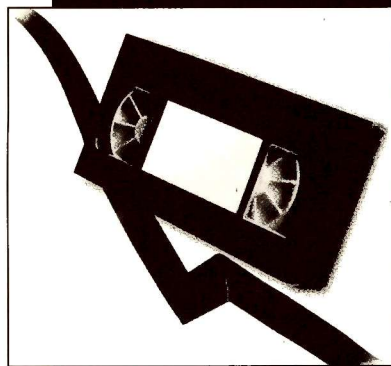
Wanted: Chroma panel for the Akai Model CT2570 (ITT Compact D/2 FST chassis). Chris Taylor, 57 Low Coniscliffe, Darlington DL2 2JY. 01325 488 027.

Wanted: TDA2450 IF chip for a Finlux TV receiver. T. Wilson, Stoneleigh, Doncaster Road, Branton, Doncaster DN3 3QP. 01302 539 709.

Wanted: A Panasonic G deck alignment tape, to buy or borrow. Doug Carson, 89 Holborn Hill, Millom, Cumbria LA18 5BL. 01229 774 749.

Wanted: Servicing information - on the cassette loading mechanism and electronics - for the Sanyo Model VHR251E. The machine won't accept a cassette. S.A. Varden, 18 Drayton Way, Nuneaton, War. CV10 9ER. 01203 393 010.

Wanted: Replacement mechanism for a Philips VR6760/05R VCR - the stereo version. The machine was damaged during a burglary. Would also like a power supply module. Arthur Brown, 11 Woodstock Road, Cheylesmore, Coventry CV3 5HQ. 01203 523 018 daytime, 01203 505 893 evenings.



Reports from
Philip Blundell, AMIEEIE
Eugene Trundle
Alan J. Roberts
Pete Gurney, LCGI
Michael Maurice
Roger F. White and
Owen Green

Toshiba V205

There was sound but no picture from the scart socket and no signal at all from the modulator. Voltage checks soon revealed that the U2 +5VS supply was missing. This supply is regulated by transistor TW005, which was without bias because the +12VS supply was also missing. Transistor TW001 was not conducting because of a short across its base-emitter junction. The culprit was CW001 (100 μ F). **P.B.**

Ferguson FV41R

There were no deck functions, though the clock worked and E-E signals came through. Voltage checks showed that there was only 3V at pin 21 (5V supply) of the servo processor chip IT01. The 5V supply is produced by transistor TT52 whose base voltage was low. This bias comes from the U2559B chip IT46 which was the cause of the fault. **P.B.**

Mitsubishi HSB27

If the fault is loss of memory, check for -30V at the emitter of Q902 in the power supply. Should this voltage be low or missing, suspect R904 (100 Ω fusible) which tends to go open-circuit. The Mitsubishi part no. is 109P052010. **P.B.**

Ferguson FV71LV

The power supply was dead but was making a ticking noise. As suggested in previous reports, I replaced CP007 (10 μ F) and the

VCR Clinic

10 μ F capacitor on the print side of the board (CP71). But the fault was still present. The culprit turned out to be CP008 (100 μ F). **P.B.**

Grundig VS180

If the power supply is dead, check D425 which tends to go short-circuit. It's type BYV28-100 or BYW98-100. **P.B.**

Ferguson FV41R

The playback and E-E sound was weak and tinny. It was even weaker with the machine's own recordings. This suggested that the faulty component was used in both the record and playback modes, giving twice the attenuation with playback of the machine's own recordings. The culprit was CS14 (4.7 μ F), which is a non-polarised electrolytic. **P.B.**

Tatung TVR952V

Two of these machines, which are of Mitsubishi origin, came in on the same day with the same intermittent fault - failure to accept or eject cassettes reliably. When it was on the way in a cassette would sometimes stop or hesitate soon after starting to move. On their way out, cassettes tended to stop short of full ejection. The cause of this problem is the mode switch, which can be either cleaned or replaced. **E.T.**

Hitachi VTM212

We've had two of these machines with dry-joints at the connections to plug PG653 on the SWC panel. The effects are intermittent, diverse and horrible. They include failure to eject, uncontrolled fast-forward winding, searching forwards when asked to search back, muting to a blue screen during playback, and lockout of all deck functions. **E.T.**

Philips VR6185

The owner of this oldish machine

complained about poor recordings and "bubbly speech". It was obvious that the heads had failed, so I fitted new ones along with belts and a pinch roller. With this deck it's very common for the old capstan belt to leave a hard deposit on the capstan motor shaft. This causes severe sound flutter, so be sure to clean it all off.

Once these parts had been fitted the machine seemed to work quite well. I left it on soak test but after about an hour there was a scraping noise. The sound seemed to be gargling again, and the noise came from the capstan. The cause turned out to be a faulty capstan bearing. Fortunately I was able to obtain one from a scrap machine. **A.J.R.**

Akai VSF410

When a programme was recorded and played back the picture was OK but the sound came from whatever channel the machine was tuned to. In other words, front-end sound was being heard all the time. You could play a tape and, as you changed channels, the corresponding off-air sound would come through. I assumed that the cause was an audio switching fault, possibly the audio switching chip stuck in one mode, but before carrying out a more detailed investigation I unplugged the machine for ten seconds then reconnected it. Everything was now OK! I can only assume that a mains spike had confused the microcontroller chip. Worth bearing in mind. **A.J.R.**

Philips VR6547

This machine provided Nicam sound only with ITV. BBC-1 produced an occasional static burst of sound with the Nicam indicator flickering. BBC-2 and Ch. 4 were stuck in mono. The tuning was spot-on: no amount of fine tuning

improved the situation.

ITV is the lowest channel (23) in this area, and I began to suspect some sort of IF bandwidth problem. There are three relevant modules: tuner, IF and demodulator. The latter incorporates the Nicam decoder and was the only one I had to hand – it had been rescued from a water-damaged machine. For want of something better to do I decided to try it. To my surprise it completely cured the problem. I can only assume that there had been problems with an internal filter. **A.J.R.**

Hitachi VTF860

As the clutch assembly had fallen to pieces I fitted a repair kit. You have to replace the whole gear block: a simple, quick and cheap repair. After that the machine seemed to work well – until I boxed it up. The cassette housing then did strange things and would not accept a tape. When I removed the top the machine worked again. After checking around I came to the conclusion that it was probably an end-sensor fault. Once the sensors had been replaced everything was OK: apparently this is a fairly common problem with Hitachi machines. **A.J.R.**

Amstrad VCR4600

This rather tatty machine would switch on for a few seconds then switch off. I found that the cassette housing motor had seized. Unfortunately this item is not available separately. You have to get the complete housing, and I didn't think the customer would be prepared to pay for one. So the scrap box came out once again. I found a motor that fitted, but I had to remove the pulley from the faulty motor and Araldite it to the replacement. The effort was worthwhile – the machine worked well and the customer was happy. **A.J.R.**

Toshiba V204

This centre-deck VCR appeared to be dead, though a quiet ticking came from the chopper power supply. The cure was to replace the chopper transistor's base coupling capacitor C007 (10 μ F, 50V) and the chip's supply reservoir capacitor C008 (100 μ F, 25V). Because of the localised heat within the screening can, capacitors rated at 105°C were used. **P.G.**

Orion D1195

Poor rewind/fast forward and very bad sound wow were the complaints with one of these machines.

There was excessive back tension because the brakes weren't being released properly. It was hard to spot the cause, which turned out to be the brake lever, item 334 in the parts list. It's secured by two small plastic lugs, one of which had broken off. As a result the lever pivoted away from the deck, allowing only partial brake release.

CPC stock this item under Matsui code MA850P600311 – for the same deck used in Model VP9401. **P.G.**

Goodmans VP2300

This machine is a Philips clone fitted with the Turbo deck. It was jammed in the fully laced-up condition, with the pressure roller in contact with the capstan. When I applied power to the machine the loading motor whirred but the main cam didn't turn. I removed the cassette housing (yes, the tape had to be destroyed) and turned attention to the worm drive, item 48A. The cause of the fault was the gear that meshes with pulley shaft item 47. It had been pushed down the worm drive shaft, and as a result didn't mesh with the cog on the pulley shaft.

I removed the worm drive, took off the gear, applied a drop of superglue to it then refitted it to the worm drive. After reassembling the deck I tested it and found that it worked well. **M.M.**

Sony SLV373

When play was selected the take-up spool wouldn't rotate. The cause of this was a bit of dirt on the take-up intermediate gear. Because of this the take-up spool stalled when it meshed with the gear: I removed the gear then cleaned and refitted it. This cured the basic problem. To complete the repair I replaced the pinch roller assembly and cleaned the half-loading arm's spindle. **M.M.**

JVC HRD880

Whenever a customer complains that timer recording is erratic and intermittent, look no farther than the mode switch, which is beneath the deck. Replacing it will cure the fault. **M.M.**

Ferguson FV71

This VCR would die with the power supply shutting down. When I'd replaced all the electrolytics on the primary side of the power supply the machine seemed to be OK. Next day however it refused to start. Replacing DP06 cured the fault. **R.F.W.**

Panasonic NVJ30

When I'd replaced the bottom set of cogs I found that this VCR had a problem in going from play to stop. It would make a horrible gnashing-of-teeth sound. The cause was the flap opener, a piece of metal that's attached to the cassette carriage – it was slightly bent. As a result the pinch roller couldn't move away from the capstan: when it tried to rise it caught the capstan top bearing and jammed. **R.F.W.**

Sony SLV270

This VCR was completely dead. The most difficult problem I had was in tracing the power supply circuit – it was in the U-View book under the Grundig Model VS500. When I'd replaced C1325 and C1326 on the primary side of the circuit the machine came back to life. **R.F.W.**

Ferguson FV60B

Intermittently dead was the complaint with one of these machines. The cause of the trouble was choke LW02 just touching the aerial booster can. **R.F.W.**

Sanyo VHR5350E

The display was flashing: not just the clock section, as happens when the time isn't set, but the whole display. Voltage checks revealed that the -40V supply was low at only -10V. The -45V supply from the power supply was also low. The cause of the low voltages was C5104 (47 μ F). In fact it had leaked, and several components had to be removed from the board to give it a clean up. **R.F.W.**

Ferguson 3V45/JVC HRD150

Cassettes wouldn't load. The drum, capstan and loading gear motors all rotated then stopped. I checked the voltage at CN102, a good test point, and found that the 12V supply was missing. CP102 (10F1) on the power supply board had failed. **O.G.**

Sharp VCMH67

This machine refused to accept a cassette. The cause was a faulty end sensor, though it seemed to read all right with a test meter. **O.G.**

Ferguson FV102LV

There was no on-screen display, and the drum tried to rotate in either direction alternately. The cause was traced to CP092 (1,000 μ F, 16V) which was open-circuit. It's in the 14V supply. **O.G.**

Servicing

the Microvitec Series 13 Monitor Chassis

This monitor chassis incorporates some unusual circuitry that can present problems for those not familiar with it. Russ Phillips explains the operation of the main circuitry and provides some

The Microvitec Series 13 VGA/SVGA monitor chassis can operate at line frequencies between 30-50kHz, has an unusual line output stage and, in some versions, provision for reduced power consumption when the monitor is connected to a PC with a DPMS-compatible video card. It's used in Models 14VC2KLN2 and 14VC2KLS2, also the Acorn AKF60. Other Acorn and Microvitec monitors, such as the Acorn AKF58, use a similar chassis.

Power Supply

The chopper power supply is based on a UC3842 control chip (IC1) which drives the BUZ80AF1 MOSFET chopper transistor TR1 directly. Regulation of the outputs is achieved in the usual way, by adjusting the mark-space ratio of the drive waveform. Fig. 1 shows the circuit.

C12 and R13 set the basic frequency. Pulses from the line output transformer T202 are fed via TR2 to pin 4 of IC1 to synchronise the power supply with the line timebase.

D2 produces across its reservoir capacitor C10 a voltage that's proportional to the outputs generated by the power supply. This voltage feeds the potential divider chain R10, R12, VR1, which supplies pin 2 of IC1 to provide regulation. VR1 enables the HT to be set at 149V.

R16, which consists of three 1.5 Ω resistors connected in parallel, monitors TR1's source current. The voltage developed across these resistors is applied to pin 3 of IC1 to provide excess-current protection.

Diodes D6, D7 and D8 on the secondary side of the circuit generate 149V (B+), 29V and 16V supplies respectively across their reservoir capacitors C17, C20 and C18. The 16V supply also feeds regulator IC2 which provides a 12V output.

Line Oscillator and Driver

The line oscillator is in the TDA4851 timebase genera-

tor chip IC201. These monitors are designed to work in the VGA and SVGA modes, so the line oscillator has to be synchronised to various incoming signal frequencies and held at the correct frequency.

Oscillator frequency control is handled by the NE555 chip IC401, which is arranged as a frequency-to-voltage converter – see Fig. 2. The sandcastle pulse available at pin 8 of IC201 is fed via TR401 to pin 2 of IC401. Since this pulse is at the same frequency as the input signal, the output at pin 3 of IC401 depends on the PC's sync signal frequency. The line oscillator's frequency is determined by the source current at pin 18 of IC201. This is supplied by TR204, which is driven by the output from IC401 via the operational amplifiers IC402A-C. IC402 is used to limit the frequency range to 27-53kHz. VR201 adjusts the F-V characteristic of IC401 to suit the control slope at pin 18 of IC201.

IC401's output is also fed to the picture geometry module to adjust the correction for the various frequencies.

The line drive output at pin 3 of IC201 is fed to the ZTX652 line driver transistor TR202, whose output is transformer coupled to the base of the BUH515D line output transistor TR203. Note that because of the unusual design of the line output stage (see below) there are negative-going pulses of some 1kV at the secondary side of the line driver transformer T201. So this area should be treated with great care when the monitor is running.

Line Output and HT Regulation

In a conventional line output stage, as used in TV sets and most monitors, one end of the line output transformer's primary winding is held at a constant, regulated HT voltage. The line output transistor is connected between the other end and chassis: it operates as an on/off switch. This arrangement is shown in Fig. 3(a).

When a monitor has to operate at various line frequencies, the line output stage's HT supply must alter with

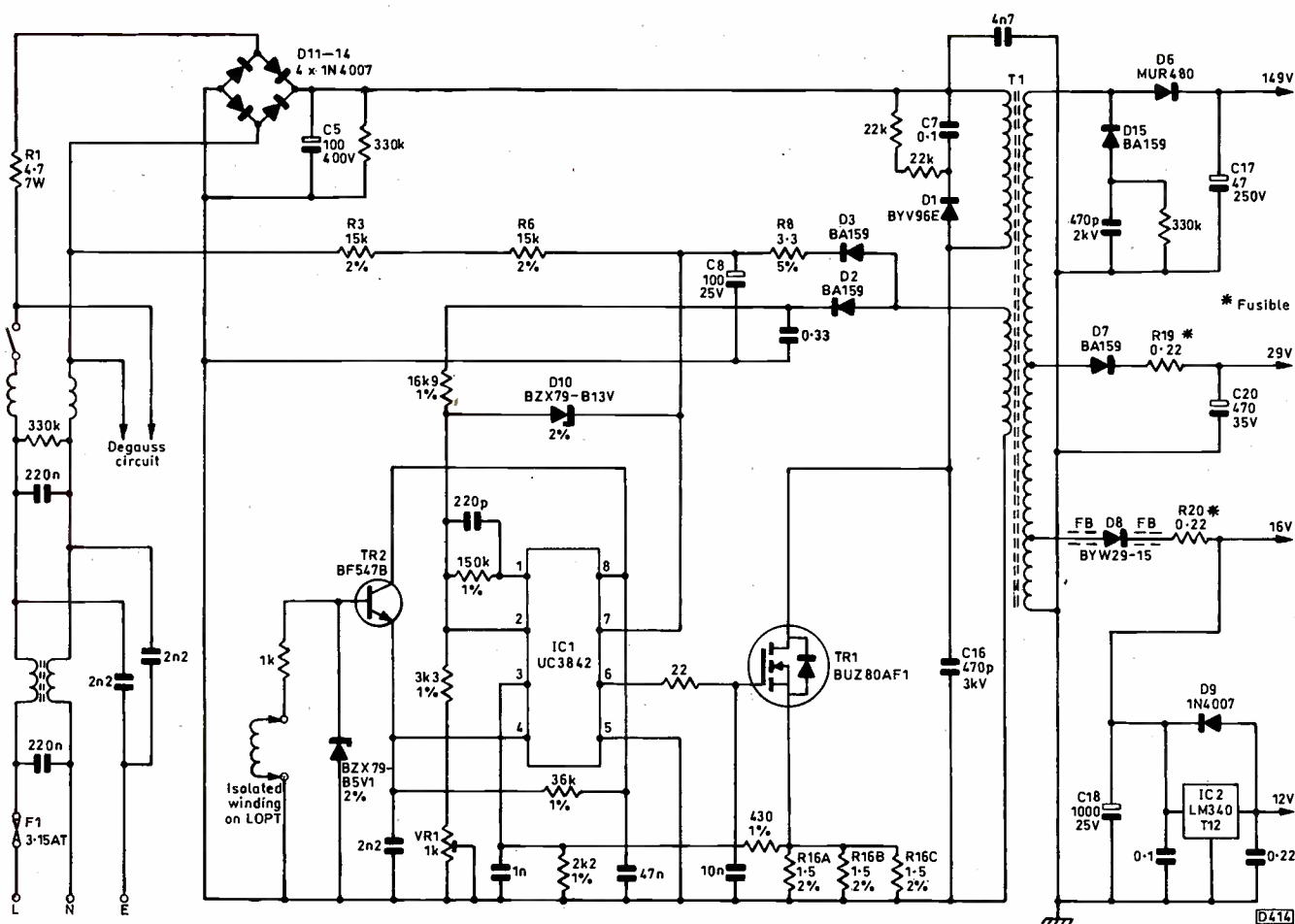


Fig. 1: The UC3842-based chopper power supply used in the Microvitec Series 13 monitor chassis.

the line frequency. If the arrangement shown in Fig. 3(a) is used, with the HT voltage varied to suit the frequency, the EHT and flyback tuning can be held constant by means, for example, of a diode modulator.

The Series 13 chassis uses a different arrangement, see Fig. 3(b). The line output transistor TR203 is connected as a switch between the HT supply and the input end of the transformer's primary winding. As a result, there are -1kV flyback pulses at the emitter of TR203 and at the secondary winding on its driver transformer. Bear in mind that with most multimeter test leads the insulation is rated at only 600V, and be careful when fault finding in this part of the circuit.

The other end of the line output transformer's primary winding is connected to chassis via the BUK455-200A FET TR101. This transistor is driven by another NE555 chip, IC101, which is arranged as a monostable that's triggered by line drive pulses at pin 2. These pulses come from the collector of the line driver transistor via C101 and R104. The mark-space ratio of IC101's output thus varies in accordance with the line frequency, enabling the stage to maintain almost constant EHT and width over the entire frequency range. Fig. 4 shows the basic circuitry.

Fig. 5 shows the EHT/focus/A1 supply sensing circuit, which varies the DC voltage at pin 6 of IC101. This circuitry is included to stabilise the picture size with variations in beam current. To set up the circuit, connect the junction of R321/C308 to a potential divider consisting

of a 470Ω resistor linked to the 12V supply and a 220Ω resistor to chassis. Apply a 48kHz input signal. Adjust the width control VR101 for an EHT of 24kV. Then adjust VR302 for 4V at TP9 (IC303B pin 7) – measure this with a 10MΩ DVM.

IC101's output also provides E-W correction. The EW parabola output at pin 11 of IC201 is fed to pin 6 of IC101 via C104, LK26 and R108. The amplitude of the EW parabola, and thus the EW correction, can be adjusted by varying VR204.

C217 provides line scan coupling and correction over the higher frequency range (43-50kHz). C501 is added by relay RL500 to adjust the correction in the lower frequency range (30-42kHz). In addition, circuitry not shown in Fig. 4 adds an extra capacitor in parallel with C106 in the frequency range 43-50kHz. This alters the EHT slightly to correct the width. There is also heater circuit compensation.

Frame Oscillator and Output

The frame oscillator is contained in IC201. R205 and C201 set the free-running frequency. VR903, a user control, is provided for height adjustment – it controls the voltage at pin 13 of IC201. The field drive output at pins 5 and 6 of IC201 is applied to pins 1 and 2 of the TDA8351 frame output chip IC301 (IC304 in some monitors). This IC's output, at pins 4 and 7, drives the scan coils in a bridge configuration. In some versions IC301/4 is supplied via an LM317 adjustable regulator

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TELEVISION



Painting Satellite Dishes

Hugh Allison considers the pros and cons of various types of dish finish

There has been a lot of talk in my area about what you can and cannot do to the surface of a satellite dish. This article is a collection of reports and ideas rather than an authoritative view on the subject, the aim being to generate interest and comments from other readers. I'll start with a couple of anecdotes.

Experiences

Some years ago a friend installed a comprehensive, high-end steerable system at the side of a large house. He was called back next day because it didn't work. When he arrived he was amazed to find that the owners had painted the dish with stone-based paint to match the exterior of the house! From this we learn that at least one kind of paint should not be used on a dish.

When he arrived he was amazed to find that the owners had painted the dish with stone-based paint to match the exterior of the house!

A relative of mine lives in an inhospitable place where it rains every day. His satellite system worked well when it was installed, but the results deteriorated over the course of a year. He put this down to the rust that then covered the dish. Being a practical sort of chap, he took the dish down and spent an hour on it with some wire wool. He had it sparkling and when he tried it out,

unprotected, received "as new" pictures. So here we have another unsuitable dish covering – rust.

Progress

The stories above relate to systems with older LNBs, the noise figure being about 2dB. Today's entry-level LNB probably has a noise figure of less than 1dB. To indicate the sort of improvement this represents, in southern England an LNB with a noise figure of 0.7dB will produce a nearly noise-

free picture from the higher-power Astra transmissions using just a pair of cupped hands. A 2dB Marconi LNB will produce nothing.

This is relevant to the dish surface, because dishes don't have to be as good as they used to be, i.e. there's more room for a margin of error. I mention this because there's bound to be a reader who will write in to say that he covered his dish with bus tickets and still gets a good picture . . .

Gloss and Reflective Paints

Heat is probably the main enemy with gloss and reflective paints. It's likely that such paint will reflect heat almost as well as it does light. Directing heat at an LNB is inadvisable for several reasons. It will temporarily increase the noise level, and may cause physical and electrical damage by overheating the LNB. It may for example melt a hole in the waterproofing cover.

Incidentally the plastic caps used by brewers to identify kegs are a good fit on the older Marconi 'blue-cap' LNBs: they have negligible absorption at 10GHz, and get thrown away in pubs. If you have split or melted covers on larger LNBs, ask your friendly local publican for a few.

For the same basic reason (heat reflection) black paint is thought preferable to white – and 'bacofoil' is also best avoided.

Metal Finishes

The problem with metal finishes probably relates to be the alignment of the metal particles. If every particle in the paint was of the same size and was a cube there would, provided they all lay neatly next to each other and their surface followed the contour of the dish, be no problem. Since this is most unlikely, there will probably be some scattering of the incoming signal. So metallic paint is best avoided.

In Conclusion

It seems that the vast majority of dish manufacturers have probably got it right. With a mass-produced, low-cost dish matt black paint is the best finish. You will probably get away with almost anything however, though weak-signal performance could suffer.

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BODYHEAT TELESCOPE PLANS Highly directional long range device uses recent technology to detect the presence of living bodies, warm and hot spots, heat leaks etc. Intended for security, law enforcement, research and development, etc. Excellent security device or very interesting science project. £8/set Ref F/BHT1.

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DYNAMO FLASHLIGHT Interesting concept, no batteries needed just squeeze the trigger for instant light apparently even works under water in an emergency although we haven't tried it yet! £6.99 ref SC152

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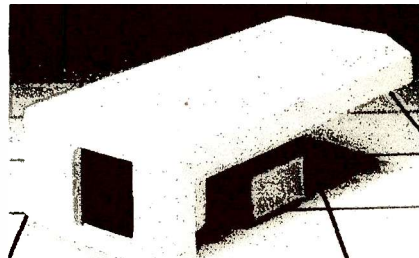
ELECTRIC MAN PLANS, SHOCK PEOPLE WITH THE TOUCH OF YOUR HAND! £5/set Ref F/EMA1.

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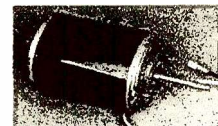
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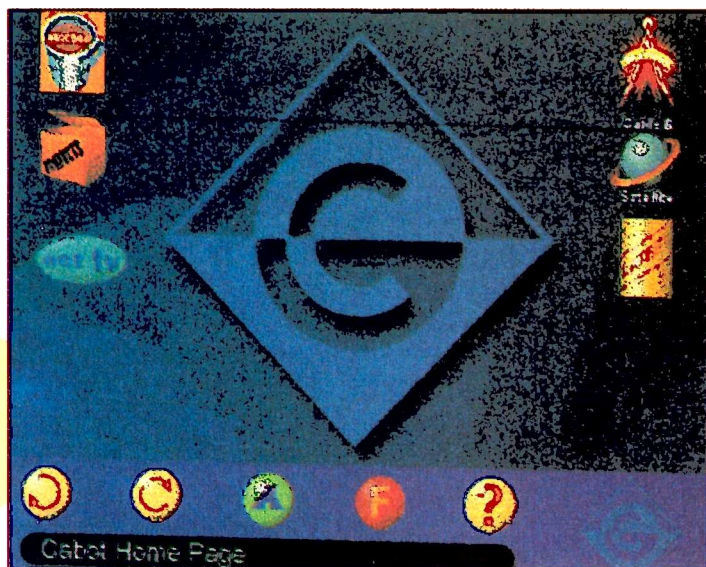
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12 - 24v operation, probably about 1/4 horse power, body measures 100m x 75mm with a 60mm x 5mm output shaft with a machined flat on it. Fixing is simple using the two threaded bolts protruding from the front



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Digital TV



What next?

J. LeJeune takes a look at some of the features that can be introduced with digital TV. Computer software in the set-top box makes many things possible

Digital TV is likely to lead to a convergence of computer, TV and telecommunications technologies. The result could be a vast new range of opportunities for viewers, broadcasters and programme sponsors. Of these, interactive services may well be the most significant from the commercial point of view. Two-way communication between viewers and broadcasters, and also advertisers, will produce much greater feedback from the man-in-the-street about programmes and promoted merchandise.

Interactive Possibilities

Viewers can respond by means of remote control unit keypresses. But the technology makes possible more than just simple answers (yes/no/not sure) to simple questions. Alphanumeric keypads can be provided with an infra-red link to a digital set-top box. Indeed with a box equipped for internet browsing such a keypad may be essential. This makes sending messages back to the broadcaster fast and efficient. There are further possibilities for the commercial exploitation of digital TV however.

Viewers might choose to forgo entertainment TV and select instead a home-shopping channel with continuous advertising – QVC-style ‘telly-selling’ or a programme dedicated to a particular store group or manufacturer. Traditionally advertising has been dead-ended: the advertisement is broadcast, and the advertiser then waits for a possible response – increased sales or no increase. Interactive digital TV can end that by providing immediate reactions. For example press #*9 to order a product, or other keypresses for a brochure or catalogue. You are, of course, invited to answer only the questions an advertiser wants to ask!

You can go shopping on the internet right now. But from my experience it's a laborious procedure: after keypresses or mouse clicks there are long waits before anything happens, while the phone bill mounts steadily. This, and a general lack of computer literacy amongst

the public at large, means that internet shopping is a service of limited usefulness. Far more people are familiar with the TV set and its remote control unit, so digital TV could provide far friendlier electronic shopping than the internet via a PC.

How it's done

This interactivity can be implemented by incorporating in the digital TV set-top box software to make possible feedback to the broadcaster or advertiser, via either the telephone network or a cable TV network's return path. Current digital set-top boxes could be readily upgraded, but later generation boxes will probably incorporate sophisticated software from the start to give access to a service such as NetTV. This can provide more precise consumer targeting.

When an advertisement is transmitted extra information such as product price and delivery, the manufacturer's name and the means of ordering can be carried by an accompanying service or Electronic Programme Guide (EPG) data stream. This information can be downloaded into receivers' memories for use as required. The data contained in the EPG is additional to that provided by the TV advertisements, which do the actual selling.

A few simple keystrokes will enable the viewer to call up ordering information from his receiver's memory. Enter the quantity required and a credit card number and the transaction is completed. The receiver will dial the advertiser's modem line and send the customer's name, address and phone number.

You can think of the Electronic Programme Guide as a sort of electronic *Radio Times*, complete with features on programmes and their presenters, stars, locations and so on – and also advertisements. While the Guide is primarily intended as a way of selecting programmes, it can also register and report back what has been selected and which advertisements have been seen.

Customer Targeting

The set-top box could register a viewer's favourite programmes and relay that and other information to the broadcaster. There are commercial uses for such information. Programmes can be categorised and coded, enabling motor sport viewers for example to be identified so that relevant information can be sent to their receivers, via their e-mail – or via snail mail.

The use of inlaid on-screen graphics enables the set-top box to question viewers during the course of a programme, giving an immediate check on reactions.

Public opinion surveys, voting and anything of this sort can be carried out instantly. In fact digital TV's potential is virtually limitless.

Internet Browsing

The prospect of internet browsing via the set-top box extends the possibilities with digital TV. A UK software house, Cabot, has developed NeTTV, a dedicated digital TV web browser. It's designed to work with any set-top box (STB) regardless of the type of microcontroller in use and the amount of memory available.

Much of the universal nature of NeTTV is down to the use of Media P-Code (MPC), which is compatible with Java, the computer programming language of choice on the internet. MPC makes efficient use of memory, reducing the amount required by fifty per cent in comparison with comparable machine-code programming.

The basic NeTTV system requires only 120K of ROM or flash memory and provides an impressively fast response rate. Caching, i.e. storing pages that can be selected from an internet site, ensures this. By reading ahead the user doesn't have to wait for the required page to be displayed – it has already been stored in part of the receiver's memory (caching is used in Fasttext teletext systems). Any remote control unit can be used, and a keyboard is not required. Cabot's software is expected to be featured in many set-top boxes in coming years.

WebTV operates in a similar way to NeTTV but uses an alphanumeric handset coupled to a dedicated TV set-top box which contains the software and modem. The unit feeds video at the standard line and field rates to a TV set that serves as a monitor.

There are pros and cons with these two systems. NeTTV is fine until the set-top box develops a fault: you then lose internet access and any interactive features as well as the range of TV/audio services for which the box is primarily intended. WebTV does not have this disadvantage, being independent of the TV STB, but is more expensive. It involves an additional box that joins the growing collection under the TV set.

Access to the internet is faster by a factor of three for a cable TV user, upstream communication taking place at a rate of between 14-20kbits/sec while downstream data, using the vertical blanking period of one TV channel, is delivered at 100kbits/sec. A three-second log-on time is claimed for the American TVOL service by Worldgate Communications. This interactive system provides more than internet access. US cable customers can also have interactive services for shopping, voting, banking, buying pay-TV programmes, expressing an opinion or merely window shopping at their own pace and in their own particular sphere of interest. The Worldgate Communications service, which uses the Wink Software system, is similar to NeTTV in that about 128K of dedicated software is downloaded to a set-top box. Service providers can add additional data to their TV programmes: this can be called up by the viewer to obtain information about the contents of the current transmission. The service uses an on-screen information

window, from which the viewer can make choices. Even re-run vintage programmes can be enhanced with an interactive back-up.

Electronic Shopping

Another service for US cable subscribers is 'Smartzone', an electronic shopping 'experience' that's available at terminals in public places as well as in the home. Suppliers are helped because they need only a warehouse, the selling site being electronic. Such selling is much less expensive for smaller retailers. Video clips and sound can be made available on request – for businesses selling music, this is a huge advantage.

For all sales organisations, having an outlet in hundreds of homes and many public spaces heavily outweighs the cost of occupying and staffing a High Street shop and holding stock – also the cost of shoplifting!

Adding Interactive Features

Cabot's Aesop software for interactive broadcasting and advertising also makes it possible to upgrade older TV programmes, even when originated in analogue form, to include such features. It's flexible to the extent that it can be used with any type of transmission. With analogue TV the vertical blanking interval is used. Return is via the telephone or cable-TV upstream network.

The Cabot Nexus system for home shopping is also usable with all current programme delivery methods, both analogue and digital, and is 'portable', i.e. it can be used with any type of digital TV set-top box, again thanks to the use of MPD.

In Conclusion

The integration of digital TV, interactive services and the internet is developing rapidly. Its driving force will probably be the commercial opportunities offered. Digital TV has other advantages of course, e.g. power economy, safe encryption and efficient use of spectrum space. But there will be many questions about regulation and protection of the public. This interactive technology is open to misuse.

As to the servicing aspects, the answer must surely be that if it's electronic it can be fixed. Just what sort of approach will be required for diagnosis is not clear at this stage, but software can always incorporate self-diagnostic programs. The future looks interesting!

Interactive advertising with Cabot's Aesop system.



Long-distance Television

DX and satellite TV news and reception. Digital and satellite TV problems with signal distribution systems. Roger Bunney reports

I sometimes wonder whether, during the periods of the year when there is little DX reception, the title of this column might breach the Trades Descriptions Act! From the terrestrial point of view, February was another very quiet month. Reports arrived from a couple of readers, but there has been little DX reception apart from the usual 'local' signals received via tropospheric propagation. Nothing of any note was seen. Signals from the Dutch Lopik ch. E4 transmitter don't, I'm afraid, really count as DX when received in Essex.

Robert Copeman (Sydney) reports that the Australian Sporadic E season is now on the wane. It's been a good season however, definitely an improvement in comparison with the last couple of years.

Auroral activity is on the increase as the new solar cycle advances. A report in *Six News* describes an auroral opening in

New Zealand, with TV and amateur radio signals at up to 55MHz reflected from the Antarctic direction. There was some auroral reception in the UK last November and into December.

Enthusiasts in Australia received Chinese, Russian and Middle Eastern signals at up to ch. E3 during the winter months via transequatorial skip propagation: the Pacific path provided more excitement with two-way 50MHz contacts between amateurs in NZ and the States.

So the prospects over the coming months look good for us in the UK.

Satellite Sightings

Analogue satellite TV is alive and well: there have been many unusual sightings this past month. As ever, sports reports featured heavily in satellite linking, particularly winter activities – skiing, ski jumping, speed skating, figure skating, bobsleighbing and ice hockey were all to be seen from both European and North American venues. There was also the bonus this year of the Winter Olympics from Nagano, Japan. Most of the European distribution links from Nagano were to be seen via Eutelsat II F4 at 7°E, usually captioned "EBU Multi 1, Feed from IBC Nagano" (or EBU Multi 2, 3 or 4). During periods of no activity or playbacks a locked-off shot of the Olympic flame would be shown, with an overlaid caption.

For pan-European sports Eutelsat II F4 is perhaps the most active satellite, though often with sound-in-sync transmission, followed by Eutelsat II F2 at 10°E. Dean Rogers (London SE2) who

monitors sports feeds regularly has found that Telecom 2C at 3°E is perhaps the best source in the UK for French/English football, with Hispasat at 30°W a close second. Spanish/Italian football is frequently carried by Intelsat at 18.5° and 27.5°W.

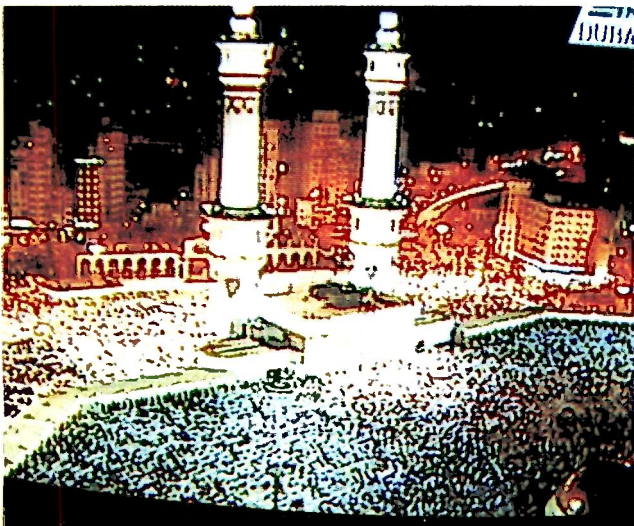
In recent times there have been analogue EBU transmissions via PAS-3R at 43°W, using the 12.606GHz horizontal transponder, with the "EBU NEW YORK" identification at the start – vaguely akin to the EBU circuit via Intelsat at 27.5°W some years back. Intelsat K (21.5°W) carried a rarely seen EBU circuit at 12.542GHz vertical on February 22nd (1830 GMT), with a two-way interview – rare at least for the EBU with this satellite.

If satellites provide the modern line-of-site communications, the beacon fire is perhaps the oldest form. The two came together on the evening of February 26th when a beacon was fired up on a desolate hilltop in Northern Ireland to start a nationwide network as part of the Countryside Alliance's protest. The beacon fire insert for a NI local news magazine programme appeared via Telecom 2C, ending with the SNG truck identification "UKI 120 DGSP". This one is new to me – any ideas?

I noticed another SNG truck, SIS4 CTV EAST, at 1815 in an equally rare transmission from Eutelsat I F4 at 25.5°E, using the 11.177GHz horizontal transponder. Roy Carmen (Sandown, Isle of Wight) has recently taken me to task for muddling up the 21.5° and 25.5° Eutelsat slots – the former is I F5, the latter I F4. Put it down to old age!

The UKI 120 DGSP SNG unit is

The spectacular Ramadan ceremonies were carried live by Dubai TV via Hot Bird at 13°E.



certainly well travelled. Before the beacon event on the 26th it was at Dublin to cover the Multi-Party talks: Cyril Willis (King's Lynn) noted preparations at 3°E for a live news report on the talks. Another 'different' magazine insert was covered by the BBC Plymouth truck UKI-231 via 27.5°E on February 5th – on the closure of the South Crofty tin mine.

David Martin (Poole) comments on the Intelsat K Reuter/Brightstar leases. If you leave a receiver tuned to one of these you will often see a switch to an incoming feed from somewhere around the world. Both San Diego and Baton Rouge teleports (USA) were for example seen with programme inserts in early February. On the 19th "BELGACOM CTC BRUSSELS" and "BT/SAIT - VIDEOHOUSE NV BRUSSELS TELEPORT" came up. Reuters Mscow is another frequent service, with news items from the east. These are strong signals: noise-free with a 1.2m dish.

A while back I found that the polariser settings at my own 1.2m dish had changed and suspected that something had gone wrong. It had! The dish's sharp focus had concentrated the sun's rays at the focal point, partially melting the plastic feed/LNB support ring. As a result there had been slight movement of the head assembly. A new, aluminium replacement ring has been obtained. The moral is: don't leave a dish pointed at high elevations during the April/October equinoxes, even if it's painted dark green!

Terrestrial News

Albania: RTV Shqiptar is still available to only half the country – the transmission network is awaiting repair following the civil disturbances. Full national telecommunications links have still to be restored in several of the larger towns, including Shkodra and Lezha. Shortage of government funds means that there could be a prolonged wait.

Egypt: There has been confirmation from the BDXC, Holland, that there are now no Band I transmissions in Egypt. Dumyat chs. E2 and 4 is shown in some lists, but currently only Band III and UHF transmitters are on air.

Botswana: The government has announced that it is to open a national TV service which will initially provide news and current affairs programming.

Ukraine: The commercial TV

station Studio 1+1 now operates for twelve hours daily using the UT-2 transmitter network. It became profitable last October and now has 95 per cent coverage.

Russia: Petersburg – 5 Kanal closed at the end of last year. It has been replaced by The Culture TV channel, which is not the same as the nationwide Kulture Network.

South Africa: If the new broadcasting bill is passed SABC will become a public corporation and will subsequently be privatised.

Latvia: TV transmissions are now 100 per cent PAL.

New Zealand: TVNZ has taken over the MAX-TV transmitter in Auckland with the intention of using it for digital transmissions later this year or early next.

Sweden: A new aerial introduced by Cellphone company RTA AB is only 16mm long instead of the usual 35mm with apparently no loss of performance: it uses a technique called "brass bracket compressed coil" (BBCC).

UK: The Isle of Wight local TV station TV12 could open as early as May, subject to UHF channel clearance. It will have a studio base at Newport and use existing masts to provide coverage of the island and part of the mainland.

Distribution Shortcomings

The NZ monthly magazine *SatFACTS* is aimed at those in the satellite installation trade in the Pacific basin region. It's edited by TV veteran Bob Cooper, father of the American backyard C-band satellite terminal. The February issue contained information of importance to all those involved in signal distribution work.

Distribution systems in smaller housing developments, blocks of flats, houses etc. may now carry a collection of satellite IF signals (900-2,100MHz) as well as the local terrestrial signals – 88-108MHz FM radio and UHF TV. The satellite signals may have been included in an already established distribution system whose wiring standards, OK for VHF/UHF, are quite unsuitable for carrying signals in the low-GHz region. The losses introduced by conventional terrestrial VHF/UHF signal splitters/combiners for example are vastly increased at GHz frequencies. The aerial outlet plates could be simple screw and saddle clamp types, which are OK for strong group A UHF signals but hopeless for satellite IF signals.

Bob gives as an example a lay-



out where the signal from a distribution amplifier feeds four TV receivers via a four-way wideband splitter, using conventional braided-screen, air-spaced coaxial cable with saddle-clamp wall plates. The eight-metre coaxial cable run to one receiver plate contributed a loss of 10dB at 100MHz, 38dB at 2GHz. The 19m run to another receiver

An NTSC offering via Intelsat K.

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SISlink identification prior to Scottish League football via Eutelsat II F2 at 10°E. The 11.163GHz horizontal signal was received by Dean Rogers, London SE2 on January 10th.

contributed a loss of 12dB at 100MHz, 40dB at 2GHz. There won't be much by way of Sky Movies with such losses.

When the whole system had been re-engineered, with correctly designed outlet plates (screened F sockets for the satellite IF signals), appropriate wider band splitters and, most important, satellite coaxial cable with both braid screening and overwound foil wrap screening, the losses were reduced to more acceptable levels. With the 8m run the losses were 9dB at 100MHz, 18dB at 2GHz; the 19m run contributed losses of 10dB and 19dB respectively.

We are now on the threshold of digital TV, which is even less forgiving. A distribution system that just gets by with marginal analogue terrestrial signals won't be adequate with digital signals. Digital terrestrial TV will start in the UK mainly with set-top decoders feeding analogue TV sets. Satellite digital TV signals will probably be fed to analogue TV sets via a separate decoder. Clearly this will lead to interconnection problems.

It would be best to re-engineer RF distribution systems in flats, hotels and houses to the higher standards required for digital TV now rather than wait for the digits to arrive. In the UK Wickes, B and Q and others have encouraged DIY aerial and amplifier installations. These are likely to be far from efficient: many 'professional' wiring contract jobs on new estates etc. are also likely to be found wanting. Bob's experiences in NZ show that many distribution systems won't handle anything above 800MHz. There is clearly a lot of work ahead.

DX Tuner

The D100 DX-TV tuner from HS

Publications, which has been in production for many years, has been replaced with a new, updated version with revised styling. It still provides full coverage of Bands I/II/III/IV/V. The electronics have been upgraded, with variable IF bandwidth, band scanning and simple interfacing for an external varicap notch filter and a DX alarm.

The DX-TV alarm unit detects incoming DX-TV signals, producing an audible and/or visual LED alert when something is present: there's a control to set the threshold (signal alert level).

The new D100 De Luxe is priced at £149.95, which includes postage and a power supply. The companion DX alarm is priced at £39.95, the varicap notch filter being priced at £17.95.

For full details write with SAE to HS Publications, 7 Epping Close, Mackworth Estate, Derby DE3 4FS or phone 01332 381 699.

Test Equipment

Tim Wright of Pagham, Bognor Regis has a couple of specialised microwave signal generators for sale at attractive prices. These are a 20-year old Danish-made Sievers generator covering 8-12.26GHz, accurate to 1MHz, and a Marconi-Sanders generator with digital readout, 850-2,150MHz coverage, a maximum output of 150mV and 28/110/230V operation. For further information phone Tim on 01243 264 959.

Satellite News

Eutelsat Hot Bird 4 was successfully launched at the end of February, bringing another twenty Ku-band transponders into service at 13°E. Eutelsat will launch W1, Hot Bird 5 and W2 later this year. The organisation has bought TDF-2 at 36°E: it provides 60dBW at its central boresight north of the Caspian, dropping to 50dBW over the Baltic sea. Later this year Eutelsat II F2 is to be moved from 10°E to 36°E, to contribute to a total of 18 transponders at this slot. Late '98 will see the addition of SESAT to provide a spot beam across central Russia and Asia. W4 will also be positioned at 36°E, arriving there next spring. Hughes has won a Russian contract to provide an HS376 satellite which will provide high-level Ku-band DTH TV transmissions from 36°E to western Russia. The satellite will be known as Bonum-1 and will be launched late this autumn.

Intelsat 806 was launched on the

same day as Hot Bird 4. It will provide coverage for Latin America/Europe at 40.5°W.

By the time this is read CMT Europe will have closed, having made losses over the past two years. CMT – the Spanish Telecomms marketing organisation – is developing programme blocks for cable distribution and will concentrate on the Pacific basin/SE Asia.

Intelsat provided world-wide coverage of the Winter Olympic games at Nagano, Japan using satellites at 60°, 62°, 64°, 66°, 174° and 180°, with both analogue and digital transmissions.

Financial problems in East Asia have affected the satellite market. The high-power Ku-band LaoStar-1 and -2 satellites, also M2A, have been cancelled part-way into construction while the Thaicom-4 launch, which was to have been in late '98, has been postponed for at least fifteen months. On a brighter note Asiasat-3R is to be built as a replacement for Asiasat-3, which was written off after a faulty launch on Christmas Day. 3R is expected to be launched in mid-1999.

The Egyptian Nilesat satellite should be launched about the time that this is read, at 7°W. Its twelve transponders will be used for digital transmissions. Amos-2 is due up this summer at 4°W, alongside Amos-1: it will provide Ku-band services to the Middle East (horizontal polarisation) and central Europe (vertical polarisation), with a centre boresight power of 55dBW.

Obituary

Dr. R.V. Jones died in Scotland on December 17th, aged 86. He was one of Britain's foremost electronics scientists during the second world war, heading Air Ministry Scientific Intelligence. During those years he fought a continuous battle against Nazi radar, initially at around 27MHz then progressing through VHF and UHF into the GHz region. His contribution was great, yet he was one of the almost unknown heroes of the war. We make use today of the legacy of his early pioneering work.

For further information see the book *Most Secret War* by R.V. Jones which is available as a Coronet paperback (ISBN 0 340 24169 1), also the BBC Video *The Secret War – The Battle of the Beams Vol. 1* (BBCV 4115 VHS PAL).



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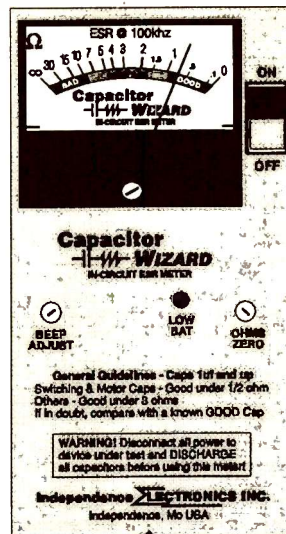
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Answer to Test Case 425

- see page 477 -

Close examination of the fault area often pays dividends. So it did in this case. After many ten-minute waits and two-second observation periods, Sage established that when the fault occurred the supply spool turntable was stuck. It was stuck so fast that the reel-drive clutch slipped: one section turned while the other was stationary.

The faulty part was in fact the back-tension band. It consists of a clear, narrow strip of transparent plastic with a white felt band glued to its inner surface. In this case the band and the strip had parted company. As a result, for some of its length the sticky plastic strip was exposed, the felt band sticking up above it. If the turntable was left stationary for long enough, the sticky band would adhere to it. It took about ten minutes, with the band pulled fairly tightly around the spool turntable, for sufficient adhesion to be built up to overcome the 90gm-cm torque of the reel-drive clutch. So the fault wouldn't show up when eject was keyed during play or immediately after the completion of rewind. A new back-tension band, a spool turntable clean up and a splice job on the tapes put everything to rights.

Next month we'll get back to TV equipment, with no cogs, wheels or nasty sticky bits . . .

NEXT MONTH IN TELEVISION

Servicing the Nokia N Chassis

This digital TV chassis, successor to the M, is found in De Graff, Finlandia, Hitachi, Nokia and Salora sets. It uses a number of custom-made digital signal processing chips. Servicing is not too difficult - especially when you have Michael Maurice's article, with its common faults list and other tips, to hand.

The '98 Electrical Retailing Show

If you didn't manage to get to the 1998 Electrical Retailing Show, where the latest in consumer electronics equipment was presented, no matter: George Cole reports on the developments and new models that were on display.

What about the Mains then?

We tend to take the mains supply for granted: plug in and await results. But it's important to know about the system that presents 240V AC to our mains sockets. Pete Roberts starts a new series that reveals all.

Test Report: The Capacitor Wizard

Several readers have commented favourably on this test meter from ICHE. It has proved to be a great help in reducing time spent on fault diagnosis. The meter checks the ESR of electrolytic capacitors in circuit, an essential test on a notorious component. Martin Pickering invested in one recently and reports on its usefulness in the workshop.

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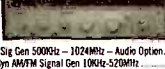
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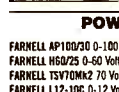
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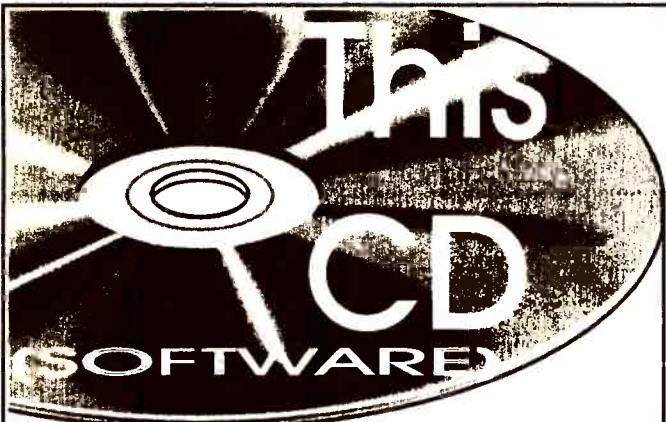
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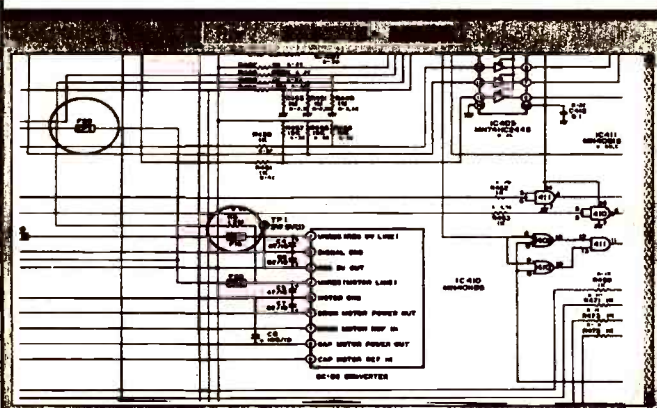
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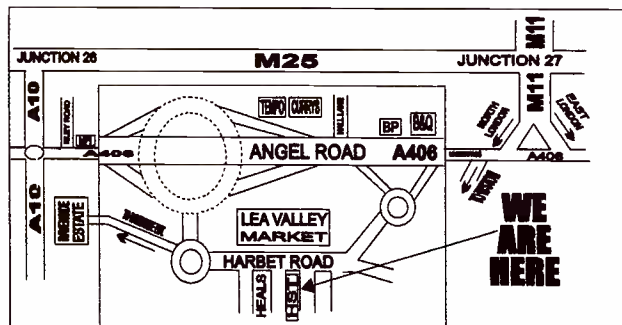
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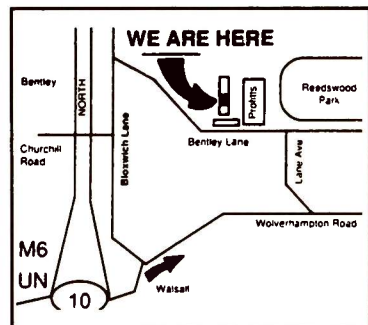
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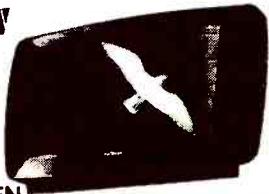
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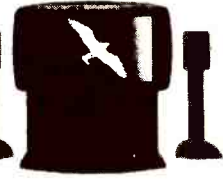
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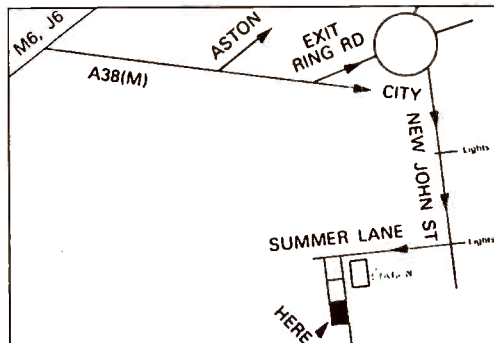
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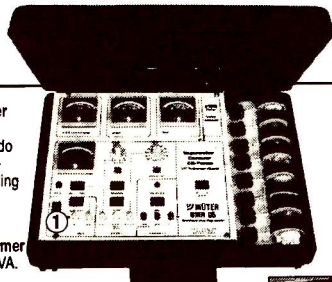
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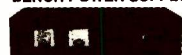
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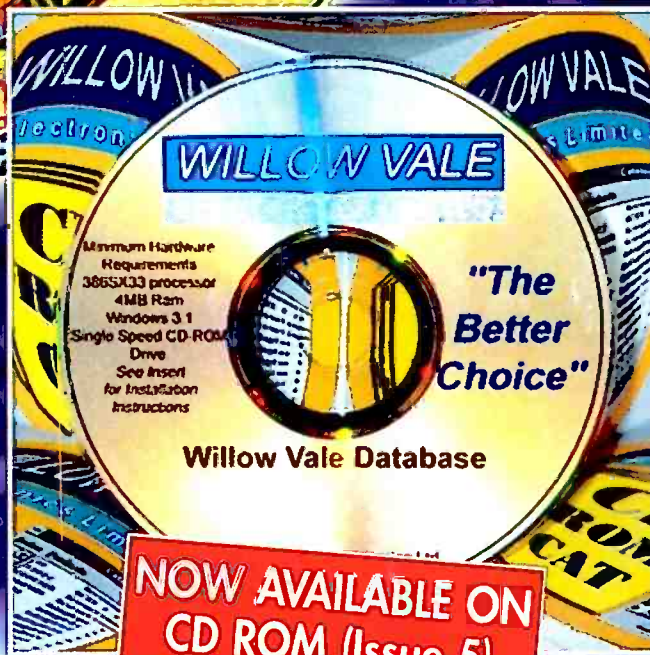
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