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Crunch Time
Monitors
Fault reports and servicing hints on computer monitors.

Teletopics
Latest on BSkyB’s digital launch, US digital TV plans, various CRT and chip developments.

Test Report
Michael Dranfield reviews the Peak DCA50 component analyser, which provides a simple, fast method of determining what an unknown semiconductor device is and its connections. A very helpful addition to your test gear.

Satellite Notebook
Solutions to problems with satellite equipment and installations.

PC Pitfalls
Personal computers provide scope for a worthwhile extension of servicing activities. Upgrades for example can be undertaken. But there can be problems with this. Colin McCormick outlines the possibilities and snags.

Satellite Workshop
Jack Armstrong’s column on satellite receiver servicing.

CCTV/VCR Trigger/Timer
Ian Rees describes a simple unit that enables a standard domestic VCR to be used with a CCTV surveillance system to make short recordings.

The Language of Digital TV
Mark Paul provides definitions of terms commonly used in digital TV texts, to serve as a ready reference.

What a Life!
From a Dansette record player to the latest JVC TV sets, Donald Bullock gets them all.

TV Fault Finding

Camcorner

Help Wanted

VCR Clinic

TX805 Technology
J. LeJeune describes the operation of the Wessel combined chopper/line output stage and its drive circuitry used in this Thomson chassis. Also some fault-finding notes.

Servicing the Toshiba 2505/2805DBT
John Coombes provides a fault-finding guide for these complex sets, which helped start the ‘home cinema’ market.

Long-distance Television
Terrestrial DX and satellite TV reception and news, RSL licence awards. Co-channel filtering techniques. Roger Bunney reports.

Next month in Television

Letters

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Note that we are unable to answer technical queries over the telephone and cannot provide information on spares other than that given in our Spares Guide.

March issue on sale February 18th. Next issue dated April on sale March 18th.

SPECIAL OFFER

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Crunch Time Coming

I t all seems so straightforward at first glance. TV is in for a glorious, digital future. Digital transmissions will mean lots and lots of channels, which is what people want, isn’t it? Plenty of choice. Sport galore, popular films as and when you want them, plenty of scope for minority-interest programming and so on. Let’s sit back and enjoy it, while the broadcasters rake in the shekels. But it might not turn out quite like this. In fact there are at present so many problems that many of those in the broadcasting and electronics industries may be cursing the day when digital TV was first proposed.

Not least of the worries is the fact that digital TV is quite a gamble. We are told that the analogue TV switch-off will be just a few years hence, by which time we will be enjoying a much wider choice of programmes with better quality vision and sound. But this all depends on whether the public goes for digital TV with sufficient enthusiasm. If it turns out to be a costly debacle, we could find ourselves left with the present services. The digital broadcasters will need all the marketing muscle they can gather: the fact that the digital TV set-top boxes are to be subsidised is an admission that persuading the public to go digital is not going to be that easy.

The overriding consideration is the public’s likely response. People do a lot of viewing already, and must be reasonably content with what’s being offered to them. The fact is that a saturation point has long since been passed. The total number of hours devoted to viewing has traditionally been, in a sense, ‘free’. If people are likely to opt for both prospective services, Why should they, in addition to what they already have? Ah, but “content is king” as they say in the media world. People will sign up if the programmes are sufficiently enticing. Obviously so, but we shall see. Sport and films are the big attractions. If BSkyB or anyone else can corner the market, it’s hard luck for the other broadcasters. Fortunately no one is likely to have a deep enough pocket to be able to dominate in this way.

The broadcasters have to generate the income required to finance their services, either by subscription/pay-per-view and/or advertising. People are sensitive to what they may be asked to pay, especially as broadcasting has traditionally been, in a sense, ‘free’. If you can get people to pay extra to watch something special, it means they won’t be watching something else. Advertising revenue depends on the number of viewers who switch on. It will be spread more widely, and will bring in less per channel. It’s a sort of no-win situation.

This may be an unduly pessimistic view, but investors don’t seem to have been greatly encouraged by the prospects: at the time of writing, BSkyB’s shares are trading at around 360p compared with a high of 666p or so during the past year. It’s hardly a vote of confidence.

The preparations for digital TV have been a bit of a botch, with several postponements to the planned start of the services. BSkyB’s satellite, Astra 2A to be more exact, has taken longer than expected to build. There have been many problems with software and getting the required clearance from the broadcasting regulatory authorities. The delays have affected set-top box manufacturers adversely, coupled with which Pace seems to have a problem with patent fees. No one, at least, is happy.

The future must lie with digital delivery eventually, since the technology is superior and offers more for less in terms of spectrum space. But it’s unlikely that there will be a huge, sudden rush to acquire digital set-top boxes or receivers. One danger is that the government might be “bounced” into forcing the issue by switching off the analogue signals prematurely. We should be left with our usual services until digital TV really does look like taking over – as 625 lines and colour did thirty years ago.

Meanwhile a lot of nail-biting is in prospect for those involved in getting digital TV started – BSkyB and BDB in the UK. They could well have a difficult time, for several years at least.
Possibly a FIRST AGAIN, you can search our www site for video spares, semiconductors, remote controls, satellite gear, line output transformers and CCTV components. Its simple and will only cost the price of a local call. You can order parts, enquire about transformers and CCTV components. Its simple and will only cost the price of a local call. You can order parts, enquire about

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Satellite division Satellite division Satellite division

"The Satellite Repair Manual"

You could say that what Martin Pickering doesn't know about satellite receivers isn't worth knowing. What he does know has become legendary. Having been at it since the start of consumer satellite TV, he has built up a massive data base on satellite receivers. Not only on their faults, common and less common but also on modifications and upgrades. Martin brings in-depth expertise to the subject, having previously been involved with equipment reliability testing and component specification. This book has become established as a bible for satellite TV repair. But the subject doesn't stand still. New models, new faults - there is always something to add. So here we have the fourth edition, which has been completely updated and now has 240 pages - the previous edition had 135. In addition to receiver fault notes and general information you'll find many useful button sequences for parental lock codes, resetting installation choices to factory default and other less well known operations, practical information on LNBs with typical current drains, a list of manufacturers and supplies addresses and other useful material, all presented in a nice hard bound so that the book lies flat on the bench.

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TELEVISION March 1998

309
Reports from
Adrian Spriddell
I. Field and
Gerry Mumford

Mitac 1564PDM
The brightness was very low when this monitor was first switched on. It improved after an hour. The cause of the trouble was the line output transformer. A.S.

Royal DN1782G
This monitor was dead. Checks showed that the BU2527AX line output transistor was short-circuit. I fitted a BU2527AF as a replacement then turned attention to the line generator circuitry. One leg of the line oscillator transformer’s centre-tapped winding was found to have burnt off. Fortunately there was enough of the remains of the lead-out wire for it to be reconnected.

In addition the 22Ω resistor in series with the emitter of the line output transistor had gone open-circuit. A.S.

Taxan MV7891R
There was very high brightness, the front panel control having no effect. R325 (27kΩ) in the brightness control network was open-circuit. A.S.

ICPI VGA 72G9140
This monitor was dead. It didn’t take us long to discover that the 33kΩ, 1W resistors R603/604 in the power supply were open-circuit. A.S.

Mitac AM4050PD
This monitor was dead – its line oscillator had stopped. There was no supply to this stage because of a dry-joint at jumper wire JW806 in the feed to the line oscillator transformer.

We’ve had several of these monitors in recently with bad joints. They look OK, but when touched with a hot soldering iron the solder falls off, revealing a blackened component or jumper leg beneath. It’s worth checking the six 47kΩ resistors on the CRT base panel and the legs of the RGB output transistors.

Another tip: to correct a poor black level, check C763 (47μF, 100V) by substitution before adjusting the first anode supply potentiometer. A.S.

Ultra UM1595
The picture was compressed at the top. A new TDA8172AP field output chip restored linear scanning. A.S.

Eizo 9060S
The power supply would run for only 1.5 seconds then switch off. The cause was eventually traced to C963 (33pF) on the power supply PCB. A.S.

AST VGA LR14
Changes colour after half an hour was the complaint. I didn’t have to wait: this monitor did a fair impersonation of disco lighting from cold, and got worse as it warmed up! It’s almost identical to the Viglen CA1426LT, but uses a conventional CRT instead of a Trinitron CRT. The CRT base is easy to work on (the Viglen version has a clamp band that secures the CRT base to the CRT neck), and there’s no danger to the print lands when the tinplate screen is unsoldered – it slides on, and is secured by solder bridges to wire links at either side and a pressed out ‘tongue’ which is soldered to the print side through an aperture.

The soldering was sparse. With a gentle tug, the blue transistor came away from the PCB. The other two video output transistors had clearly visible fatigue marks around all three pins. I recommend that when resoldering one of these AST or Viglen monitors the PCB is thoroughly defluxed and all weak-looking solder joints are attended to. I.F.

ADI PV448
This monitor was completely dead because of a power supply blow-up. Casualties included the 2SK2038 chopper transistor Q901, R990 (0.33Ω, 2W) and the BYV28 rectifier diode D962 on the secondary side of the power supply: Q901 and D962 were short-circuit. Replacements got the supply going again, but the line output stage would shut down very quickly. This was because the HT (B+) voltage at the LOPT was high (about 140V instead of 90V). The cause of this was the 2SB649A power switching transistor Q921 which was also short-circuit. G.M.

ASTVision 4L CMC-142381
There was no picture, though the LED lit up and a faint clicking noise came from within the monitor. The cause was not the usual blown line output transistor but the associated resistor R516 (10, 1W) which was open-circuit. G.M.

Commodore JD144K
This monitor displayed a white raster. When the brightness control was at its minimum setting however a very faint picture became visible. With the brightness control at maximum, the tube’s G1 voltage was at less than +1V, R437 (220kΩ, 0.25W) in the brightness control circuit had risen in value to 300kΩ. G.M.

AOC CM335
This monitor was dead because one of the series-connected start-up resistors R907/8 (220kΩ, 0.5W) was open-circuit. As is usual with start-up resistor pairs only one of them had failed, but for reliability it’s best to replace them both. G.M.
Free cover disk and reader offer

Test Equipment has come a long way over the last few years. Traditional ‘benchtop’ instruments such as oscilloscopes are giving way both to smaller hand-held units and more recently to PC-based instruments. Pico Technology is at the forefront of these developments and, in conjunction with Television magazine, gives you the chance to save 15% off the purchase price of any Pico product.

The disk on the cover of this magazine contains two programs: the first is a demonstration version of PicoScope for Windows (see screen shots below) and the second an on-line catalogue and order form that allows you to buy any Pico product at 15% discount. Alternatively you can order either the ADC200 or osziFOX oscilloscopes using the order form below. Please note that this offer is valid until 15 April 1998.

Transform your PC into an oscilloscope, spectrum analyser and multimeter...

The ADC200 range of PC-based oscilloscopes offers performance previously available only with the most expensive ‘benchtop’ scopes. By integrating several instruments into one unit, the ADC200 is both flexible and cost effective. There are three models in the ADC200 range (see the on-line catalogue on the floppy disk for full details and specifications). For video signals the ADC200/50 is an ideal solution. It combines a dual-channel 50MS/s digital storage oscilloscope with a 25MHz spectrum analyser. The screen shots of PAL video signals shown opposite were captured using an ADC200/50.

Connection to a PC gives the ADC200 the edge over traditional scopes: the ability to print and save waveforms is just one example. Advanced trigger modes, such as save to disk on trigger, make tracking down those elusive intermittent faults much easier. The ADC200 is supplied with Pico Scope for Windows (see disk for demo version) which is powerful, yet simple to use, especially with its comprehensive on-line help.

A scope at your fingertips...

Oscilloscopes were once heavy and clumsy to handle, but over the years they’ve got smaller and smaller. The latest development in this field has just arrived: a digital storage oscilloscope in a handy slim housing, scarcely longer than a pencil and about as thick as your thumb.

Despite its small size, its performance can match that of a service oscilloscope. With a sampling rate of up to 20MS/s even signals in microprocessor circuits can be recorded. Using its voltmeter function, numeric AC and DC voltages can be easily measured.

The low cost of the osziFOX, together with the unit’s small size, makes it ideal for any electronics engineer who needs the ultimate in portability.

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BSkyB's Digital Launch

According to BSkyB, its digital satellite TV service will start before the end of June. The company is to order one million set-top boxes which will be manufactured by Pace, Panasonic, Amstrad and Grundig. They are to be made available to viewers at a subsidised price of around £200.

The original plan was that the subsidy would be provided jointly by BSkyB and British Interactive Broadcasting (BIB). But the fact that BSkyB owns 32.5 per cent of BIB has concerned the European Commission, from which clearance is required. BSkyB has now announced that to start with it will provide the subsidy itself.

Concern about regulatory clearance, delays in confirming the orders, and problems with the final specification for non-exclusive software for interactive operation have all contributed to a delay in the start of set-top box production. Some observers continue to feel that the start of the service may be delayed until the autumn.

Incidentally British Digital Broadcasting (BDB) will also be subsidising the cost of the set-top boxes required for reception of its digital terrestrial transmissions. The cost is put at some £550m over twelve years. BDB will be spending £150m on promoting and subsidising its services, which are due to start this autumn, over the next two and a half years.

US TV Goes Digital

The first digital terrestrial TV (DTT) services in the USA are to start later this year - working receivers, many with HDTV capability, were on display at the Las Vegas Consumer Electronics Show in January. Broadcasters have assured the Federal Communications Commission (FCC) that transmissions will be available in the ten areas of greatest population density - New York, Las Vegas, Chicago, Philadelphia, San Francisco, Boston, Washington, Dallas, Detroit and Atlanta, which account in total for thirty per cent of the population - by May 1999. Services are to be extended to the next twenty main areas by November 1999. The digital signals will be able to provide either standard or HDTV resolution depending on the receiver being used. The FCC expects the analogue TV switch-off to occur in the year 2006, when the freed spectrum space would be auctioned off for other uses.

Setmakers that are to launch digital TV receivers this year include Sony, Philips, Panasonic, Hitachi and Sharp. The industry expects sales to be around 100,000 in the first year, rising to one and a half million in 2002. A boom period is assured if things work out this way!

CRTs

The increasing amount of effort being put into flat-screen display technology doesn't mean that the CRT has reached the end of its development. Sony has come up with a new version of the Trinitron called the Wega - after the brightest star in the Lyra constellation. It has a much flatter screen and, to increase the length of the electron-lens system, a longer gun. The result is a bright picture with twice the resolution of previous Trinitron tubes. Corner resolution is particularly good. Sets fitted with the tube were on show at CES, Las Vegas. Toshiba has announced, in Japan, a series of wide-screen models (32Z1P, 32Z1D, 28Z1P and 28Z1D) that are fitted with a newly-developed, virtually-flat CRT. They employ progressive as opposed to interlaced scanning, and will be compatible with the Japanese digital TV broadcasting system. Transmissions are due to begin in the year 2000. The sets will not be sold outside Japan.
News from CPC

As part of a £10m investment aimed at further increasing CPC's business capacity over the next six years the company has bought almost six acres of land adjacent to its Faraday Drive, Fulwood, Preston site. CPC is also running trials of an on-line catalogue service which the company expects to introduce later this year.

The investment project will be split into two phases, the first starting this year with the building of a 56,000 sq ft warehouse. Phase two, scheduled to start in 2000, will add a 60,000 sq ft building which will include a high-bay (20m tall) warehouse. When both phases have been completed, CPC's total storage space will be around 270,000 sq ft.

CPC has added a range of compatible repair and replacement parts for video games consoles to the computer spares and accessories the company already stocks. Because of their specialised nature, spares for games units are often difficult to obtain in the UK. CPC can now help with controller replacement pads, circuit diagrams for popular video games systems, game cartridge opening tools, replacement cables, connectors and a selection of memory cards. A ten-piece kit of compatible replacement parts for games controllers is available, containing all the commonly needed items for repairing two controllers.

CPC has also launched a new support service for customers needing assistance with its preprogrammed remote control handsets. The Remote Control Help-Line, number 0891 633 261, is specifically designed to assist end users of universal handsets. The line goes directly to a help desk centre manned by a team of qualified technical personnel. Calls are charged at 50p per minute – the line is open from 8.30am to 5.30pm Monday to Friday. Extra capacity is being built in to serve customers requiring technical assistance with other CPC products.

Philips' Chip Developments

Philips has been investing heavily in its TriMedia processor technology – several hundred engineers have been working on the project. The stage has now been reached where Philips is in talks about second sourcing and joint industry development of the processing architecture. The TriMedia processor can be used as the basis of a number of chip sets for various consumer information and entertainment applications, and can bring consumer-quality video and audio to PCs.

The stage of the technology is the use of a very long instruction word (VLIW) central processor core, enabling five instructions to be processed per clock cycle. Thus some four billion operations per second can be carried out at the relatively slow clock rate of 100MHz. Further development aims to increase the frequency to 133MHz and then 166MHz. The TriMedia compiler can be used with C programming, and handles the VLIW scheduling as part of the compilation processing.

A single-chip TriMedia based digital TV design called TM2 is due to be released later this year. The technology is already in use in a Samsung set-top box, while Polycom’s videconferencing unit uses two TriMedia chips. Philips' aim is that the top TV manufacturers will adopt the technology for their digital TV products, opening up a huge market.

Video Developments

JVC has developed the DualCam, which is a combined VHS-C camcorder and digital still camera. The digital camera section can store up to 44 pictures in flash memory in the standard mode, or up to 22 pictures in the fine mode. These stills can be displayed as thumbnail images on the camcorder's LCD screen or fed to a PC. They can also transferred to VHS-C tape. The DualCam Model GRX880 is due to be released in May.

Sony has developed a new videotape library system known as SmartFile. It stores information about the programmes recorded on a tape in a memory IC inside the cassette label. Stored details include programme name, channel number, date and length. VCRs for use with the system are equipped with two SmartFile sensors to read the data and display it on the TV screen being used. One sensor is on the machine's front panel, the other inside. Sony is to launch the system in the UK later this year.

More on these new technologies in next month's CES report.

The Sharp Viewcam Model VLDC3H is a highly compact (167 x 101 x 73mm) digital video cassette system that weighs just 595g. It has a 4in. LCD screen, a 270° rotating lens and provides several special effects such as still and strobe. Maximum recording time is two hours in the standard mode, 50 per cent extra in the long-play mode. Price is around £1,500. An optional digital stills unit, Model VR3SUP, is available for an extra £300.
The Peak DCA50 Component Analyser

The DCA50 provides a simple, fast method of determining what an unknown device is and its pin connections. Michael Dranfield finds it an invaluable aid for the service department.

If, like me, you find data books a real bind when checking transistor pin connections, you need the new DCA50 Component Analyser from Peak Electronic Design Ltd. Though measuring only 13 x 6.5 x 3cms, it's a very advanced semiconductor device checker.

What it Does
The DCA50 automatically identifies the nature of almost any bipolar or MOSFET transistor, diode or LED when the device is attached to its clip-terminated, colour-coded connecting leads. You simply connect the unknown device to the gold-plated crocodile clips, any way round, then press the small, blue recessed button to start the test routine. After a couple of seconds the large, clear two-line character liquid-crystal display (6.5 x 1.5cm) presents the results. The finding is displayed for about twenty seconds - even when the device under test has been disconnected.

On Test
As a first test I connected a 2SC 1815 transistor to the clips. It's a general-purpose Japanese transistor. After pressing the button and waiting briefly I was greeted with the following information: NPN transistor, Hfe 380, RGB = EBC. The latter indicates that I had connected the emitter to the red lead, the base to the green lead and the collector to the blue lead. Truly amazing!

The current gain (Hfe) finding for a bipolar transistor could be very useful for engineers who deal with audio/hi-fi equipment, where an amplifier might require a matched pair of transistors to provide optimum performance.

I must say that I was surprised to discover the extent to which the gain of a bipolar transistor can vary, even with devices that have come from the same batch. I checked ten 2SC1815 transistors taken straight off a bandoleer and found that the Hfe figure varied between 90 and 400. Presumably the Thorn T numbered transistors, such as the T9053, were gain-selected BU devices.

The DCA50 can display gain figures from 5-995. In the case of high-gain Darlington types, such as the TIP110, a small arrow is added next to the figure 995 to indicate that the gain exceeds 995.

In the unlikely event that the DCA50 cannot identify the device you have connected to it, the message "no valid part found" is displayed. This message also appears if the device is defective or its operational parameters are outside the limits listed in the User Guide.

With a diode or LED you simply use any two of the test leads. When an LED is tested its anode and cathode are identified and the device flashes on and off. No current-limiting resistor is required -- the DCA50 limits the test lead currents internally to very safe levels. With a zener diode you can check the polarity but not the reverse breakdown voltage.

A useful feature is the ability to check three-terminal, surface-mounted double-diode networks. These are used extensively in camcorders but look just like a surface-mounted transistor. The DCA50 detects the two junctions and alternates its display between them, telling you whether there is a common anode or a common cathode.

Most MOSFET transistors can be checked, the DCA50 indicating the gate, drain and source connections, also whether the device has a p or an n channel. The rare depletion-mode MOSFET cannot be checked.

In General
The source of power is a PP3 (or equivalent) battery -- one comes with the unit. Should the battery voltage drop below 7-8V the DCA50 displays the message "warning low battery" before it starts to carry out a test. The battery should last for up to eighteen months. There is automatic power on and power off.

The unit has two good-quality fibreglass PCBs inside. One is fitted with a custom-programmed PIC16C64 microcontroller and six smaller chips -- all surface-mounted. The other one holds the liquid-crystal display and its driver chips.

This is a good-quality piece of test equipment that should provide years of service. I have found it to be invaluable.

The DCA50 does not seem to be available through any of the large distributors. It can be bought direct from Peak Electronic Design Ltd., 70 Nunsfield Road, Buxton, Derbyshire SK17 7BW at an all-inclusive price of £59. Peak's telephone number is 01298 70 012, the fax number being 01298 70 046.
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Amstrad SRD510
If the problem is patterning that sweeps vertically and is especially easy to see on dark scenes, first try replacing C46 (470μF, 10V). If this doesn't clear the fault, replace C86 (100μF, 16V) which is next to TR9.

If you repair Amstrad receivers on a regular basis it's worth getting a hundred 47kΩ 0.75W metal-film resistors, part no. 337-377, from Farnell Electronic Components (phone 01132 636 311). These resistors are rated at 350V. Fit them and you will never get a comeback again.

Pace SS9000
The owner of this set was new to the area. After moving in he found that his receiver refused to power up with the dish connected. I was told that the power supply had been rebuilt some months previously.

After checking for feeder shorts etc. I turned attention to the power supply. With the set on the bench it was obvious that even without an LNB connection the supply line voltages were much too low - the 5V line was at nearer 3.8V. Scope checks showed that the electrolytic capacitors on the secondary side of the supply were intact, but I replaced them all anyway because they were the original ones which do tend to dry out. I then replaced the usual items on the primary side - the 100Ω resistor R5, the 1μF capacitor C11 and the potential divider that supplies pin 7 of the TDA8380 chopper control chip U23 - though their values were all correct. Further checks showed that the voltage at pins 14/15 of U23 was a little high. When the 0.22Ω fusible resistor here (R13) was checked it was found to have risen to almost twice the correct value. As a result, the power supply was in the current-limit mode. A replacement of the specified type restored correct supply line voltages and cured the fault.

Hwa Lin Modulators
Pace SS9000/9200 series receivers, also the D100 and D155 MAC decoders, use Hwa Lin UHF modulators. In recent weeks I've had three separate SS9200 receivers and one D150 decoder that have produced good pictures via the scart socket but poor video quality with the UHF output.

The symptoms were tearing on captions and wobblly verticals. No amount of TV receiver fine tuning helped.

The culprit is soon found when you remove the modulator's cover. A 1μF capacitor, normally green, is used for video input coupling. It's next to the preset resistor and the third modulator pin from the left-hand side of the can, looking in from the rear of the receiver (main input socket on the left).

For good measure, also replace the other two electrolytics in the can - the adjacent green one is 0.1μF, the black one by the intercarrier sound coil 10μF.

The problem must be coming to light now that these capacitors have taken their maximum dose of heat as a result of living inside the receiver.

The modulator in Model SS9000 is slightly different, with two inter-carrier sound coils. I've not as yet had the capacitor problem with this one - probably because fewer of these receivers are still in use.

Pace MSS100
One of our customers rang to complain that a flashing, unset clock was always present with radio reception. TV channels didn't display the clock. The clock display on a blank radio screen can be switched on and off by pressing the i and store buttons in quick succession - whether or not the menus are locked with a PIN.

I've never really understood the clock feature with Pace receivers. If the mains power is removed, even briefly, the time is lost. In this part of the world (Portugal), where power supply cuts are fairly common, it's barely worth setting the clock with a new installation. It would, ideally, be nice to have the clock retain memory - even limited - in the event of a power supply failure, or to have the facility in the set-up menu to add or delete the clock. Failing this, how about replacing the flashing clock, when it's not set, with just a non-flashing "clock not set" message?

The Green Box
A few weeks ago I installed a number of Pace MSS100 receivers at holiday villas. With one exception, each villa had its own fairly recently installed terrestrial TV aerial, with good quality coaxial cable. As the cable route into the villas was a bit difficult, I decided to use the existing cables where possible, with diplexers to combine and split the terrestrial and satellite TV signals.

There was an urgent request to install a system at one of the villas late on a Friday afternoon. The two adjacent villas were to be fed from the same dish on the following Monday. As they were occupied at the time, I didn't have access to them.

I diplexed the satellite IF signal into the existing terrestrial aerial cable and was rewarded with good results. At the time I didn't take much notice, but one of the villas to be visited on the Monday didn't have a terrestrial TV aerial on the roof.

When Monday came I had access to the other two villas. My first job
was to locate the existing cable routes. The first villa had good local TV reception, and I then recalled the absence of a terrestrial TV aerial.

Eventually I found a small plastic box outside, with the feeds from the roof. This included Friday’s satellite IF feed. The box’s inputs and outputs were linked by simply being twisted together — for good measure the connections had corroded and gone green! It was a surprise that everything had worked so well on Friday, with no evidence of HF roll-off or the odd weak channel. The satellite IF signal was present at the TV aerial socket, along with the DC voltage for the LNB.

In the end I fed the three adjacent villas via a magic switch, with the terrestial signals fed to it from one aerial. This worked well, and made one of the existing two terrestrial TV aerials redundant.

Another villa gave me a headache as the coaxial cable, which was in an underground pipe, provided good terrestrial reception but didn’t have DC continuity. It was well and truly stuck, and couldn’t be moved. A lot of drilling through thick walls was required to bring a new cable into the villa.

In another case the satellite signals ceased within a few hours. The cause was a poor connection inside the diplexer, between the F socket’s inner pin and the PCB.

Pace SS9000/9200
I normally carry a Pace remote control unit with me in the car. Some customers lose their remote control units and are content to use the front panel controls to change channels. At one such customer’s house I had to do some retuning and had left the remote control unit in the workshop. Fortunately you can, with the SS9000/9200, use the front buttons to tune and store channels.

When you press standby and channel up at the same time the normal tuning menu appears. The up/down buttons then have the same functions as when you tune via the remote control unit. To go down through the tuning menu you press standby alone — this is the same as pressing setup with the remote control unit. To store a channel you press channel up/down and standby at the same time, then select the number you want to use to store the reprogrammed channel via the up/down buttons. Store again by pressing all three buttons at once.

Universal Remote Controls
Quite a few of our customers use these nowadays. They abuse them just the same. This particular one had a small green LED that should flash twice when the initial TV/sat receiver code was correctly entered, but all it did was to flash when the batteries were installed. After that it did nothing.

When I cleaned up the PCB, though there wasn’t much evidence of dirt on it. This made no difference. So I opened the unit again and noticed some muck between two of the pins of a large, surface-mounted IC. Once I’d carefully cleaned up around the chip and applied power, normal operation was resumed. H.C.

Cambridge RD480
All sorts of erratic operation problems with these receivers can be caused by dried out capacitors in the power supply. Known culprits are C47 (22µF), C38 (0.47µF), C39 (10µF), C16 and C20 (both 1µF) and C173 (100µF). We now replace all these capacitors as a matter of course. It generally makes further investigation unnecessary. A.S.

Panasonic TUSD200
There was no display though the power supply worked. Checks on the secondary side of the circuit showed that the voltage at the cathode of the 14V supply rectifier D14 was low. Its associated reservoir capacitor C21 (2200µF, 25V) looked a little brown on top and turned out to be the cause of the fault.

Another problem was that the centre pin at the aerial input had moved back into the socket. It can be pushed back from the rear then secured with some Araldite. I’ve had several of these Pace receivers (PRD800/900 series) with this fault. I.R.

Lightning Trouble
The owner of a Pace MSS200 receiver phoned to say that his house had very nearly had a direct lighting hit. This had caused various problems one of which, unsurprisingly, was the satellite system now permanently displaying the “LNB Short-circuit” message. The telephone line enters the house near the dish. As the phone/fax no longer worked, it was likely that the LNB was indeed faulty. In addition to the lightning, a small hurricane had brought down trees in the vicinity.

When I replaced the LNB I was greeted with the same message. A replacement receiver then produced normal results — once the dish had been realigned (it had adjusted itself very nicely for reception of the Eutelsat bird at 16°E!).

At this point I beat a hasty retreat to the workshop with the suspect LNB and the faulty receiver. The LNB turned out to be dead. The receiver worked normally when not supplying any LNB power: the correct H/V voltages were present at the receiver’s F socket, but the slightest load (in this case a satellite signal meter) reduced the voltage with the result that the overload detection circuit came into operation and the pink screen message appeared.

The culprits turned out to be R452 and R208, which were open-circuit. They are both 182 resistors and are connected in parallel between the 14V supply and the collector of Q25, at the front of the PCB — roughly in the middle.

I cleaned up the PCB but there wasn’t much evidence of dirt on it. This made no difference. I opened the unit again and noticed some muck between two of the pins of a large, surface-mounted IC. Once I’d carefully cleaned up around the chip and applied power, normal operation was resumed. H.C.

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SATELLITE
Personal computers can provide scope for a worthwhile extension of the service engineer's activities. Upgrades in particular are often requested, but there can be problems with these. Colin McCormick provides guidance on what can be done and the snags that can arise. The article is in two parts, to be concluded next month.

It is all too easy to fall into the belief that building or upgrading a PC is simply a matter of fitting the parts and installing the relevant drivers. In a good day this can be the case, but there are many pitfalls that can result in wasted time and money and a poorly performing PC. In this article, which is not claimed to be exhaustive, some of the difficulties I've encountered will be described.

It's assumed that the reader is aware of the main items in a PC and what they do. We will be considering relatively modern machines. The intention is to provide advice on some of the main areas that cause problems for those who build and upgrade PCs, rather than to tell the reader how to build a PC.

**Processors**

No one would today contemplate building a PC with a processor of 486 or earlier specification. This is not to say that a high-performance 486 is of no value: it would simply not make economic sense to use one. Many people assume that an Intel Pentium is the processor to use. This is fine if finances allow, but there are alternatives worth considering. In particular the AMD K5 and K6 and the Cyrix 6X86, which is also sold under the IBM name, all fit the Socket 7 standard Pentium class motherboard. But the fact that a processor fits doesn't mean it will work: the motherboard's instructions will have to list the processor you specifically want to use.

The AMD K5 for example is a conventional Pentium equivalent. While the K5 PR133 and earlier processors are now becoming obsolete, the K5 PR166 is still widely available at a very reasonable price, offering excellent value. It runs at 166MHz internally: the motherboard is set to run at 66MHz (bus speed). The other motherboard settings you need to know are the multiplication factor and the supply voltage. With the K5 PR166 the nominal supply voltage is 3.52V, but the device will work between 3.45V and 3.6V.
The bus speed, multiplication factor and supply voltage information for each processor type will often be found in the motherboard’s instructions, but not always. Sometimes the instructions merely list the various settings available, so you must know what settings are required for the processor you wish to fit. This information is often available at the processor manufacturer’s web site, for which you need internet access of course.

Sometimes the settings are not as obvious as they appear to be, for example processor speed. Non-Intel processors have a PR rating, which is a Pentium equivalent performance figure. The K5 PR100 does run at 100MHz, but the Cyrix 6X86 PR200+ runs at 150MHz. Although the 6X86 PR200+ claims to have somewhat more processing power than the Pentium 200 – hence the name PR200+ – in practice this is an optimistic claim.

The AMD K5 PR166 processor has an unusual multiplication factor, 1.75, which is preset within the chip. The motherboard’s multiplication factor will not have any effect on the processor’s operation, but for neatness set it as though the processor is a Pentium 166MHz. Table 1 lists the settings for various processors – it has been compiled from the best information I have available. Contradictory information is sometimes issued, and manufacturing processes keep changing – so don’t blame me if this list is not flawless!

MMX is one of the newer processor technologies. AMD K6 series chips and the Cyrix/IBM 6X86MX (may be referred to as M2) as well as the Pentium MMX itself are all MMX compatible. It provides a modest performance gain, but again the motherboard will have to be able to work with such a processor. These processors require dual voltage supplies, for their I/O interface and for the core. If your motherboard says it’s MMX compatible, it should meet this requirement – even if the instructions on how to achieve this are less than clear.

A word of warning about Cyrix/IBM 6X86 processors: some motherboards claim to be able to work with them but won’t. The reason for this is as follows. Earlier 6X86 (C028 process) versions require a 3.52V supply. Later ones (C016 process) require a 3.3V supply. Later ones again (6X86L) require dual 3.3V and 2.8V supplies. The instructions for some motherboards say that a 6X86 processor can be used, but this may not be true of all versions. Be sure that your motherboard can provide the correct supplies before you consider using one of these processors. If you obtain a 3.52V version, note that it requires a special high-power cooling fan rather than the normal Pentium type.

There have been reports that certain applications won’t work with these chips. The cause may not be with the processor but with the fact that some badly written software relies on loops in the code for timing: the processor outwits these loops, so the applications fail. Ways of dealing with this are often to be found on the internet.

Because of bus driving capability, earlier versions of the 6X86 can cause problems for users of Windows NT4. For such users the 6X86L is advisable.

Some non-Intel processors, such as the 6X86 PR200+, require a motherboard speed of 75MHz. Since no Intel processors require this, Intel motherboards don’t provide it. This is not as selfish as it may sound. If the motherboard is run at 75MHz, the PCI (Peripheral Component Interconnect) bus must run at half this speed, i.e. 37.5MHz, which is higher than the 33MHz that’s guaranteed to work. Some PCI devices, such as video cards, might not work properly though modern cards should be OK. Some processors require a 3-5X clock multiplier, but not all motherboards have links for this. In this case the 1-5X setting may be identical to 3-5X – you can’t tell until you try it!

The new Cyrix MediaGX processor is not Socket 7 compatible. It incorporates much of the multimedia processing on-chip. Intel Pentium II processors require a motherboard with the Intel Slot 1 rather than (or as well as) Socket 7. The Pentium Pro processor requires a special motherboard: it’s intended mostly for commercial applications that use Windows NT.

Note that Pentium class processors take a fan and heatsink that clip on the motherboard’s Socket 7, whereas 486 processor fans clip on the processor itself. Use of some heatsink compound is highly recommended. The fan usually takes power via a plug-and-socket arrangement which is in line with the power supply to the hard disc or suchlike.

**Motherboards**

From the above it may seem that selection of a motherboard is simply a matter of finding one that satisfies the requirements of all the processors you might ever want to use with it. A range of motherboards with varying performances is available however, fitted with chip sets from different manufacturers. Intel is one of the largest, and just as with selection of an Intel processor an Intel motherboard may be the way to achieve a hassle-free system, though not necessarily providing the best value for money. Intel’s current offerings have either an economy chip set called VX, a higher-performance one called HX or the latest which is called TX. These chip sets may also be used with motherboards from other companies. There are alternative chip set manufacturers such as OPTi and SiS, also ranges called VXPro, HXPro and TXPro. These latter illustrate some of the good and bad points of using a board other than an Intel one.

One of the cheapest motherboards is the PCChips M537 VXPro which I have installed, with an AMD

![The PCChips M537 motherboard.](image-url)
K5 PR166 processor, in my own PC. It can be bought for around £50. This looks like excellent value, and within certain constraints it is. One problem is that none of the currently available tape streamers will work with its floppy interface. The reason for this is that all new tape streamers (over 1Gbyte capacity) require at least a 1Mbyte floppy interface instead of the older 500Kbytes standard. Another problem is that if a hard disc that has a previously installed version of Windows 95 is used with the motherboard the IDE (Integrated Drive Electronics) interface is not properly recognised. As a result, Windows 95 drops to a slower 'compatibility mode'. This can be overcome by installing driver software, which is very painful: the best solution is to wipe Windows 95 and reinstall it. One final problem can be failure of the board to identify the floppy drives correctly, and the A/B swap facility not working correctly. So installation can be slower 'compatibility mode'. This can be overcome by installing driver software, which is very painful: the best solution is to wipe Windows 95 and reinstall it. One final problem can be failure of the board to identify the floppy drives correctly, and the A/B swap facility not working correctly. So installation can be

Connections

The case's front panel connectors (reset, lock and turbo switches and LEDs and the speaker) will usually fit any modern motherboard with only a modest amount of messing about. Motherboards tend to supply a signal to the front panel to indicate whether the board is in the turbo or low-speed mode, but the case's front panel sometimes doesn't have a cable for this – the signal is taken directly from the turbo switch. Care needs to be taken when fitting the fiddly front panel connectors: it is possible to short across the 5V line, which could result in track damage. I usually check everything out with a meter initially – even then it's possible to get the lock/unlock or turbo/slow conditions crossed.

Some cases have a two or three seven-segment LED display at the front. Typically this will show the processor's speed or PR rating in MHz when in the turbo position and some other parameter in the slow-speed position. Years ago this would have been something like 20 (MHz) turbo and 8 (MHz) slow. The slow position has become increasingly meaningless over the years however – modern processors still go like the wind even when asked to run with the brakes on! You can get the display to read "LO" in the slow position if you have a mind to, but fitting the links on the PCB behind this display can be very tricky to get right unless you have the appropriate instructions – or just as tricky if you have them!

Some power supplies have one motherboard connector, others have two. If there are two, they are inserted together so that the black wires are side by side. I often superglue the connectors together in this way to prevent subsequent confusion.

Testing

Each time I build a PC I am reminded that on the previous occasion I vowed "never again"! Possibly the most terrifying moment comes when you have fitted the processor, memory and video card to a brand new motherboard. You will have spent some time hoping that you have understood which links go where, and double-checking them, especially the supply voltage ones. You then switch on and hope that the BIOS (Basic Input/Output System) start-up screen will appear. Maybe it will. Or maybe you will get some ugly beeps from the speaker. It is unlikely that the motherboard's instructions will be so helpful as to tell you what the particular bit of Morse code you have just heard actually signifies, but it may be telling you that there is an impermissible memory configuration or that the video card isn't working. The worst that an happen is that you get nothing when you switch the PC on – no beeps, no display, nothing whatsoever. Have you made a mistake that has destroyed the processor, motherboard, memory, video card or a combination of these? It can happen, but you would be very unlucky if it did.
If you have just built or upgraded a PC and you get no results or nasty sounding beeps, you must start by stripping all the non-essential items off the motherboard. Leave the board with just the processor, memory and video card. Once you have that working, add the floppy and hard discs followed by niceties such as the sound card and interfaces for scanners, tape drives etc. It might seem like hard work to do this stripping down, but it’s the only way of getting to the bottom of a seriously unwell PC.

A good example is what happened when I added some memory to my own PC recently. After doing this there was no display and the PC wouldn’t boot up. I removed the new memory and it still didn’t run. The cause of the problem was the video card, which had been pushed by some cables and didn’t make proper contact in its PCI slot.

The Case
Before you contemplate the upgrade of a PC’s motherboard, be sure that the case is a standard one. Some manufacturers, such as Dell, Hewlett-Packard, Compaq and Packard Bell, have built PCs using their own layout. Such PCs often won’t accept a standard replacement motherboard. They may also have some functions such as the video driver built on to the motherboard, so these will also have to be replaced.

Most slimline desk-top PCs have non-standard arrangements. Do not upgrade the motherboard in such a PC you will probably have to buy a new case and whatever other items may be non-standard, such as the memory, floppy drive, keyboard and mouse. It may be simpler to discard the lot and start afresh. For this reason I would advise against purchasing a PC of this type in the first case. Some upgrades to this type of PC might be possible however, such as the processor or hard disc. You are likely to need the motherboard instructions to be able to check for compatibility.

Memory
Most memory is these days supplied as either 72-pin SIMMs (Single In-line Memory Modules) or 168-pin DIMs (Dual In-line Memory – the other m got lost somewhere along the line!). The latter is the new, faster standard, but is more costly. A Pentium-class motherboard with 72-pin SIMM sockets can use conventional 72-pin SIMMs DRAM “fast-page mode” memory left over from a 486, but a modest performance improvement will be obtained by using the now cheaper EDO (Extended Data Out) SIMMS.

Synchronous DRAM (SDRAM) is now available at a higher cost, and runs at the full motherboard speed. But on many boards the two types cannot be mixed. DIMs are a bit more complicated. They come in 3.3V and 5V versions: a motherboard with DIM sockets can use 3.3V or 2X 75MHz or 2X 50MHz memory they are supplied as either SIMMs or DIMs, but mixtures of the two types are not permissible, or that they cannot be fitted to obtain various amounts of memory.

Further confusion can arise because not all 72-pin SIMMs are the same, particularly 8Mbyte ones which can be single- or double-banked (often called single/double-sided, which is not entirely accurate). Some motherboard instructions may say that certain combinations that don’t work are permissible, or that they won’t work though they do! Experimentation may be the only sure way to find out: no damage should arise.

Most modern 468 and Pentium PCs do not require parity (ninth check bit) at their 30-pin or 72-pin SIMMs, but there are exceptions. Some 468 motherboards provide selection of parity or non-parity memory in the BIOS set up.

Older motherboards, including some 486 ones, use 30-pin SIMMs. These are now expensive. With most systems they need to be fitted in pairs. They can be fitted singly in a 468 PC. DIMs can always be fitted singly. Most motherboards have listed in their instructions the combinations that can or cannot be fitted to obtain various amounts of memory.

Table 1: Processor settings

<table>
<thead>
<tr>
<th>Processor</th>
<th>Motherboard speed (MHz)</th>
<th>Multiplication factor</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pentium-75</td>
<td>50</td>
<td>1.5X clock (50/75MHz)</td>
<td>–</td>
</tr>
<tr>
<td>Pentium-90</td>
<td>60</td>
<td>1.5X clock (60/90MHz)</td>
<td>–</td>
</tr>
<tr>
<td>Pentium-100</td>
<td>66</td>
<td>1.5X clock (60/90MHz)</td>
<td>–</td>
</tr>
<tr>
<td>Pentium-120</td>
<td>60</td>
<td>2X clock (60/120MHz)</td>
<td>–</td>
</tr>
<tr>
<td>Pentium-133</td>
<td>66</td>
<td>2X clock (66/133MHz)</td>
<td>–</td>
</tr>
<tr>
<td>Pentium-166</td>
<td>66</td>
<td>2.5X clock (55/166MHz)</td>
<td>–</td>
</tr>
<tr>
<td>68X68 PR120+</td>
<td>50</td>
<td>2X clock (50/100MHz)</td>
<td>–</td>
</tr>
<tr>
<td>68X68 PR133+</td>
<td>55</td>
<td>2X clock (55/110MHz)</td>
<td>(1)</td>
</tr>
<tr>
<td>68X68 PR150+</td>
<td>60</td>
<td>2X clock (60/120MHz)</td>
<td>(2)</td>
</tr>
<tr>
<td>68X68 PR166+</td>
<td>60</td>
<td>2X clock (66/133MHz)</td>
<td>(3)</td>
</tr>
<tr>
<td>68X68 PR200+</td>
<td>75</td>
<td>2X clock (75/150MHz)</td>
<td>(4)</td>
</tr>
<tr>
<td>68X68MX PR166</td>
<td>66</td>
<td>2X clock (66/133MHz)</td>
<td>(5)</td>
</tr>
<tr>
<td>68X68MX PR200</td>
<td>66/75</td>
<td>2.5X 66MHz (5)</td>
<td>–</td>
</tr>
<tr>
<td>68X68MX PR233</td>
<td>75</td>
<td>2.5X clock (75/187MHz)</td>
<td>(5)</td>
</tr>
<tr>
<td>AMD K5 PR75</td>
<td>50</td>
<td>1.5X clock (50/75MHz)</td>
<td>(6)</td>
</tr>
<tr>
<td>AMD K5 PR90</td>
<td>60</td>
<td>1.5X clock (60/90MHz)</td>
<td>(7)</td>
</tr>
<tr>
<td>AMD K5 PR100</td>
<td>66</td>
<td>1.5X clock (60/100MHz)</td>
<td>(7)</td>
</tr>
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<td>AMD K5 PR120</td>
<td>90</td>
<td>1.5X clock (60/90MHz)</td>
<td>(8)</td>
</tr>
<tr>
<td>AMD K5 PR133</td>
<td>66</td>
<td>1.5X clock (60/100MHz)</td>
<td>(8)</td>
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<td>AMD K5 PR166</td>
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<td>1.75X clock (66/116.6MHz)</td>
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<td>AMD K6 PR166</td>
<td>66</td>
<td>2.5X clock (66/166MHz)</td>
<td>(10)</td>
</tr>
<tr>
<td>AMD K6 PR200</td>
<td>66</td>
<td>2X clock (66/200MHz)</td>
<td>(10)</td>
</tr>
<tr>
<td>AMD K6 PR233</td>
<td>66</td>
<td>3X clock (66/233MHz)</td>
<td>(11)</td>
</tr>
</tbody>
</table>

(1) Few boards work at 85MHz.
(2) Same as Pentium-120.
(3) Same as Pentium-133.
(4) 75MHz motherboard.
(5) 2.8-3V core. With 68X68MX PR233 see (4).
(6) Same as Pentium-75.
(7) Same as Pentium-90.
(8) Set multiplier links to 2X.
(9) Set multiplier links to 2.5X.
(10) 2.9V ±145mV 7.5A supply.
(11) 3.2V ±100mV 10.5A supply.

Notes
**Amstrad SR950+**

"I've written my diagnosis on the label" the customer said.

"That's helpful" I replied, "but I can't read it and I'd prefer to know the symptoms."

"Symptoms? Ah, symptoms. I didn't get where I am today without knowing how to describe a symptom. It's the tuner. Faulty."

As Dr Smith is getting on a bit I asked questions (and answers) about the most usual UK satellite receivers, and some 'bar-tals, warts and all! There are also frequently unedited and unexpergated original e-mail information.

**Toshiba TS540**

The TS540 is actually the Pace MSS500. This particular one had a cool. No, you won't need an ambulance. Just bring your car - and, er, don't forget your cheque book."

They are unedited and unexpergated original, unesoterised, untranscribed notes that Pace recommends.

The final invoice was rather high compared with say a PRD800 receiver repair, and the customer declined my offer to fit a miniature cooling fan. I didn't mind. "See you again in twelve months" I said cheerfully to the customer, who is one of those who likes to keep his equipment nice and warm.

TV, Video and Satellite Servicing

Lots of people are taking advantage of my free help service via e-mail. But some forget that I handle only satellite receiver repairs. Anyone in the TV trade who would like to join an e-mail self-help group that deals with TV sets and VCRs should contact Chris Davies by e-mail at:

dad@deathsdoor.com

or try the following Web page:

http://www.geocities.com/CapeCanaveral/Lab/116

Jon Lye runs a bulletin board - phone 01275 879 005. Contact Chris Davies if you want further e-mail information.

Previous issues of Satellite Workshop are now available via the SatCure website:

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

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**Satellite WORKSHOP**

The SR950+ is actually a rebadged SRD700. Tuner faults are usually bad news with these receivers: most of the video and sound demodulation circuitry is incorporated in the tuner, which is therefore very expensive. I feared the worst when I connected the LNB cable and saw very sparkly pictures. I tried the tuning mode, but that didn't improve matters at all.

Rather than condemn the tuner outright, I decided to check whether the cause of the problem might be a faulty electrolytic capacitor. Inspection of a dead tuner from another of these receivers revealed that C41 (10µF) is mounted close to the IC, and is thus the most likely capacitor to suffer from excessive heat. As removal of the tuner takes about half an hour, I connected a new 10µF capacitor across the relevant print pads (see Fig. 1) then switched on. My guess proved to have been correct: the picture was now perfect. So I phoned Dr Smith.

"Hello, doctor. The patient has been cured and the prognosis is good - provided you keep her cool. No, you won't need an ambulance. Just bring your car - and, er, don't forget your cheque book."

When the LNB was connected to the receiver there were bad black and white sparklies on several channels. This is quite a common effect with some Pace tuners when the receiver has been in a cold place for a time. On this occasion however use of the hairdryer to warm the tuner produced no improvement. Even with the AFC set to manual some sparklies remained. I decided that the tuner was faulty.

A rather more delicate task to remove the display panel without cracking it in half, so I soldered the replacement capacitor across the pads on the back of the board instead. Since the original electrolytic capacitor goes open-circuit when it fails, I see no problem with this 'bodge'. It saves time and avoids calamities. The trick lies in knowing the exact position of C2.

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Grundig GRD150
For some reason I've had a lot more trouble with these receivers than with the average Pace or Amstrad model. Though the receiver is inherently more reliable, or was during the guarantee period, the faults that are now occurring seem to be difficult ones to trace. Perhaps this is because most of the signal processing is carried out by an "application specific integrated circuit", which is a 64-pin, surface-mounted device.

Anyway the receiver that came to me on Christmas Day (yes, people really do need to watch satellite TV that badly!) was "stuck in standby". It would light up but didn't respond to button presses. This was tricky.

After checking the power supply voltages I jumped in with both feet and replaced the microcontroller chip and its associated crystal. I was clutching at straws - and I was wrong. It had to be something that's connected to the I2C data bus. Maybe the EEPROM.

But wait a minute - the tuner is also connected to the data bus. Maybe the EEPROM.

I was wrong. It had to be something that's related to the I2C data bus. May be the EEPROM. Maybe the EEPROM.

But wait a minute - the tuner is also connected to the data bus. As I looked across to it I spotted a crack which had propagated from the tuner securing lugs across two adjacent tracks. Repairing these cured the fault.

The pub owner's wife was impressed by my speedy service. Her husband was less impressed with my invoice - but he still drew me a pint.

Pace PRD800
Christmas time always brings some curious faults - and some curious people as well. In walked this fellow who was wearing a red coat with hood and sported a snow-white beard. He pulled a PRD800 out of his sack.

"Just on me way t' school" he mumbled, "gotta give out t' presents t' kids you know. Dam satellite won't tune above 11-573. All I get is snow. Missing me Eurosport. Faulty fuse, I'll bet. Bung us in another, ta." He then shuffled outside into the snow and disappeared.

Sure enough there were no programmes above a certain frequency. At first I thought that the power supply might be switching my universal LNB to high-band operation, but there was no sign of interference on the supply rails. Unconvinced, I fitted a new tuner. It made no difference at all. When I monitored the tuning voltage I found that above a certain frequency it switched from 1.6V to 4.8V and stayed there. This couldn't be caused by anything other than the Nicky IC.

So I replaced it with my invoice - but he still drew me a pint.

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But one of the field scan coils. How could this have anything to do with interlacing?

Another technician had a look at the screen and told Ray that there was an interlace fault. What he was seeing was interline flicker. The text display was interlaced: it shouldn't be. He drew Ray's attention to pin 27 of IC001 and to Q009 nearby. The IC pin passes a 25Hz squarewave to the transistor, whose collector is connected to the earthy side of the field scan coils: it's purely an output device, the field ramp generator and sync sections being within the mighty signal processor chip.

An oscilloscope check at pin 43 (vertical output) of IC201 showed a ramp waveform which remained the same when the set was switched between picture and text displays. It wasn't very clear to Ray which of the two big chips contained the text decoder, but this didn't seem to matter as the decoding was OK: the data on the screen was correct - but flickery. There are only two links between IC601 and IC201, the ramp output from IC201 and a feedback network that takes in the height control. Both of them appeared to be in order, and the field scanning was full and linear. Where next?

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How does this circuit work - and why wasn't it doing so in this particular set? See page 365 for the solution.

Test Case 423
Poor old Cathode Ray! He'd no sooner mastered phasing up a Sanyo VR150 deck than he got involved with a pumping Thomson TV set. This had to be put to one side while he pondered a mistracking problem with an urgently required Panasonic S-VHS VCR. He'd hardly found where the oscilloscope probes were to go when the wretched loudspeaker above the workshop door summoned him to the office to be sent off to watch his Wallace and Gromit tape.

Another problem Ray encountered was a poor quality picture. He checked the power supply and all was well, but there was still a flickering effect. The problem was that the electron image flickered. Ray assessed the set's performance carefully. The off-air pictures were OK, but the captions and graphics on text pages had a flickering, skimmering effect. Not vertical judder exactly, but more lively and disturbing to watch than the text displays produced by other sets in the workshop.

Ray kicked off by feeding a signal from another set to the Hitachi receiver's scart socket. As before, the picture was OK but the text flickered. A close examination of the text display revealed that there were no clearly visible scanning lines: with the other sets in the workshop, the text displays had a coarser but 'steady' line structure. So the problem had to be something to do with the field scanning. Off came the back, and out came the circuit diagram. Most of the circuitry in this 1996 design is contained within two 52-pin chips, an SAA5296 microcontroller (IC001) and a TDA8361 signal processor (IC201). Apart from the power sections there's very little else.

IC601 provides the drive to the field scan coils: it's purely an output device, the field ramp generator and sync sections being within the mighty signal processor chip.

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How does this circuit work - and why wasn't it doing so in this particular set? See page 365 for the solution.
Closed-circuit TV for surveillance is now readily available and cheap. The basic camera can be connected to a scart or RF input or viewed using its own monitor. But the facility of being able to record what’s going on, using a time-lapse VCR, is still very expensive. This article describes a way of using a domestic VCR to record short bites of scenes viewed by a camera. The recording process can be triggered by sensors.

Initial System

My first attempt to use a VCR for CCTV recording was based on an old top-loading Ferguson machine which had a wired remote-control jack at the front. I used a relay to connect a 1kΩ resistor across the jack input to start recording. In the stop state an 18kΩ resistor was connected across the jack. The relay was controlled by a PIR set to two minutes in the ‘walk test’ mode. See Fig. 1. The camera’s video output was fed to the VCR, while its RF output was connected to a standard monochrome TV set that acted as a monitor.

This simple system was satisfactory, but there were drawbacks. The time required to lace up the tape resulted in some loss of the recorded event. Partial compensation could be achieved by triggering from a greater distance. A potentially more difficult problem to cure was the tape coming to an end while the VCR was triggered to make a recording. As the relay held the 1kΩ resistor across the VCR’s jack input for the duration of the record cycle, the VCR could go into a record/rewind mode, i.e. it would try to record and rewind at the same time! To prevent this, there always had to be enough tape left to run.

But customers who came in began to spread the word about the system, and I picked up some orders from garages and shops. It soon became obvious that an improved, universal design was required.

This simple unit, designed by Ian Rees, enables a standard domestic VCR to be used with a CCTV surveillance system to make short recordings

The redesigned universal trigger unit can be used with a large number of modern VCRs, including LP and ready-lace models, and can be set off by either normally-open or normally-closed sensors.

Circuit

Fig. 2 shows the circuit diagram of the trigger/timer unit. The timer section consists of a monostable switch — IC1 and its associated components.

If either an open- or a closed-circuit is applied to the relevant input, Tr1 or Tr2 will switch on as C1 or C2 charges. Relay RLY1 then pulses once, sending a record signal to the VCR via its contacts. A low at pins 8/9 of IC1a, via R4, sets IC1 in its timing mode. When the timing period ends, a high from the output of IC1d (pin 11) is fed via C4 to the base of Tr3, which switches RLY2 on momentarily to send a stop signal to the VCR.

Power for the unit is obtained from an unregulated 1A power supply of the type that can be purchased with a mains plug as part of its moulded casing. The output from this is fed to a 12V regulator (IC2) which is attached to a small heatsink. If required, the camera and/or PIR can be obtained from the same source.

Construction

There is nothing critical about construction of the unit. I have built it in several forms, including one which contained the timer, camera and PIR. If you have to use very long leads to trigger the inputs/outputs, screen them to prevent false triggering.

The regulator’s heatsink has to be positioned to dissipate its heat, which can be used to prevent fogging of the camera lens when this is mounted in the same case. If you use a bare PCB pinhole camera, you will find that it develops quite a bit of heat. One thing I learnt about these is that it’s a good thing to fire the camera up to find out which way the image will be presented. It seems that little care is taken with fitting the camera mosaic during manufacture. Four-to-one odds of it being correct are not very good!

Installation

Most of my installations have been in small shops, where
a pressure mat or reed switch on the door is all that's required. A PIR detector can be switched in at night to cover areas where conventional entrance may not be gained - PIR detectors used during normal shop hours tend to be triggered by staff, which is not satisfactory. Strategically-positioned pressure mats can be avoided by staff, reducing unwanted operation.

With domestic premises the unit can be triggered by conventional PIR/floodlight circuits at night, using a mains relay in the lamp auxiliary circuit to switch the timer. Some other method will be required during daylight hours: say a switch at the front gate.

Conventional PIRs can be used in daylight, but should be of the counting type to reduce false alarms as a result of changes in sunlight intensity etc. Other types of detector, e.g. break beam, are easy to incorporate.

The small PIRs used in burglar alarm systems have a normally-closed output when powered, giving an open state when triggered. They can be connected to the unit's NC input. Reed switches give a normally-closed output when a magnet is brought into close proximity, and can be mixed with PIRs by connection in series with the NC input.

Mats are normally-open until trodden on. They should thus be connected to the NO input. A reed switch can be made to operate as normally-open by arranging for a magnet to pass it, say as a door opens. All normally-open detectors are connected in parallel with the unit's NO input.

The trigger connections to the VCR can be arranged in several ways. My original top-loader VCR, switched by the two-resistor stop/start method, is still in use in my workshop. Two other alternatives are possible. The first requires a direct connection between the VCR's record and stop buttons and the contacts of RLY1 and RLY2. If preferred, a connection could be made to the equivalent VCR remote control unit buttons. The original lace-up time shortcoming remains. If a ready-laced VCR is used, this problem will be virtually eliminated.

The unit's momentary switching action reduces the end-stop/rewind/recording problem. Care is still required to ensure that a tape has plenty of run time, but rapid cycling against the end-stop no longer occurs. Note however that some VCRs just stop when the end of a tape is reached and don't automatically rewind.

The value of C3 determines the length of the recordings. Increasing its value increases the recording time: about two minutes seems adequate. In the standard play mode a four-hour tape will provide 120 triggers. With an LP machine this number will obviously be doubled.

**Results**

The system in the approach to my workshop is still triggered by a PIR in the 'walk' mode. I have a switch to disable it during the day, but covertly switch it on should this seem advisable. It's left on when the workshop is unattended - and has recorded some strange happenings!

The CCTV camera is a pinhole device with six infrared LEDs to illuminate the scene in darkness. The camera's 12V supply is taken from the trigger/timer unit. Its output signal is fed directly to the VCR's video input, along with audio from an electret microphone which is mounted in the camera's case.

Clarity is excellent, and playback just as good. I feel it important that callers know there is an active camera in operation, and display notices to say so. At least one monitor is on view to callers, showing their actions at all times.

Long before I fitted active CCTV I had a dummy decoy camera stolen (then thrown away outside). I continue to employ dummy cameras and, as it is accessible, camouflage the genuine one to prevent theft.

With professional systems the tapes are time stamped. This can easily be arranged by leaving a large clock in the camera's field of view.

Shops report that petty pilfering is greatly reduced. I find that dodgy characters are less inclined to hang about when faced with a monitor that displays their images.

**Components required**

- **R1, R3-6, R8** 2.2kΩ
- **R2** 47kΩ
- **R7** 1.5MΩ
- **C1, C2, C4** 470μF, 25V electrolytic
- **C3** 100μF, 50V electrolytic
- **C5, C6** 0.1μF, 30V disc ceramic
- **D1, D2, D3** 1N4148
- **IC1** CD4001 quad two-input NOR gate
- **IC2** LM7812 12V, 1A regulator
- **Tr1, Tr2, Tr3** BC639
- **RLY1, RLY2** Sub-miniature relays. 12V coil. One pole changeover

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**Fig. 2: Circuit diagram of the CCTV/VCR trigger/timer unit.**
Part 2 of Mark Paul’s guide to the terminology of digital TV makes a start on definitions of commonly used terms

The Language of Digital TV

In Part 1 last month detailed explanations of the most commonly encountered abbreviations used in connection with digital TV were provided. This time a start is made on defining the terms used. The series will be concluded next month.

Definitions

Access Unit With MPEG video, the coded representation of a picture. The term is also used for coded audio data. After decoding, the units are referred to as Presentation Units.

Algorithm Rule for solving a mathematical problem in a finite number of steps: a kind of flow chart or programme, providing a set of instructions/steps for solving a problem.

Aliasing A disturbance created by spectrum mixing when the bandwidth of a signal being sampled is greater than half the sampling frequency. The term comes from the word alias, which means an assumed name.

During A-to-D conversion, the analogue signal is sampled at a fixed rate, creating a digital signal that has less detail than the original signal. Fidelity to the original signal thus depends on the sampling frequency: the higher the sampling frequency, the better the fidelity.

Analogue Signal An electrical signal produced by a sensor such as a microphone, solid-state imager or camera tube. Consists of a varying waveform that corresponds with the original sound or image.

Asynchronous Lack of synchronism or correspondence with time. In IEEE 1394 serial data interface terminology, asynchronous means the transmission of data with varying time intervals between the characters, and transmission of data as available.

B Picture Coded picture obtained from I and P coded pictures by bidirectional interpolation. The picture is coded using motion-compensation prediction from past and/or future I and P pictures.

Baseband Term used for the frequency band occupied by an analogue or data signal prior to modulation or after demodulation.

Block In JPEG or MPEG compression, an 8 x 8 pixel section to which DCT is applied.

Buffer A data storage device used to provide at its output a constant data flow rate.

Burst Errors Name given to multiple errors that occur in a short time, with relatively longer in-between, error-free periods.

Channel Coding Also referred to as Forward Error Correction. Addition of coding to a digital signal prior to transmission to enable errors to be corrected at the receiving end. The coding is matched to the characteristics of the form of transmission used.

Checksum Mathematical sum of all the bits in a sequence. Used for error checking.

Clock Synchronising signal used for all the encoding and decoding processes in a data transmission/reception path. Consider it as the digital heartbeat.

CODEC Combination of a coder and a complementary decoder.

Comb Filter Filter whose response is akin to the teeth of a comb. Used for separating signals that are part of a single transmission.
Compression Reduction of the number of bits used to represent an item.

Compression Layer With MPEG, the output from individual audio and video encoders. This is the Elementary Stream of compressed data.

Conditional Access System permitting subscriber access to programmes on a controlled basis, e.g. pay TV or pay per view.

Constant Bit Rate Coded Video Compressed video bit stream with a constant average bit rate.

Constellation Display in I/Q phase co-ordinates of all the possible states of a QAM or QPSK signal.

Convolutonal Coding The inner part of channel coding for satellite and terrestrial transmissions. It provides two bit streams from the original one: this data increase is used mainly to correct random errors caused by noise in the transmission path.

Decoding Time Stamp (DTS) Field that may be present in a packetised elementary data stream packet header to indicate the correct decoding time for an MPEG Access Unit.

Delta Modulation Form of differential pulse-code modulation in which only the sign for the difference between each signal sample and its predicted value is retained and encoded.

Differential Coding Source coding (i.e. compression) method that uses the difference between the value of a sample and a predicted value.

Differential Pulse-code Modulation (DPCM) Process in which the difference between each sample of a signal and its predicted value, derived from a succession of previous samples (or quantised values), is quantised. The resulting series of quantised values is converted, by coding, into a digital signal.

Discrete Cosine Transform MPEG/JPEG conversion of a block of pixels into a series of coefficients that represent the cosine harmonic functions of the pixels.

Echo Equaliser Device used for the cancellation or attenuation of echoes (ghosting) in a transmission path. Used particularly with cable transmission.

Elementary Stream Bit stream generated by an MPEG video or audio encoder.

Elementary Stream Clock Reference (ESCR) Time stamp present with a packetised elementary stream for the control of decoder timing.

Encryption Coding of transmitted information to make it available only to those authorised by a conditional access system.

Energy Dispersal Combination of a digital bit stream with a pseudo-random binary sequence (PRBS) to obtain even energy distribution after modulation.

Entropy Coding Coding principle used with variable-length data words, whereby the encoding of information elements depends on their probability of occurrence. Also known as variable-length coding (VLC). The best known method is the Huffman Algorithm.

Eurocrypt Conditional access system used mainly with the D2-MAC standard.

Fast Fourier Transform A fast algorithm for performing a discrete Fourier transform.

Flash Memory (EEPROM) A large, non-volatile electrically erasable and programmable read only memory. Can be overwritten only in blocks, not individual addresses or cells. Rather like an electronic hard disc.

Flicker: Disturbing periodic variation in the brightness of a scanned raster when the refresh rate is below 50Hz.

Fourier Analysis Establishing the harmonic components of a complex waveform. The result is a Fourier Series that represents the waveform.

Fourier Principle The principle which shows that all repetitive waveforms can be resolved into a series of sinewave components that consist of the fundamental frequency and a series of harmonics at multiples of this frequency. Named after the French mathematician J.B.J. Fourier (1772-1837).

Frame In reference to audio, an elementary period during which psycho-acoustical coding takes place. Corresponds to twelve times 32 pulse-code modulation (PCM) samples. The duration of the period varies between 8-12msec depending on the sampling frequency.

Generic Coding Method of digital coding for pictures, based on a specific algorithm, enabling it to be used for a number of applications. Enables the same ICs and components to be used for different applications such as TV broadcasting, computer graphics, videotelephony etc.

Granule In layer two MPEG audio this term means a definitive group of three consecutive sub-band samples, corresponding to 96 PCM samples.

Hexadecimal Numbering system with a base of 16 numbers instead of, as in decimal notation, ten. Uses a character set of 0-9 plus A-F. Employs 16 arrangements of four bits.

I Frame/Picture An intra-coded picture, i.e. one which has been coded using only information from itself (compare with B and P pictures).

Interframe Coding Predictive frame coding, where the values for prediction for a frame are taken from the previous and current frames.

Interlaced Scanning The conventional TV picture scanning arrangement in which successive fields scan out the odd and even lines of the picture.

Interpolation Technique of generating information by averaging the values of data from adjacent picture fields.

Interrupt A signal that breaks into a running digital processor program.

Intracoding Coding of a macroblock or picture using only information in that macroblock or picture.
**Intraframe Coding** Predictive frame coding where the values for prediction are taken from the same frame.

**Isochronous** Something performed in equal times, in regular periods. With IEEE 1394, means the transmission of time-critical data in the quasi-synchronous mode, i.e. real-time audio and video.

**Joint Photographic Experts Group (JPEG)** An ISO/IEC group that developed the image compression algorithm for continuous-tone still colour pictures.

**Joint Stereo** MPEG audio technique which exploits redundancy between the left and right channels. There are two sub-modes. MS Stereo means coding of L + R and L – R channels; Intensity Stereo means coding the common sub-band coefficients for high-band L and R channels.

**JPEG-1** Standard, with several levels of compression, for digital still colour pictures. The levels give various resolutions in Y, Cb, Cr and RGB formats.

**Latch** Mechanism for temporarily storing data. Used in conjunction with shift registers so that data streams can have their format altered, i.e. SIPO (serial data in, parallel data out) and PISO (parallel data in, serial data out).

**Layer** With MPEG audio, the algorithm used for compression from sequence to block (there are three different layers); with MPEG video, hierarchical decomposition from sequence to block (see Fig. 1).

**Level** With MPEG-2, the spatial resolution of the picture to be coded.

**Line-locked Clock** Clock synchronised to the line-scan frequency of a video signal, controlled by a phase-locked loop (PLL) circuit.

**Lossless Compression** Also known as Reversible Coding. The opposite of lossy compression.

**Lossy Compression** Compression process that discards some imperceptible information.

**Macroblock** Used for motion prediction. Consists of four 8 x 8 blocks of luminance data and two of chroma data (4-2-0 format), or four luminance and two each Cr and Cb blocks (4-2-2 format), or four luminance, four Cr and four Cb blocks (4-4-4 format).

**Masking** A sound concealed by a more powerful one at a near frequency. This is a property of human hearing. The phenomenon is made use of for MPEG audio. Masking can be in terms of frequency and/or time.

**Motion Compensation** Use of motion vectors to improve the efficiency of motion prediction. The vectors provide offsets into past and/or future reference frames or fields (I pictures) that contain the decoded sample values used to form a prediction error signal.

**Motion Estimation** Process of estimating motion vectors for encoding. The term relates to the derivation of a motion vector from a previous picture, to enable conditions in an area of a picture to be deduced.

**Motion Vector** Two-dimensional vector used for motion compensation. It provides an offset from the coordinate position in the current picture or field to the coordinates in a reference (I) frame or field.

**Motion Picture Experts Group (MPEG)** The ISO/IEC group that develops compression standards for moving pictures and associated information.

**MPEG Video Data Hierarchy** The MPEG video structure, see Fig. 1. One pixel (picture element) is defined as the size of a scanning spot at rest, i.e. one line high and one line wide. It is used to form blocks of 8 x 8 luminance pixels plus 4 x 4 red and blue chroma pixels (the later are referred to as Cr and Cb respectively). The next step up is the macroblock, see above.

Several macroblocks are then grouped in sequences known as slices, which are positioned in the same left-to-right and top-to-bottom order as with conventional picture scanning. Slices are used as sets of data, being suitable for error detection purposes. If an error is detected in part of the data stream that makes up a slice, the decoder ignores the data in that slice and moves to the start of the next one.

The data slices are combined to form the active picture area of a video frame – usually referred to as a picture – which can be regarded as the system’s basic coding unit. Twelve of these pictures, referred to as a GOP (Group of Pictures), are combined to form the basis of interframe coding. As a result of this process, most frames are represented as their differences from a reference frame (an I or intraframe). Each twelfth frame is an intraframe. Organising the pictures in groups simplifies random access to a group and provides recognisable boundaries for interframe coding.

Finally, the MPEG system allows several groups of pictures to be gathered together in what is called a Video Sequence. This is an uninterrupted series of GOPs that have the same basic parameters. This sequence consists of a sequence header code, one or more GOPs and an end of sequence code.

**Multicrypt** DVB conditional access option based on a detachable CA module which is connected via the DVB-CI common interface.

**Multiplexing** A system that enables two or more signals to be transmitted simultaneously via a single channel.

**MUSICAM** Masking pattern-adapted Universal Sub-band Integrated Coding and Multiplexing An audio bit-rate reduction system based on sub-band coding and psycho-acoustic masking.
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What a Life!

Problems as diverse as wow with a Dansette record player to an hourglass picture with a recent JVC TV set came Donald Bullock's way this month.

Just as I had sat down to write my Television article, Greeneyes came in and turned the TV on. I don't much like the TV being on at all, especially when I'm trying to write an extremely intellectual article. So I told Greeneyes that she was a cretin, and we had a row about my manners and her mother. Then the TV's brightness went - it's a Sanyo CTP6256 - and I laughed nastily.

Greeneyes said I'd have to mend it right away. So I put my writing aside, took the back off the set and looked at the chassis. The brightness returned.

"How did you manage that?" asked Greeneyes.

"Cleverness and influence" I said, refitting the back.

When I'd finished and sat down again, the brightness had gone. Greeneyes shot me a withering look. Time to start all over again. I took the back off, leant it against the wall, then turned to the set which was now OK. Greeneyes' big ginger cat strolled over, looked at the screen and laughed at me. So I touched it with my foot. Greeneyes saw it shoot off, and we had a row about my wickedness and her lavishing all her affection on cats and dogs and turtles instead of me.

When we'd finished our row and agreed that she was right and I was wrong, and that the red pair of shoes in Clarks would go well with the green frock she's going to get from River Island, the brightness went again. This time it stayed off, and I started to tap around with the pen I'd intended to use for my article. As I couldn't make it come back I decided to take the set to the workshop, and put the rear cover back on. The brightness returned and I made a bit of a scene.

"Have we got to call Snoddy's?"

Greeneyes asked, "or shall I ask son John to mend the set. We can't go on like this."

Then the phone rang for me, and while I was talking Greeneyes got John to take a look at the set. He went out for a soldering iron and a few minutes later had the set working - even with the back on. It didn't fail again.

I pretended not to notice that the set was now working satisfactorily, or that it had been fixed so quickly, until Greeneyes went out to fix a banquet for her cats and dogs and turtles. Then I casually asked John what the trouble had been.

"R622" he said. "It's a two-inch tall ceramic resistor stood up on end. The solder joint at the top was dry."

"Thought it would be" I said.

This one sounded awful. I frowned. "Where's that wow coming from?" I said aloud.

Harry's silly face lit up. "From the Gwamophone, of course" he quipped.

I told him to come back in a couple of hours' time then gave the record player a service, right down to oiling the motor, but the wow remained. Then I noticed that the blip occurred once per revolution of the record. I finally lifted the turntable mat and found that a little inspection label, not much bigger than a stamp, had been carelessly stuck on. So there was a ruck in it. Removing the label cured the trouble.

The Other Sort

Then Mr Magic came in with a Toshiba portable, Model 1400TBT. His real name is Cyril Pipe, and he spends his spare time dressing up and doing conjuring tricks at children's parties. I can't stand conjurors.

I looked at the set. "Nice one, Cyril" I said, "what's wrong with it?"

Cyril hunched his back and drew his head down into his shoulders. "Picture like this" he said. Then he pulled from his pocket a shabby pack of cards which he fanned out. "Pick a card, pick a card" he said.

I looked pained. "Bugger the cards" I replied, "let's think about the set."

I plugged it in and sure enough there was bad field cramping at the top of the picture. The set uses an AN5515 field output chip, and I recalled a similar fault with a similar model. I traced the IC's supply from pin 7 back to the rectifier circuit C511/D309/R317 which is fed from a winding on the line output transformer. When I checked the
value of the 7-Ω surge limiter resistor R317 I got a reading of 48Ω. A replacement resistor of the correct value cured the fault. As I boxed up the set I thought that Cyril ought to be relieved of eleven pounds, a tenner for the repair and a pound for his bit of conjuring.

As I turned to him he said "Wait a minute" and drew a £1 coin from my car. "Put that on the counter close to me Cyril" I said, "and add another one plus a tenner. It'll get you out of debt and your conscience good."

**G11 Problems**

Meanwhile Paul, who spends most of each day on VCRs because he's so good at them, pulled a Philips set fitted with the G11 chassis on to the bench. "We've made some money out of these" he commented, thinking of all the BU208As, the smoothing blocks, the field time-base chips and the odd tube or two we've replaced. This one was dead, and Paul soon found that the negative side of the mains lead was connected to the plugtop loosely.

"I've had this before with these sets" he said, "but why is it always the negative connection that becomes loose in the plugtop? The little retaining screw loosens, doesn't it."

"And how?" I replied. "It's because of the thyristor power supply, which does violence to the nice smooth mains supply waveform. If you were the little screw at the top of the plug's negative lead you'd jigger about with the sudden current pulses, I'll bet."

When he'd seen to the plugtop he found that there were intermittent outputs from the line output transformer because of dry-joints at the pins. Resoldering them restored the set to life, though the width still varied and tried to collapse now and again. "What makes the line output transformer's pins go dry at their joints?" he asked.

"More hammer" I said. "That transformer is vibrating at a very good lick, and producing heat. The solder joints have to contend with the rapid pulse waveforms at the pins while the heat affects the chemical makeup of the fluxes in the joints. They eventually shake loose. It's much the same with the other wound components in the line output stage. In view of the picture width variations I reckon you'll find some more dry-joints in that area."

He did, and after some careful resoldering all round he had a good, steady picture.

"Remember" I said "any transformer that vibrates at a high frequency and has to handle spiky waveforms will tend to develop dry-joints at its connecting pins. And the next time you get intermittent brightness with a chassis that uses a tiny line driver transformer, like the old ITT Compact, check this item for dry-joints. Resolder the pins, even if you can't actually see any poor joints."

**Interlude**

Just then a chap with some steps poked his head through the door. "Window cleaner" he called. "Who, me?" I reacted. At this point a girl who looked like Keyhole Kate picked her way into the shop. "Yoo-hoo" she trilled, "anybody home?"

I moved towards the door. "Oh. You're somebody else, aren't you?" she said.

"No I'm not" I replied, "I'm the same chap I've always been."

"What I mean is, you're not Steven or Paul, are you?"

Steven came to the rescue. "That Ferguson of ours you mended back last summer" she said, "the picture's got thin bands of lighter picture all over it. What will it be and what will it cost?"

"Ah, your TX90" said Steven. "The cause will be C189, a 22μF 50V electrolytic reservoir capacitor, and the cost will be ten pounds, if you bring the set in."


"Ten pounds!" Steven said.

Then the window cleaner came in. "Clean now?" he asked, jerking his thumb at the window.

I pushed some money into his hand. "I suppose your sons are quite competent by now" he commented.

"They're coming on" I replied. "Of course it will take them some time to pick up all I've learnt over the last fifty years. I feed them the answers, quietly."

**A JVC MXII**

Then Mr and Mrs Murphy came in. Nice people, also the smallest couple we've ever seen. Steven gave them a smile.

"We've got our JVC telly in the car, Mr Blockhead" he said. "The picture's like an hourglass. Last time you did it while we waited. Can we wait for it again?"

Steven brought it in and put it in front of me. "Can you look at it quickly?" he said. "It's the modern Nicam stereo set - MXII chassis. Tends to get this fault."

The Murphys smiled at me as I began to take the back off. Steven continued with his instructions.

"The chassis uses an electronic screwdriver chip, IC707, for picture geometry adjustment. The chip's cheap enough, and we've got one in stock - from Willow Vale, part number 87028M - but you'll need the manual to enter the screwdriver menu and program the new chip. The repair takes only a few minutes, as you know."

I knew nothing of the sort, and stood there trying to digest what he'd said. None of the chips looked like a screwdriver to me, and I grew increasingly puzzled. Five minutes later I was no further forward. Steven looked over and began to lick his lips.

"Gosh, I'd like a cup of tea" he said. "The sort you make. How do you do it? Is it three bags or five?"

"I'll do it" I said, and he was on my stool before I'd left it. When I brought in the tea the set had been boxed up and displayed a perfect picture.

Harry Quipper came back for his gram just as Mr and Mrs Murphy were paying Steven a few browns. He had one of his irritating smiles as he watched. As they left, he turned to us.

"Nice handful of cabbage that" he said, "talk about being grateful for small Murphies!"
Reports from
Philip Blundell, AMIEEIE
Michael J. Cousins
Keith F. Brown
Michael Dranfield
Graham Colebourn
David Smith
Glyn Dickinson
Chris Watton
Nick Beer and
Roger F. White

Thorn C15012R (Samsung P68SC Chassis)
This set produced a picture with weak red content. When I checked the voltages at the collectors of the RGB output transistors I found that the red output transistor’s voltage was at a higher level than that in the green and blue output stages. Checks on the colour-drive signals from the mother board, at plug CN901, showed that the DC bias in the red channel was low. I traced back through the circuit and found that the red drive was being dragged down by diode RD09, which adds the on-screen display to the drive from the colour decoder. This 1N4148 diode was leaky. For green channel problems check RD10, for blue channel problems RD11.

Incidentally the spares address for Thorn brand TV sets is Thorn UK Ltd., Glaisdale Drive, Bilborough, Notts NG8 4LA (01159 290 434). Trade only.

GoldStar CIT9902F (PC04A Chassis)
This set wouldn’t come out of standby. When checks were carried out around the microcontroller chip IC701 I soon discovered that crystal X701 (10MHz) wasn’t oscillating. A replacement crystal was required.

Ferguson ICC9 Chassis
This monster (Model D78N) had no green. As I didn’t fancy hauling it back to the workshop it had to be fixed on site. A tube analyser cleared the CRT, and the TEA5101A RGB output chip IB01 was OK. Tracing the signal path back brought me to the STV2160 multifunction chip IV01. This seemed to be the most likely suspect, especially as there have been reported cases of failure because of CRT flashovers (there’s a modification for this – remove jumper link JV56 and fit a surface-mounted 4.7kΩ resistor in its place). Needless to say a replacement chip didn’t cure the fault.

Only one area remained: the buffer amplifier transistors, the relevant one being TV76 (BC858B). This surface-mounted pnp transistor had been cold checked and found to be OK, but a replacement restored the tube’s green drive. If only I had a nice, compact scope or a few more muscles! M.J.C.

Sharp DV5935 (BCTV-A Chassis)
When cold checks were carried out on this dead set I found that the 2SD1546 chopper transistor Q705 and the MC44602 control chip IC700 were short-circuit. In addition the 100µF chopper drive coupling capacitor C712 was low in value. On the secondary side of the circuit rectifier diode D708 and its feed resistor (not shown in the circuit diagram) were badly burnt. These items were replaced and the set was then powered. It produced outputs on the secondary side of the power supply except for D708, which supplies a 12V regulator and an 8V regulator IC. In view of the previously distrected state of D708 I thought that the cause of the problem was heavy loading, but eventually found that the chopper transformer T700 was damaged. A new transformer restored the 12V and 8V supplies and the set sprang to life.

Mitsubishi CT2553STX (Euro 4Z Chassis)
The reported fault was no signals – scart operation was OK. An attempt to retune the set showed that while channels could be found they couldn’t be stored. The EPROM chip IC702 was suspected, but checks showed that its –31V supply at pin 2 was missing. This is derived from transformer T951, via rectifier D955. The cause of the problem was an open-circuit secondary winding on T951. A replacement transformer restored IC702’s –31V supply and hence the picture and sound.

Goodmans 1450T (Onwa Chassis)
This set was dead apart from the fact that the standby light was on, there was a click from the relay and the power supply was producing a 115V HT output. No visible damage could be seen. The cause of the problem was loss of the supply to pin 42 if the multifunction chip IC301 because R323 (6.8kΩ, 5W) was open-circuit. A replacement
restored the picture and sound. If this doesn’t cure the fault check C909 and C911 (both 47μF, 50V), the 12V, 1W zener diode ZD402 and IC301 (AN5601K). K.F.B.

**Tatung 190 Chassis**

There was sound but no picture - no EHT in fact. The cause of the problem was that R413 (18Ω, metal film) in the supply to the line driver transistors was open-circuit. No reason for its failure could be found. M.Dr.

**Hitachi CPT2174 (G6P Chassis)**

This set was brought in because it was dead with no power - no EHT at all. The owner for its failure could be found. After a couple of these transistors had been replaced, the set came on but was off-tune. In addition the automatic station search didn’t stop when a station was found. After spending a lot of time on the problem we found that the replacement vision detector coil T101 cured the fault. M.Dr.

**Philips CF1 Chassis**

For loss of field sync, replace C2377 (10μF, 63V). This will cure the problem, but for good measure C2368 and C2369 should also be replaced. They are both 4.7μF, 63V. M.Dr.

**Hitachi CPT2476 (G6P Chassis)**

If the set comes on with a bright white screen, there is only 20V at the tube’s cathodes, and the set switches to standby after two seconds. The latter was missing and R854 was open-circuit. But the replacement was found. After spending a lot of time on the problem we found that the replacement vision detector coil was cured the fault. M.Dr.

**Ferguson ICC5/IMC Chassis**

There was a very odd problem with one of these sets: no sound, no picture, and a raster when one of the tube’s cathodes was earthed via a 10kΩ resistor. This proved that the cause of the problem was not field collapse. When we advanced the setting of the first anode control we got a blank, unmodulated raster with flyback lines.

We thought that the set might be stuck in the AV mode. When a VCR was connected to the scart socket we got good sound but still no picture. A lot of time was spent carrying out various checks before we noticed that the power supply’s 8V output was low at 5.4V. The culprit was CP37 (4.700pF, 25V, 105°C) which was open-circuit. M.Dr.

**Sony AE2 Chassis**

This set tripped back to standby after two seconds. The manual says a two-second trip means that there’s a field fault. When the set was switched on and off in quick succession there was only half a field scan - the top half. The TDA8179S field output chip in this chassis requires + and -15V supplies. The latter was missing because safety resistor R854 (0.470) was open-circuit. But the replacement was found. After spending a lot of time on the problem we found that the replacement vision detector coil cured the problem. M.Dr.

**Hitachi G8Q Chassis**

If the power supply is tripping and you can’t find any shorts on the secondary side of the circuit, try replacing C908 (220μF) on the primary side. In one case we had in recently this capacitor had fallen in value to 150μF. A replacement rated at 105°C cured the problem. M.Dr.

**Bush 1500**

Another dealer had attempted to repair this set. In the process he’d removed two transistors which he had not replaced. With the help of a similar, scrap chassis we decided that a 2SC1815 would be suitable in positions Q104 and Q611. After fitting a couple of these transistors the set came on but was off-tune. In addition the automatic station search didn’t stop when a station was found. After spending a lot of time on the problem we found that replacing the vision detector coil T101 cured the fault. M.Dr.

**Sony KVM2170/2171**

Although these sets are still quite new we have had a couple of them suddenly go completely dead. The chopper power supply was working, but one of its outputs was missing. There should be 135V at the cathode of D606, 20V at the cathode of D607 and 8.5V at the cathode of D608. In both cases the 8.5V supply was missing because ICP PS603 was open-circuit. It’s rated at 1A (N25 type). The current through the replacement was between 0.4-0.6A, so all was considered to be OK. Neither set has been repaired - the repairs were carried out several months ago. G.C.

**Matsui 1496R**

This set was dead with no power supply operation. There should be a 119V HT output at C119, which is handy to remember! We found that R108 (220kΩ) was open-circuit: as a result there was no 5V bias at pin 3 of the TDA4605 chopper control chip IC104. R109 (330kΩ) was also going high in value, so this was replaced as well. As the set is still a youngster we uprated both resistors to 1W. G.C.

**Sanyo CBP2576/2876 (ED0 Chassis)**

This set had given up, with a pungent smell of burnt plastic that lingered for days! A hole had been burnt in the PCB at the line scan end of connector K-FF. After the usual clean up and rewiring exercise the set came back to life, but there was no EW correction because ICP R756 (N20) was open-circuit.

Finally there was no sound. We got it back by carrying out the "start NVM" procedure described on page 13 of the service manual: this restores the basic digital set-up of the chassis. Very little further adjustment of the digital settings was required to obtain correct picture geometry. G.C.

**Hitachi CPT1558/Luxor 18036549**

These 15in. Swedish sets are ideal for kitchen use, having a sealed membrane keypad. When a Luxor example came in with a severely mangled keypad we discovered that it’s no longer available as a spare part. A repair was possible however, using a keypad from a scrap Hitachi version of the set: it’s marked differently but works in the same way.

Our troubles were not over yet, as keyboard operation was intermittent. We eventually traced the cause of this to a cracked joint in a very unexpected place, at one end of RD54, an 820Ω resistor which is between the base and emitter of TD12 near the keypad ribbon-cable connector. We then knew why the original keypad had been clawed to death!

If you have trouble with the microcontroller or ROM chip (ID01 and ID02) in these sets, get in touch with Chas Hyde (01759 303 068). There were several versions and sources of these chips, and they are not all compatible. G.C.

**Toshiba 150R6**

This set had been given a new LOPT, a set-up, a soak test and a clean bill of health. The owner brought it back next day with the classic condemnation “it’s gone
again – it lasted only fifteen seconds”.

This time there was no 5V output at pin 9 of the power supply board output connector. R505, a 15Ω, 0.5W fusible resistor, was burnt and open-circuit. It feeds a 5V regulator, Q502. We fitted a new resistor and connected a voltmeter across it to monitor the current. The reading was 0.5V running, as stated in the service manual, and 0.33V in standby. The set ran happily all day and the next. No connection between the two failures could be discerned. G.C.

**Philips CP110 Chassis**

This set was dead except for the display of “F1”. A voice in my mind kept blaming the microcontroller chip, as it was the original one with no metal shield, but voltage checks showed that it was OK. The 1.6A Wickman fuse F1653 was open-circuit, no doubt because of excess voltage, the overvoltage protection board seeing it off. When the fuse and the CNX62A optocoupler had been replaced the set behaved impeccably during a lengthy test run. D.S.

**ITT Monoprint B Chassis**

This set was in the standby mode with the CRT’s heaters lit. I found that C722 (470µF, 16V), the reservoir capacitor for the 8V supply, had gone low in value. D.S.

**Philips G90AE Chassis**

There was no focusing at all. When the top of the tube base was unclipped the reason was immediately obvious. The entire focus connector and its spark gap were covered with verdigris. A new tube base cured the fault. D.S.

**Ferguson TX805 Chassis**

This set (Model D14R) didn’t do anything. When checks were carried out in the power supply we found that RP41 and RP42 had both gone high in value. The correct value is 68kΩ. D.S.

**Philips CF1 Chassis**

This set was tripping. After checking for obvious shorts I decided to disconnect the crowbar thyristor and power the set via a variac. It worked perfectly, with the HT correct at 95V. To save time (1) I replaced the three series-connected zener diodes and the thyristor, but the set still tripped. I then replaced the only other two components in the trip circuit, a resistor and a capacitor. It still tripped. Time for some theory. The zener diodes were being switched on not by the DC voltage but by ripple, because the 47µF HT reservoir capacitor C2322 was open-circuit. G.D.

**Philips 2A Chassis**

After repairing a straightforward field fault I noticed a message which said that the set was reluctant to come out of standby when the remote control unit was used. This was true, with the set tripping instead of coming on. The set could be heard ‘plopping’ in standby. I traced the cause of this fault to C2681 (6.8µF, 63V) in the optocoupler circuit. G.D.

**Bush 1500**

This set was stuck on one channel with no response from the front controls. The usual cause is a faulty pushbutton, but not this time. There was a clue: standby couldn’t be selected because a leak across the auxiliary contacts of the mains switch locked up the microcontroller chip. The cause was some nasty black glue that was used to anchor the wires. Removing this cured the fault. G.D.

**Ferguson ICC5 Chassis**

EW bowing was the not unusual fault with one of these sets (Model 59P7). After resoldering the obvious dry-joints the fault was still present with the usual suspects blameless. The width and pincushion controls worked, but not enough, while the trapezium control was inoperative. This was the clue. It receives its supply from the 23V line via a resistor and a 6-8V zener diode, DG10. This was leaky. G.D.

**Salora J Chassis**

A fault we are now getting quite often with these sets is variation in raster size and focusing with picture content. The culprit is the EHT tripler. Unfortunately this is rarely mentioned when the set is brought in because of another fault. It can wreak havoc with your estimates, especially as “the set never did that before you fixed it”! G.D.

** Matsui 209T**

This set was dead because C613 (7nF, 1kV) had failed, which is not unusual. It’s in the HT rectifier circuit. If you don’t have a handset, you can’t switch the set on from the front as it comes on in standby – which is a good way of selling handsets! To get the set out of standby, short out ‘switch’ SW414 (not fitted) at the front of the PCB momentarily. The set will then spring to life! G.D.

**Sony KV2762**

Tuning voltage instability was the problem with this set. Colour would sometimes be lost, but only in certain areas of the picture. At other times the sound would be lost, with the picture fluttering. My first check was at the 33V tuning voltage stabiliser D005, where only 30V was present, but a replacement didn’t improve matters. The feed comes from the 40V supply, which I found to be low at only about 33V. So not enough current was flowing to operate the regulator. This 40V supply is derived from the chopper transformer, via R651 (1.2Ω) and D652. R651 had risen in value to nearly 70Ω. C.W.

**Finlux 1000 Series**

This was the later version with CTI (colour transient improvement).

When these sets are first switched on the screen should remain blank until the TDA3505 video processing chip has checked the grey-scale levels. This set came on with a red raster, then green followed by blue. The cause was Cb38 (10µF, 63V). C.W.

**Philips CP90 Chassis**

The power supply was OK but there was no line drive. A check on the 19V supply produced a reading of only a couple of volts. The 330µF, 35V reservoir capacitor C2691 was the duffer here. C.W.

**Hitachi CPT2178 (G6P Chassis)**

Loss of sync was the trouble with this teletext set, the cause being on the text PCB. When the video signal arrives at this panel it goes to IC2101 and, via Q2104, to pin 3 of the CD4016 chip IC2108. This acts as a sync separator, but there was no output at pins 1 and 4 which are connected together. After making various checks I found that the 5V supply was low at only 2.5V, because the HA17085 regulator IC2110 was faulty. This supply is used by the logic system. Because it was low, the control applied to pins 12/13 of IC2108 was affected. C.W.

**Bush 1418**

If one of these sets is dead with no standby light and 320V is present across the main reservoir capacitor, check R913. This 330kΩ resistor can go open-circuit. C.W.

**Salora J Chassis**

No picture was the complaint with
TELEVISION

this set. A scope check on the sandcastle pulse input at pin 7 of the TDA3562A colour decoder chip IC2B00 showed that the field component was missing. The field timebase was working all right, the field flyback blanking pulse being lost at the junction of RB424/5 because TB209 (BC237) was short-circuit. N.B.

**Toshiba C2225B**
The owner insisted on having this set repaired despite its tired tube. There was an arc on sound and vision from cold, but you couldn’t instigate it by physical means. It could be heard anywhere around the power supply and line output sections of the chassis. I eventually discovered that the earthing screw from the core of the LOPT to the PCB was corroded. Replacing the screw and retinning the land cured the fault. N.B.

**Panasonic Alpha 1W Chassis**
This set was dead. Some quick voltage checks showed that the 12V line oscillator supply at pin 7 of IC101 was missing. It comes from the 12V regulator IC851, which had no input because rectifier diode D855 was open-circuit. N.B.

**Salora J Chassis**
It’s been a long time since we had a new fault with one of these sets. The field scan flickered and rolled intermittently. No amount of fiddling in the field timebase affected the scanning, but twisting the chassis did. The cause of the trouble turned out to be a dry-joint at the odd pin of the Ipsalo transformer - the one in the centre of the diode-split type (so the fault would not be possible with the tripler version of the chassis). N.B.

**Sony KVM1421 (BE2A Chassis)**
There were jagged verticals when the set had warmed up. The cause of the fault was C814 (47µF) in the pincushion correction circuit. R.F.W.

**Ferguson ICC7 Chassis**
One of these sets had a strange sound fault. To start with the sound was normal, but after a while the volume and mute controls stopped working – the on-screen graphics were still present. If the set was then put into standby and brought back on there was no sound. I suspected bad joints on the Nicam board and carried out a close examination, resoldering any joints that looked dodgy. To my great relief this cured the fault. R.F.W.

**Sanyo CTP6144**
A very intermittent hum bar was present only when an aerial was connected. If I touched the aerial socket and an earth at the same time the set would go to standby. The cause of the fault was the optocoupler D331. R.F.W.

**Matsui 1492**
This set had a peculiar fault after putting right the usual results of failure of C909 and C910 in the power supply (the line output transistor, the 12V zener diode and the field output chip all had to be replaced). When the set was put into the standby mode the sound and picture went but a dark monochrome picture then appeared, with no sound. The cause was Q907 which was short-circuit. R.F.W.

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Ferguson F801
This unit had a dead camera head: the VCR section was OK. Checks showed that there was an open-circuit track between D903 and pin 8 of connector CN909/PG909. This is the camera on (low) line. The cause of the open-circuit was leakage from adjacent surface-mounted electrolytics, which all had to be replaced. N.B.

Panasonic VW-AMC2B (NVM550B etc)
There was an odd fault with this commonly-used camcorder mains unit/battery charger. Charge LED1 was permanently on, and there was no battery charging in position 2. Transistor Q3 (2SB952P) in the switching section was short-circuit. D.C.W.

Panasonic NVRX1
This is one of the newer 'slimline' models. The fault was ability to focus but not to zoom, which rather restricted use of the camcorder. As a result of the lens design in modern units, with everything internal, the fault condition meant that there was only one point on the focus scale where a reasonably good picture could be obtained. The zoom motor drive was present and correct, but it didn't move. A new motor, part number VEM0451, cured the fault.

We've had similar problems, caused by the gear inside the lens, with various Panasonic models that use this design. The plastic gear cracks and then slips on its shaft. N.B.

Sony CCDTR75E
There was a "no picture" note attached to this Handycam. Chroma only was present at the AV sockets - customers don't count this as much of a signal I suppose! The cause of the fault was C318 (120pF, 6-3V) on board VS67. A replacement capacitor and service restored the unit to good working order. D.C.W.

Canon UC16
Playback picture intermittent was the complaint with this fairly recent model. The cause was a detached connector between the mic/jack PCB and the main VTR PCB. It's becoming quite a common failure, usually because of too vigorous fitting/removal of the AV leads. The connector is available from Canon if required - it's CN001, part number VS1-5469-016-000. D.C.W.

Panasonic NVRX1
This newish camcorder would neither focus nor zoom - its E-E picture consisted of an unfocused 'blob'. Playback was OK. Error code F52 was displayed in the EVF: the manual tells us that this means "zoom motor lock". When I inspected the motor I found a surplus of hardened grease on the actuating shaft. All was well once this had been removed and new lubricant applied.

To avoid having to reset operating data etc. it's important to refit drive assemblies to current types of lens units very accurately. Although these set-ups are easier than ever now, using automatic programming via a PC interface, life can be very frustrating if you don't have such facilities. D.C.W.

Sony CCDV600E
The problem with this nice (I have one!) Hi-8 model was described as "no operation". The only sign of life was a flashing DEW symbol in the camera LC display. As there was no other activity, the dew sensor was clearly not to blame.

Camcorner

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The cause of the trouble turned out to be IC201 on the mode control PCB (FD44). Don't confuse this with the more usual syscon mode control functions carried out by PCB SS134. A replacement IC and a general service restored good operation. D.C.W.

Canon UC10E
There were no EVF pictures: operation was otherwise normal. The cause of the trouble was failure of C2911 (10µF, 16V) on the EVF PCB. I have since had two more of these camcorders with the same fault. D.C.W.

Panasonic NV5R0
This VHS-C camcorder would display, very intermittently, coloured lines down the EVF's colour picture. The symptom would often be present only once a day, which made fault finding rather difficult. I have previously had to replace the viewfinder flexi-connector to cure a number of different EVF faults produced by these camcorders. So one was ordered (part number VWJ0739) and fitted, clearing the fault. When the original one was examined, the start of a split across the middle of the connector, where it bends quite sharply beneath the viewfinder, was discovered. B.S.

Sanyo VM6D6P
These 8mm camcorders tend to have problems with their battery contacts, which are easy enough to replace. But after doing this there seemed to be some intermittent problems with the mechanism. When a cassette was inserted, the tape would sometimes not be loaded around the drum. The cause turned out to be the cassette-down switch, which was loose. There was still a problem when this item had been cleaned and re-tensioned: the mechanism would sometimes just whirr, then the camcorder would power down and sulk. The cause was a damaged gear in the rather eccentric loading mechanism. Part number is 1915RQ. Once this item had been replaced the camcorder worked normally. B.S.
## TRANSISTORS/LINEAR ICs

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**TELEVISION March 1998**
**Replacement Idlers & Pulleys**

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**Replacement Idler Tyres**

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**VCR Belt Kits**

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**Replacement Parts**

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**NEW INVEREX REMOTE**

See Page 350

**JAVARRTIF**
# PINCH ROLLER ASSEMBLY MODEL LIST

<table>
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<tr>
<th>PINCH ROLLER ASSEMBLY</th>
<th>ORDER CODE</th>
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<td>KV1000, KV2000, KV3000</td>
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**Note:** The table represents a list of PINCH ROLLER ASSEMBLY models and their corresponding order codes and prices. The prices are indicated as 140p, 1409, 700p, etc., and may represent different currencies or exchange rates.
**MODE SWITCH**

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<td>NV2000</td>
<td>2010, 7000, 7200, 7800 (VSS0048)</td>
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<td>NV230</td>
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**AUDIO CONTROL HEADS**

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<tr>
<td>K30, K35, K40, K73, K74</td>
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**REPLACEMENT TV SWITCHES**

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**DATAMETER**

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

* Acoustical signal: On signal strength *LED indicator: Vert/Hori *Frequency Range: 900 to 2050 MHz *Input impedance: 70 Ohm *Power amplifier: 16db *Detection Range: -60 to -10 DBM *Max. input signal: -10 DBM

**VCR ALIGNMENT KIT**

SET OF 8 ALLEN KEYS

CONTAINS: SET OF 7 HEAD & TAPE PATH ALIGNERS

- RCA TYPE AUDIO & CONTROL HEAD POSITIONING TOOL: 0.77mm 0.90mm
- RCA ADJUSTMENT TOOL FOR TAPE GUIDE POSTS: 1.27mm 1.50mm
- RCA TYPE BACK TENSION TOOL: 1.65mm 2.00mm
- TENSION ADJUSTMENT TOOL FOR VARIOUS USES: 2.40mm 3.00mm

**TRANSFER REPAIR/ADJUSTMENT CASSETTE**

This transparent videocassette replaces a normal videotape during measurements, adjustments and inspections. The mechanical parts come into sight and become accessible.

**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.

**SWITCH MODE TRANSFORMERS**

ORDER CODE: PACE9000 PRICE: 800p

**VIDEO TOOLS**

**TELEVISION** March 1998

**VIDEO CLEANING KITS**

Price 17p each 15p each pack of 10pcs 13p each pack of 25pcs

Order Code: TOOL 8, Price 600p

**SATELLITE TUNERS**

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**SPLINES**

Price: 135p

**BACK UP BATTERIES**

**PHILIPS**

Part Nos: 138 - 101138, 138 - 10313 1.2v 90mAH

Order Code: BB00

Part Nos: 138 - 10229, 2.4v 100mAH

Order Code: BB02

Price: 75p

**FERGUSON**

Part No: 00E6 - 067 - 001 1.2V 100mAH

Order Code: BB03

Part Nos: 00E6 - 066 - 001 2.4V 100mAH

Order Code: BB04

Price: 150p
### FUSES

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**Notes:**
- All fuses are made in the UK and fully meet BS4265 & BS1362 safety standards and should not be compared with cheap imported types.
- All the above items are manufactured by Servisol.
- If you purchase more than one Servisol Product, postage & package will be charged as follows:
  - 300p for 2 or 5 cans
  - 500p for more than 5 cans

---

### Ceramic Plug Top

<table>
<thead>
<tr>
<th>CURRENT RATING (A)</th>
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<td>13A</td>
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### 32 mm Ceramic Slow Blow

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### 20 mm Ceramic Time Lag

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<td>FUSE43</td>
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**Notes:**
- **ALL THE ABOVE PRICES ARE FOR PACKS OF 10 FUSES**

---

### 38 mm Ceramic Time Lag

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<tr>
<td>10A</td>
<td>FUSE58</td>
<td>100p</td>
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---

### Voltage Tester

A terminal screwdriver incorporating continuity & voltage with Euroset.

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### Service Aids

**DESCRIPTION**

- VIDEO HEAD CLEANER: 75ML, SP1, 125p
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- FREEZE IT: 170ML, SP4 / SP5, 200p
- FOAM CLEANER: 400ML, SP6, 155p
- ANTI-STATIC: 150ML, SP7, 155p
- AEROFIX: 150ML, SP8, 155p
- AERODUSTER: 400ML, SP9, 260p
- PLASTIC SEAL: 200ML, SP10, 220p
- GLASS CLEANER: 200ML, SP11, 150p
- COLOCLEAN: 250ML, SP12, 225p
- EXCEL POLISH BD: 250ML, SP14, 145p
- ADHESIVE 125: 400ML, SP16, 180p
- LABEL REMOVER 125: 200ML, SP18, 240p

**Description:**

- SPRING HOOK: 200ML, SP19, 240p
- TUBE SILICON GREASE: 50 GRAMMES, SP21, 350p
- TUBE SILICON SEALANT WHITE: 7ML, SP22, 350p
- TUBE SILICON SEALANT CLEAR: 7ML, SP23, 350p
- TUBE HEAT SYN COMPOUND: 25 GRAMMES, SP24, 180p
- DRIVE CLEANER: 200ML, SP25, 135p
- SCREEN CLEANER: 200ML, SP26, 145p
- COMPUTER CARE KIT – SP27, 210p

---

### soldering Accessories

**DESCRIPTION**

- ANTEX SOLDERING IRON: 25 WATT 240V (XS25W 240V)
- DESOLDERING PUMP: 22 SWG 500 GRAMMES
- SOLDER MOP: 1.2MM X 1.5M
- DESOLDERING AIDS: 20 SWG 500 GRAMMES
- DESOLDERING STAND: 200ML, SP28, 30p
- SPARE SPONGE: 15 WATT 240V (XS15W 240V)
- SPRING HOOK: 200ML, SP29, 240p
- IC PF10, IC PF15, IC PF20, IC PF25, IC PF38, IC PF50, IC PF75
- IC PN5, IC PN10, IC PN15, IC PN20, IC PN25, IC PN38, IC PN50, IC PN75

**Price:** 30p EACH ONLY

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**ICPN5, ICPN10, ICPN15, ICPN20, ICPN25, ICPN38, ICPN50, ICPN75**

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<table>
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## CASSETTE DC MOTORS

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<td>2405</td>
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## CASSETTE TAPE HEADS

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## REMOTE CONTROLS

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VISION March 1998

349
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PRICE: £5.00 each

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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: New or good used LOPT (type FEA214) for a 17in. CTX monitor, CPS-1760 Proscan. Colin McCormick. Please call 01752 405 201 evenings or e-mail colinmct@mail.eurobell.co.uk

Wanted: Service manual or circuit diagram (photocopy OK) for the Sharp FA-W141O word processor. Bill Young, Foxhedge, Church Lane, Redmire, Leyburn, N. Yorkshire DL8 4EQ. 01969 622 598.

Wanted: Mullard DG7-5 CRT for a Mullard valve tester, and a Cossor 807 valve (or Air Ministry A/M 1908) for a Cossor 339 oscilloscope. H. Penn, 111 North Walsham Road, Norwich, Norfolk NR6 7QG. 01603 425 557.

Wanted: Circuit diagram (photocopy OK) for the Ayr Viewdata/teletext add-on unit Model T1, or any service information. R.E. Holt, 46 Osborne Parc, Helston, Cornwall TR13 8NZ.

Wanted: MB88536 IC for the Sanyo TV Model CTP6135-00. Alfred Moores, 14 Edward Street, Norwich, Cheshire CW9 7DQ. 01606 351 006.


Wanted: Complete upper and lower drum assembly for the Mitsubishi HSM34, or alternatively a complete scrap machine. James Burch, 9 Groveland Road, Beckenham, Kent BR3 3PU. 0410 626 002.

For disposal: Many copies of Television going back over the last 25 years. Please send for list. R.W. Moxon-Groves, 22 High Tree Close, Ongar Hill, Addlestone, Surrey KY15 1BT. 01932 854 122.


Wanted: LOPT for the Goodmans Compact 100 PCTV. Michael Pope, 76 Barkby Thorpe Lane, Thurmaston, Leicester LE4 8GS. 01162 602 270.

Wanted: Instruction manual (photocopy OK) for a Grundig VPS550 VCR. Also a Maplin UHF tuner kit (code no. LPO9K) built or not. David Roberts, No. 5 Pendower, Lloyd Street West, Llandudno, N. Wales LL30 2BE. 01492 877 932.

Vintage Equipment: I repair vintage wireless sets and associated equipment and also collect old radio receivers. I would be happy to hear from anyone who wishes to dispose of any old sets or has a service/spares requirement. Steve Farley, 128 Hawthorn Road, Kingstanding, Birmingham B44 8QA. 0121 382 1312, fax 0121 382 1558.

Wanted: SDA2011 microcontroller chip or complete front panel for the Grundig CUC2410 chassis, and an MAB8441P front-panel microcontroller chip for the CD player in a Philips FCD565/35 hi-fi system. Owen O'Reilly, Belfield, Gay-brook, Mullingar, Co. Westmeath, Ireland.

Wanted: Fairly up-to-date set-up chart for the & K 467 CRT tester (my one, 497-022-0-586, 1986, is out of date). Loan or sale, photocopies OK. Also 510ABC222P tube for the Mitsubishi Model 2027; circuits or an IC list for the SAFT fast-charge Mk II; and a colour tube data/equivalents book. Michael J. Levy, 10 Tottonhew Close, Kenton, Harrow, Middx HA3 0HS. 0181 907 3620.

Request: Because of a mail delivery problem while I was away, some replies to my request for valve radio/TV spares (January issue, page 186) may have gone astray. Could anyone who didn't receive a reply from me please write again? Steve Taylor, 11 Charnborough Road, Coalville LE67 4SF.

Wanted: Working power supply for the Panasonic NVL28 VCR. M. Shafiq, 4 Leighton Road, Old Trafford, Manchester M16 9NX. 01706 621 015 or 0956 668 524.

For disposal: Copies of Radio and Television Servicing from 1953-62 for sale at £5 per volume plus postage or collect. Phone Nick Hunter on 01162 872 397.

Wanted: Any information - circuit diagram, service manual, instructions, parts list - for the floor-mounted Pye studio video projector dating from about 1980. Thanks to all who contacted me about TDA chips - I now have plenty. Richard Gifford, 4 Gipsy Lane, Needham Market, Suffolk IP6 8DY. 01449 723 009.

Wanted: VPT PCB, working or not, for the Salora SV9900 VCR. I have for disposal service manuals, counting tubes, semiconductors (including older US types), video and TV parts, some 200 ICs in original packs and other electronic goodies, all at a reasonable price. Please fax Greg Strange, I.Eng., G8IWI on 0151 327 5971.

Wanted: Line hold control, circuit reference L404, for the JVC Model 3040UKC 5in. portable mono TV/FM radio receiver. David Parkinson, 84 Abbotsbury Road, Broadstone, Poole, Dorset BH18 9DD. 01202 255 103.

Goodmans VN6000
If one of these machines comes in dead with no blown fuses, check the E 5-8V line at plug P801 in the power supply - the PCB has the voltages marked on it. If the voltage is low, check C822 (330µF) by replacement. P.B.

Philips VR268
This machine was faulty from new. When a recording was made then played back, the picture would fade to snow - as if the heads were becoming dirty. The picture would return when the tape was rewound.

All became clear when an LP recording was tried. The machine didn’t sense that it was an LP recording, playback being in the SP mode. A problem with the control track? Yes, the machine was intermittently failing to record the control track. Link 9604, which is by the threading belt pulley, was broken. A new wire link restored normal operation. P.B.

JVC HRJ610EK
For a dead power supply with no blown fuses, check C12 (2-2µF) by replacement. P.B.

Grundig GV540
This machine worked all right mechanically, but with playback and E-E operation there was no sound or video (just a blank screen) from the modulator. Scope checks showed that the TDA8540 video switching chip IC7770 was not switching the signal to the modulator.

A look through the on-screen menus and the special features revealed no reason for this, so a new TDA8540 was fitted. It made no difference. Fortunately by this time we had a new GV540 in stock, so comparisons could be made. By using both traces of a double-beam scope, I found that the 12C bus signals to IC7770 differed between the two machines. But why? I was about to swap the main boards over when I spotted an IC with a socket. Replacing it restored the signals. The chip was IC7250, the operating system EPROM. P.B.

JVC HRD5800EK
The only thing this machine would do was to display a flashing clock and a hyphen where the channel indicator should be. Checks showed that the standby voltages were all present, correct and clean. Scope checks on the clock oscillators proved that they were all working normally. With this in mind I decided to replace the memory chip IC602, which cured the problem.

Note that the machine will play without IC602 being present - a useful test if you suspect it. R.F.

Daewoo V21 (V215, V415)
‘Extreme tiredness’ would best sum up the trouble with this machine. The cassette was stuck inside because there was not enough ‘urge’ to eject it. Tape threading was very slow. Unthreading was equally slow, after which the deck would go back to sleep. This was all because the voltage on the ever-14V line had fallen to 7V. The 14V supply reservoir capacitor C818 in the power supply section was i-circuit. E.T.

Panasonic NVL28
We’ve had two cases recently of the fluorescent display panel becoming dirty or extinguishing intermittently. The cause was traced to the chopper transformer T110 in the tape. In the other cases the component was replaced.

All became clear when an LP recording was tried. The machine didn’t sense that it was an LP recording, playback being in the SP mode. A problem with the control track? Yes, the machine was intermittently failing to record the control track. Link 9604, which is by the threading belt pulley, was broken. A new wire link restored normal operation. P.B.

JVC HRJ200
At random times in the E-E record modes the picture and sound would be lost, with a crackle in the background and pattern on the screen. Playback was OK at times. Prolonged scope checks revealed that the intermittent fault was in the module TNR2. A new module cured the problem. E.T.

Philips VR813
The intermittent fault with these machines took the form of cassette ejection, deck readout pulse and other symptoms. The intermittent nature of the fault proved that the microcontroller chip was the problem. We traced the cause to dry-joints between P1 and the power supply PCB. The mode switch on the Panasonic G deck used in this machine was also changed. E.T.

Hitachi VTF860E
There had been a mains power failure: when the power was restored this machine remained dead. Replacing C6 (1µF, 250V, 105°C) restored normal operation. To ensure reliability we also replaced...
Mitsubishi HSB27
When this machine was powered it worked perfectly except for the fact that in the play mode loops of tape were left. There was no take-up. Once I’d got the tape out I noticed that the felt pad had fallen off the half-loading arm. Don’t be tempted to refix it without removing the arm, as the rubber washer beneath it may be decomposed, leaving a sticky mess – I’ve had this with the last two of these machines that came in.

Once the gunge had been removed, a little grease applied, a new washer fitted and everything reassembled the machine produced immaculate pictures. D.S.

Aiwa FX2500/FX3500
These two machines both had clock update problems. The time could be set correctly in the evening. The next day it would be one hour fast or slow.

While observing one machine in the workshop I noticed that at 12:00 noon there was no change but at 12:01 the PDC flashed off and on and the time changed to 13:01. By 12:02 it was at 13:03.

The microcontroller chip uses teletext data to set the clock at certain times during the day and night. The PDC and time signals are decoded by the SDA5649 chip IC106. Replacing this item in both machines cured the timer problems. M.K.

Soundwave VCR961
This machine is identical to the Alba VCR7310 and the Orion D1096. Very low playback audio was the symptom. As a buzz could be induced in the speaker by touching the back of the ACE head, a new head was fitted. This failed to cure the fault. Neither did replacing the LA7280 chip IC5001. After much checking the culprit turned out to be C5028 (1µF, 50V), which was very low in value and leaky. It’s connected to pin 8 of IC5001. A replacement restored the sound level. M.K.

Aiwa HVF3500
There was a tape stuck in this machine, but it would still face up. To sort out the cause of the problem I had to dismantle the machine to get to the underside of the main PCB – you have to do this with machines from more and more manufacturers nowadays. A careful examination of the power supply area then revealed a bad dry-joint at the emitter of Q601. Once this and other suspect joints had been resoldered and the machine had been reassembled it worked perfectly.

We’d had intermittent mechanical and electrical faults, such as no drum rotation, because of poor contact with the flexible PCB links that connect the drum and capstan motors to the base PCB. Modified parts are available from Aiwa: DM lead CB part no. 58 065 130 120 and CM lead CB part no. 58 065 130 111.

I also clean the base PCB spring contact pads with a pencil eraser and the spring contact on the main board, finishing off with alcohol. This mechanism (TN6500) is used by other manufacturers. M.K.

Toshiba V209
The symptoms were as follows: the carriage would shuffle in and out; the cassette symbol was permanently lit; and no functions would operate though the correct symbols would light up in the display. The cause of all this was the front loading switch S122, which was permanently closed. It should open when eject is completed. The lever that operates it moved correctly, but the clear plastic cover-cum-operating block was missing. A new switch restored correct operation. R.B.

Ferguson 3V48
A quickie on this machine: the cause of intermittent drum rotation was a dry-joint at the 28B1052 transistor Q1. R.B.

Sony SLV625
Rewind and fast forward were particularly noisy, and there was a slight but noticeable rhythmic knock during playback. When I watched the toothed drive belt in the play mode it was obvious that the tension was varying. The machine was considerably quieter in all modes when the belt has been removed and cleaned, also the drive gear on the capstan shaft.

There’s a temptation to strip out the reel drive gears and look for problems here when the fault is more fundamental and easier to cure. R.B.

Goodmans VP2300
This machine uses the Philips Turbo deck. It was unable to load a cassette – and for good measure a coin was rattling around inside it.

Goodmans GVR4500
I’ve had a number of these machines, which use a Daewoo deck, with no tape take-up because of a bent idler unit. This time the idler unit was straight, the cause of the problem being the cassette tray which was bent down slightly. As a result the idler couldn’t move. Straightening the tray cured the fault. P.G.

Goodmans PD1700
Patterning on the playback picture, more noticeable with a dark background, is a problem I’ve had with several of these machines. It seems to affect only some of them however. If the screws are left out of the rear of the upper case, or the upper case is removed, there’s no earth connection to the bottom cover plate. This picks up radiation from the power supply and transfers it to the lower drum and head amplifier. To prove the point, remove the plate. My cure is to add a soldered lead between the power supply can and the plate instead of relying on multiple screws to make good contact. P.G.
Thomson TX805 Technology

In this concluding instalment J. LeJeune describes the combined chopper/line output stage, which is known as the Wessel circuit, also the drive and protection arrangements.

Last month we covered most of the circuitry used in the Thomson TX805 small-screen TV chassis. We left for separate consideration this month the combined chopper/line output stage, which uses an arrangement called the Wessel circuit.

It's not the first time that this circuit has appeared in TV sets in the UK. The TX80E chassis, predecessor to the TX805, used it. Older readers will recall the Ferguson 9000 series chassis, which was introduced in 1975. It used the same basic circuit, which Ferguson referred to at the time as the Syclops (synchronous chopper and line output stage) circuit. Shortly after that, in 1978, Rank Radio International imported a small-screen Saba chassis that featured the circuit. This chassis was used in the Bush BC6004 and one or two other RRI models.

The basic idea is to use a single switching transistor, in the TX805 an S2000AF, as both the chopper and line output transistor, with separate chopper and line output transformers in its collector circuit. An isolating diode separates the driven end of the two transformers' primary windings. There are advantages to operating the chopper circuit at the line frequency, including the fact that a single drive system is required.

The chopper transformer is used solely to generate the HT supply for the line output side of the circuit. With the exception of the supplies required for standby operation, all the other supplies are derived from the line output transformer.

**Basic Circuit**

Fig. 1 shows the basic elements of the Wessel circuit with component reference numbers that relate to the TX805 chassis. TP10 is the single chopper/line output transistor and LP03 the chopper transformer. This transformer's primary winding is fed with some 320V which is produced by the mains bridge rectifier circuit.

TP10 is switched on about half way through the line scan. Current then flows through the chopper transformer's primary winding and also, via the isolating diode DP10, the line output transformer's primary winding (LP04). When TP10 is switched off, rectifier diode DP11 switches on, charging CP17 to produce an HT supply of some 103V to power the line output circuit.

When TP10 is switched off DP10 also switches off. The line output side of the circuit then operates in the conventional manner to produce the flyback followed by the first half of the line scan. To recap on this, tuning capacitors CP18/CP19 produce, with LP04, a positive half-cycle of oscillation during which the scanning beam is returned to the left-hand side of the screen. When the oscillation tries to swing negatively, the efficiency diode DP13 conducts and the first half or so of the forward scan is produced. TP10 is then switched on to complete the forward scan and drive the chopper transformer.

The squarewave drive at the base of TP10 is timed to meet the requirements of the chopper action and the line output stage operation.

**Drive Circuitry**

Fig. 2 shows the mains rectifier, standby switching and Wessel drive circuitry. Bridge rectifier DP26-29 produces some 320V across its reservoir capacitor CP31. This is the feed to the primary winding (pin 12) of the chopper transformer. In addition, RP44/42/41/DP02 bias the base of the 12V regulator transistor TP15, which supplies the standby switching transistors TP11/12 and also, via LED DK01, the microcontroller circuitry (see Fig. 8 last month). When TP12 is switched on by the microcontroller circuit - its emitter is controlled by pin pin 20 of IR01 while its base is connected to the 'start' line - TP11 in turn switches on and the Wessel drive circuit comes into operation.

For regulation, we need a variable mark-space ratio pulse waveform to drive the base of the chopper/line output transistor TP10. The origin of this is the charging circuit RP12/CP03 - both are close-tolerance components. CP03 is charged via RP12 from the voltage at the junction of RP12/RP03. This voltage is controlled by the conduction of the error sensing transistor TP03.
whose emitter voltage is stabilised by the 2% tolerance zener diode DP06 while its base is fed via a potential divider network that’s connected across the line output stage’s 103V supply (see Fig. 1). Should the latter vary, the voltage at the junction of RP03/RP12 will vary, altering CP03’s charging time. PPO1 enables the HT and the voltages derived from the line output transformer to be set up.

CP03 is discharged at line frequency intervals by TP02/TP01. When the amplitude of the voltage developed across CP03 as it charges, and thus the voltage at the emitter of TP02, exceeds the voltage at the base of this transistor it will switch on. TP01 in turn switches on, and CP03 is discharged. These transistors then switch off, since TP02 is once more reverse biased. The free-running frequency is slightly lower than the line frequency. So positive-going line sync pulses from pin 20 of IL01 (see last month) are fed to the base of TP01 to switch the discharge transistors on.

The net result of all this is a sawtooth waveform, whose rise time is controlled by TP04, at the base of TP04. The output from this buffer transistor is AC coupled (to provide a DC block) to the base of TP05, with DC restoration by DP37. RP14/15 attenuate the sawtooth waveform. TP05 acts as a pulse-width modulator – Fig. 3 illustrates its action. It switches on when the sawtooth voltage waveform at its base rises to 0.7V. TP06, which had previously been forward biased via RP16, then switches off. TP09 in the line driver circuit is now forward biased via RP76, while TP13 is reverse biased. TP10 is then switched on.

When TP05 switches off, TP06 switches off, TP13 switches on and TP10 switches off. TP10’s base drive network is interesting. When TP09 is on and TP13 off (TP10 is then forward biased and thus on), CP08 is charged to a maximum of 2.7V (set by zener diode DP21). When TP09 is switched off and TP13 switches on, CP08’s positive plate is effectively earthed. The base of TP10 is thus driven negatively as CP08 discharges. This ensures a rapid turn off for TP10.
There are several protection arrangements in the TX805 chassis. Some of the actions were described last month, in connection with Fig. 8.

The earthy end of LP03's secondary winding is connected to chassis via the low-value resistor RP92. DP90 produces a negative voltage across CP90. This is applied to the base of the pulse-width modulator TP05, via DP92/DP94/RP90, as bias. The aim of this feedback is to provide current limiting so that LP03 doesn't saturate, with loss of regulation. There is also a link to the PROT line, via RP91 and DP96.

The line output transformer's heater winding is also connected to DX03, see Fig. 5, which develops a positive voltage across CX02. This is monitored by the 2%, 10V zener diode DX02. Should the outputs from the line output transformer rise because of failure of circuit regulation, DX02 will conduct applying a positive voltage to the base of TR06 (Fig. 8 again, last month). The start line then goes low, switching TP12 (Fig. 2) off, and the receiver reverts to standby.

Fault Finding

The chassis suffers from a common fault that results in a virtually dead set. One or more of the resistors (RP44/42/41) that bias the base of transistor TP15 goes open-circuit. The usual culprit is RP41. There is never any other reason for the failure of these resistors. You won't find any signs of overheating or any other indication of trouble. It could be that the resistors are damaged by leadout wire preforming prior to insertion in the PCB. A replacement resistor should be all that's required to restore normal operation.

Reliability is otherwise good. There are one or two points worth noting however, as follows.

The front LED, DK01, can develop a high-resistance state. There is then a reduced voltage feed to the 5V regulator TR08. If this can't switch on, there is no supply to the microcontroller circuitry so the set will again produce the no results symptom. As a quick check, short to the microcontroller circuitry so the set will again produce the no results symptom. As a quick check, short across DK01. This can be a tricky fault to diagnose if you are not familiar with the chassis.

For intermittent colour dropout, replace the 4.43MHz crystal QC01.

Finally there are several BA157 rectifier diodes in the power supply circuits. This device tends to be unreliable and is a prime suspect in the event of a fault condition. My thanks to Mark Paul for these fault notes.

Wessel Circuit

Fig. 4 shows TP10 and the circuitry it drives. We have already described the circuit action (in connection with Fig. 1). Note however that while the efficiency diode DP13 is conductive during the initial part of the forward scan DP10 is held non-conductive. Thus TP10 can be turned on early in the cycle for the sole purpose of energising the chopper transformer LP03. Once DP13 switches off, TP10 can also drive the line output transformer LP04, via DP10.

Circuit Protection

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The Toshiba 2505/2805DBT

John Coombes provides a fault-finding guide for these complex receivers, which helped start the ‘home cinema’ market

The Toshiba Model 2805DBT came on the market some eight years ago. It was one of the first ‘home cinema’ receivers. There are numerous features including a large, 28in. CRT with a special lavender coating, Fastext and Nicam. The thick plastic cabinet has a slim double baffle to give powerful (20W per channel), good quality stereo sound. Frequency-synthesis tuning provides selection of a hundred stations. With the aid of two external speakers you can have Dolby Surround Sound. A 25in. version, Model 2505DBT, was also marketed.

Power Supply Faults

The chopper power supply is quite complex, with two control chips, master and slave. The master chip is on the secondary side of the circuit, the slave on the primary side. Fig. 1 shows the basic arrangement in greatly simplified form. On the secondary side of the full circuit there are two 5V regulators and a 12V regulator. The L78MR05 regulator Q806 provides the supply for the microcontroller circuit.

Fortunately these sets have proved to be very reliable. There is one misleading condition that can occur in the power supply, giving the no results symptom, when several faulty components have been replaced. Under certain fault conditions C828, which is connected to pin 3 of Q803, will charge to some 3.8V: the receiver will not come to life until this voltage has been discharged — assuming that the fault has been cleared.

If the set is dead, check the voltage across the mains line rectifier’s reservoir capacitor C818. No voltage here could mean that the surge limiter resistor R805 or the mains fuse F801 is open-circuit. In this case the chopper transistor Q804 (2SC4288A) could be short-circuit. If so, the two chopper control chips Q803 (TEA2164) and Q807 (TEA5170) should also be replaced. These chips can be ruined when Q804 is dry-jointed. Set failure because of a fault in this area can also occur when D817 (RU4A) in the snubber network is short-circuit.

If the voltage across C818 is OK at some 320V, check the start-up resistor R810 (82kΩ, 3W). It may be open-circuit or could have gone high in value, though the latter is a rare occurrence. If there has been an excessive overload you might find that resistors R822 and R824 (both 0.39Ω, 1W) are open-circuit.

Sometimes the receiver will go into the trip mode when switched on. In this case check Q816 (12kΩ) whose value may have changed. If the power supply is tripping in the standby mode, check the switching transistor Q817 (2SC2120Y). If this is OK, check the voltage across the 13.7V supply reservoir capacitor C824. The items to check if this voltage is low or missing are D810 (BYD33J) which could be short-circuit, R814 (0.33Ω) which could be open-circuit and C424 itself which could be short-circuit or leaky. If all these items are OK, the slave chip Q803 is suspect.

The master control chip Q807 (TEA5170) can be powered by a 9V battery to check its operation. If it is OK when so powered its output wavefrom at pin 3 will be in the maximum on-time state. Check whether the supply is in the burst mode. If so, check the standby control circuit (Q809, Q810, Q811, Q814 and associated components).

If there is no drive output at pin 14 of the slave control chip Q803 (TEA2164) but the LT supply is present at pin 13 (13.7V across C824), check whether C828 is charged which may indicate that there’s an excess current fault.

On the secondary side of the circuit, the first item to check is the HT rectifier D818 (RU4AM) which may be short- or open-circuit. If necessary check for shorts across the LT lines provided by diodes D819, D826, D828 and D829 (all type RU4Z). The chopper transformer T803 could have shorted turns, in which case the audio output chips Q608 and Q609 (type TDA2030A) could have blown up – D828 will probably have suffered.

An item to check on the primary side of the circuit is D809 (BYD33J) which sometimes goes open-circuit. If the HT voltage developed across C833 is low at about 65V, check for a fault in the line output stage. If necessary, check the operation of the L78MR05 5V regulator Q806. There should be 20V at pin 1. If this voltage is missing, check D826 (RU4Z) and R861 (0.22Ω, 1W). If the 20V supply is very low, check whether the 12.5V regulator transistor Q813 (2SD717Y) is short-circuit – also whether zener diode D827 (04AZ13X) is short-circuit.

If everything seems to be OK so far, suspect the chop-
Fig. 1: The basic chopper power supply arrangement, simplified, used in the Toshiba Models 2505/2805DBT, showing the master-slave control chip system. The 10V supply feeds a 5V regulator; the 20V supply feeds 5V and 12.5V regulators – the former provides the microcontroller chip’s supply.

per transformer T803 (part number TPW3186).

Sometimes there’s a memory problem rather than a power supply fault. If the set goes back to standby after switch on though pin 37 of the CX80424-1075 microcontroller chip QA01 drops to a low state then quickly rises back to 5V, the μPD6254CX memory chip QA07 is faulty. Its replacement will restore normal operation.

**Line Timebase Faults**

If there is no sound or picture and the voltage across C833 (HT reservoir capacitor) is low, check the line output stage. The ON4408 output transistor Q404 or either/both of the EW modulator diodes D440 (BY228) and D441 (BYW95C) could be short-circuit. If not, suspect shorted turns in the line output transformer T461. If Q404 goes short-circuit as soon as the set is switched on, D440 is probably faulty – check it by replacement.

If the HT is OK but is not present at the collector of Q404, check the feed resistor R444 (0.82Ω, 2W). This resistor may have to be replaced if the line output transistor and/or transformer have gone short-circuit. If R444 is OK, check the voltage at the collector of the 2SC1569/FA5 line driver transistor Q402. No voltage here means check the driver transformer T401 for dry-joints, Q402 for being dry-jointed or open-circuit, and the 3.61a 7W feed resistor R416 which could be open-circuit or, sometimes, dry-jointed.

If the line driver stage is OK, check that there is 9.2V at pin 40 of the TA8783N colour decoder/deflection chip IC501. If the voltage here is correct or low, IC501 is suspect; if it is missing, check whether the 04AZ9.1Z zener diode D401 is short-circuit or R867 (100Ω) in the power supply is open-circuit.

If there is excessive width, L423 could have shorted turns – check it by replacement.

For sound but no picture, see if the CRT’s heaters are alright. If not, check whether R920 (5.1Ω, 1W) is open-circuit or pin 9 of the line output transformer is dry-jointed. It’s just possible, though this is rare, that the CRT heaters are open-circuit.

**Loss of Sync**

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If there is no line or field sync, replace IC501 (TA8783N).

**Field Faults**

For field collapse, first check that the 27V supply is present at pin 2 of the TDA8170 field output chip Q303. If it’s OK, check Q303 by replacement; if the voltage is missing, check R327 (4.70, 1W) and D302 (BYD33J) either of which could be open-circuit, also C314 (2.200pF) and C322 (220pF) which could be short-circuit or leaky. If necessary check the flyback boost diode D305 (BYD33J) which could be open-circuit.

It’s possible that the scan coils are open-circuit, though dry-joints or open connections at pins 5 and 6 of plug/socket P570 are more likely.

A DC bias is applied to the scan coils. If this is missing, check whether R334 (560Ω, 2W) is open-circuit.

The field ramp is generated by IC Q371 (TA8739P), which also produces the EW correction drive. If there is field collapse with a few scanning lines visible above the centre line, check for a ramp waveform at pin 15 of this chip. Its absence could mean that the chip or C372 (2.2µF) has failed.

**Tuner Faults**

The tuner unit can be responsible for a flickering picture and/or more often the picture just going to blue mute. In
either case the remedy is to replace the tuner.

Tuning drift can be caused by the tuner unit but is more often caused by the pPC574AL 33V stabiliser D108. If there is no tuning voltage, R829 (10kΩ, 2W) in the power supply is probably open-circuit.

**Video Faults**

If there is a blank raster with no sound, check whether the back terminal cover plate is pressing on QV22 – remove and resolder all connections if necessary.

For RGB problems, check the voltages at the RGB output pins of IC501 (TA8783N), 41/2/3 respectively. There should be about 3-75V here. If these voltages are incorrect and the voltage at pin 53 is more than 0-5V, replace IC501.

On a few occasions we have found that there is a blank raster, the remote control unit works but there’s no on-screen display. The cause of this has been the TDA8170 field output chip Q303: check at pin 3, where the voltage should be 0-7V.

No picture could mean trouble with the voltage regulation transistors Q514 (BC327) and/or Q516 (BC547A) on the tube base panel: check the DC conditions here carefully.

We’ve traced the cause of dark lines across the screen to dry-joints at C319 (0-22μF) in the field output circuit.

**Sound Faults**

The sound section does not give much trouble – most of the problems occurred in the early years, before modifications were introduced. A motorboating noise from all speakers with the set in the standby mode was caused by a poor earth connection to the heatsink for ICs Q609 and Q610. This was a very intermittent fault.

For further details, refer to Toshiba Technical Bulletin CDH41 (March 1992), which also deals with the problem of a ticking noise from the right-hand Surround speaker, present only when using Dolby Surround and noticeable when the Surround speakers go quiet with no signal. To overcome this problem, remove R610 and jumper link J109 which is under the heatsink for ICs Q608/Q611. Fit R610 in the J109 position and fit a link in the R610 position.

A third problem covered by bulletin CDH41 is a low-level hum from the left-hand Surround speaker in all modes, more noticeable at minimum volume. The cause is earth loops induced in the Surround sound chip Q610. Check the bulletin for the correct position of the green wire and cutting the earth print.

If there is motorboating in standby that’s not caused by the problem mentioned above, check for a short between pins 4 and 5 of IC Q608 (TDA2030A).

For no sound from either or both main channels, check that the 30V supply is present at pin 5 of the relevant chip(s), IC Q608 and Q609. If the supply is present, suspect the chip(s). If the supply is missing, check D828 (RU4Z) in the power supply.

If the main channels are OK but the Surround channels are not, check the 24V supply at pin 5 of ICs Q610 and Q611. If the supply is correct, check the chip(s) by replacement. If the supply is missing or incorrect, check D828 (RU4Z) and pin 15 of the chopper transformer where there may be a dry-joint.

If there’s a Picnic problem, such as Picnic dropout or crackle on sound, it’s usually best to replace the Picnic PCB complete. Repair can be very expensive, in terms of both time and component costs.
2.5GHz frequency meter for under £100?

Hand-held and battery-powered, the FC2500 costs just £99 exclusively to Television readers.

Normally, the FC2500 2.5GHz frequency meter retails at £116.33 including VAT. But for a limited period Television, in conjunction with Vann Draper Electronics, is making this instrument available exclusively to readers at the special price of £99 – including VAT and postage – representing a discount of £17 on an already low price. Simply fill in the coupon and post it to Vann Draper at Unit 5, Premier Works, Canal Street, South Wigston, Leicester LE18 2PL. Tel. 0116 2771400, fax 0116 2773945.

### Specifications

<table>
<thead>
<tr>
<th>Range</th>
<th>2.5GHz</th>
<th>500MHz</th>
<th>10MHz</th>
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<tr>
<td>Span</td>
<td>50MHz-2.5GHz</td>
<td>10MHz-500MHz</td>
<td>1Hz-10MHz</td>
</tr>
<tr>
<td>Sensitivity</td>
<td>≤100mV, 50-75MHz</td>
<td>≤50mV, 35-350MHz</td>
<td>≤50mV</td>
</tr>
<tr>
<td>Gating</td>
<td>2.75s sample, 100Hz resolution</td>
<td>1.5s sample, 50Hz resolution</td>
<td>0.5s sample, 10Hz resolution</td>
</tr>
</tbody>
</table>

### Use this coupon to order your FC2500

Please send me ...... FC2500 2.5GHz frequency meter at the fully inclusive special offer price of £99 each – fully inclusive. Also ...... AT20 Tx measurement antenna at £6.95 inclusive.

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Company (if any)

Address

Phone number/fax

Total amount £...........

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

Card type (Access/Visa)

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Expiry date

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

*Overseas readers can also obtain this discount but details vary according to country. Please ring, write or fax to Vann Draper Electronics.*
As this column is being written during the first week in January, it is time to reflect on the past year's TV-DXing. There was an improvement in Sporadic E activity compared with 1996, also in autumn tropospheric openings. The mid-November Leonids meteor shower period was an active one. With the rapidly increasing sunspot count we can look forward to some early evening TE (transequatorial skip) reception, while next winter could bring the first signs of F2 layer propagation for some years. It has also been suggested that the Leonids meteor shower next November could bring record activity.

Unfortunately there has been a decline in the number of active DX-TV enthusiasts. There are several probable reasons for this. First, conditions have not been very good in recent years. Secondly the number of low-band VHF TV transmitters in Europe has declined as services have moved to UHF, while interference levels across Band I have increased. Then there is the lure of satellite reception. There's always something to be seen from the Clarke belt, and dishes can sit at ground level. The number of those interested in multi-satellite reception has grown, more than offsetting the decrease of interest in terrestrial DX-TV reception.

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The future lies with digital TV - the technology has already taken a firm hold in the satellite field. Fortunately there are still many analogue signals available from the satellite belt but, looking to the future, we need to grasp the digits! Sadly there was little terrestrial DX-TV activity during the last month of 1997. Low-level SpE signals were received on the 7th, 14th and 27th of December, all in chs E3 and E4. The signals were all unidentified and were present during the mid to late morning period.

Now back to TE reception. Robert Copeman in Victoria, Australia reports mid-evening reception from China (ch. Cl, 49.75MHz vision carrier) on several occasions. During late November he received Malaysian signals in chs. E2 and 3 (at 2105-2200 local time), and on two occasions during the month he received ch. A2 (55-25MHz vision carrier) signals from American Samoa. This is encouraging news.

Later that morning (17th) something seemed to be afoot in Russia. From 0900 there appeared, via an Intelsat K Brightstar lease (11.532GHz), shots of a space control room with orbital tracks on the monitor screens. One screen displayed the familiar 0167 test pattern. Subsequently there were shots of TV cameras etc. being set up, white balance adjustments, mic tests etc. Then the feed cut to Brightstar colour bars. We shall never know what was up.

A reader asks what the "Pegasus Test" via Intelsat K (11.4985GHz horizontal) was on December 11th at 1830GMT. Anyone know?
More sport. While checking Orion 1 (37.5°W) at 1700 GMT one day I came across “UKI-77 TEST” alternating with “BT TES 9 + 00044 802852221” via the 12.669GHz vertical transponder. At 1705 the caption “TV Sport Turin” appeared followed by several two-way interviews. The caption then returned until 1930, when a Manchester United v. Juventus match started. Low-level audio subcarriers were present at the usual 7.1, 7.2 and 7.4MHz.

I’d not seen the NTSC “US TV Pool Sarajevo” test pattern since the end of hostilities in the former Yugoslavia. But there it was, on December 22nd at 0830, via the 12.554GHz vertical transponder aboard Orion. Later “US TV Pool TUSLA” came up. The reason for this activity then became clear: President Clinton was meeting the US troops and extending Christmas greetings to them. A camera shot of the camp notice board proclaimed “Eagle Base Tuzla, Tuzla, Bosnia”. Cyril Willis (King’s Lynn) saw Roy Carman (Sandown, Isle of Wight) also watching this but feels “it’s high time he went digital “as analogue feeds are drying up”. He’s considering the Nokia 9600. Nevertheless his log for December 19th lists six active analogue feeds via Kopernikus 2 (28.5°E) at 1730.

Terrestrial TV News
Spain: Deregulation of the TV broadcasting system is planned to take place on January 1st 1999. Two further national TV networks will be added to the present ones (two from RTVE, Antena 3, Canal Plus and Tele 5). Retevision will distribute and transmit via Orion 1 but on this occasion the feed was via the Intelsat bird at 53°W.

Finally, I’ve found the new Iran TV service via Hot Bird 3 at 13°E (12.434GHz horizontal) of interest. Material seems to consist of video offerings from the state broadcaster IRIB and, for much of the evening, the University of Sahar. It’s certainly different, and I’ve seen some beautiful video sequences.

Transmitter News
A 600kW ERP, ch. E59 transmitter at Jihlava near Jacevice is now being used by Prima TV in the Czech Republic.

To make provision for DAB expansion, the 100W transmitter at Flensberg, Germany, is now using ch. E10 instead of E12 for the NDR service. The local Rugen-TV service at Garz is on ch. E26 at 5kW ERP: programmes are transmitted from 1700-0530 local time, text pages being transmitted at other times.

The Hungarian MTV-2 service has moved to satellite transmission. The TV-2 network has taken over the transmitters previously used for MTV-2.

Lublin-3 TV is now in operation on ch. R39, with 100kW ERP. The mast is 200m high.

Noord TV in the Netherlands is transmitted on ch. 14, with 100kW ERP. RTH (Portugal) has been given financial assistance by the EU to experiment with 16:9 transmissions.
(three applicants) and Leicester (two applicants).

Final licence approvals are expected in the spring, with the services likely to start this summer. The licences will last for two years.

Because no suitable channel is available, the ITC has decided not to offer licences in Glasgow, Nottingham, Tyneside, Liverpool, Cardiff, Cambridge, Motherwell and Newcastle.

Co-channel Interference Filtering

In the January column (page 212) I mentioned a co-channel interference filter marketed by the New Zealand company Tennatron. Since then I have received from Steve Fogerty of Tennatron detailed information on the subject. Interesting that he is a long-time reader of *Television* – and remembers when Charles Rafarel wrote the DX-TV column back in the Sixties!

Steve points out that when TV transmitters in adjacent areas use the same channel there is usually a line offset to minimise visual interference effects. These offsets are at typically one third, one sixth or one half the line frequency.

The one-third line offset is used where there are three stations (two possible sources of interference). A typical offset frequency would be 10.425kHz, giving offsets of –10.425kHz, 0kHz and 10.425kHz. The interference pattern is three lines wide.

The half-line offset is used with two stations. Offsets should be 23.41kHz (one and a half line offsets), i.e. 0/-23.4kHz or 0/23.4kHz. The interference pattern is two lines wide.

The one-sixth line offset (1.3kHz) is used between stations with one-third line offsets. The interference pattern is six lines wide and is quite noticeable with large-screen TV sets.

Any multiple of one twelfth of a line can be used as an offset frequency, a half-line offset (±7.8kHz) for example.

At the transmitter, the frequency tolerance with non-precision offsets is ±500Hz. For improved results, precision offset tolerance should be used, typically ±1Hz. The latter, with a one third or one sixth offset, locks the line structure within the picture.

Precision locking implies a very stable transmitter, i.e. one whose oscillator is locked to a high-stability source such as a GPS frequency standard or a rubidium oscillator.

Broadcasters suffer co-channel interference because of frequency sharing and congestion. With small transmitters that use the RBR (off-air rebroadcast) technique, using high receiving aerials, the potential for interference is considerable – even when stacked and screened aerials are used. The problems can increase during high-pressure weather conditions, when tropospheric propagation enhances weak, distant signals.

The electronic co-channel filter provides superior and more versatile cancellation. The broadcaster uses the filter at IF rather than the RF input frequency, so that the filter can be used with any channel – assuming that the transmitters involved are precision stable. Domestic receivers are far from stable, and are thus not suitable for IF precision offset operation.

Tennatron have an RF input version however (for connection in series with the aerial feeder) for Bands I/II, for both domestic and professional use. The price of the former in New Zealand is the equivalent of about £120UK. A baseband video input model is to be introduced later this year at roughly the same price. It’s essential to quote the wanted and unwanted frequencies, RF or IF, or with the video baseband unit the unwanted offset frequency (10.425kHz, 23.41kHz etc). The ITC can provide information on nominal and offset frequencies for UK transmitters.

My thanks to Steve for all this information. Trade/cable enquiries about these co-channel filters should be sent to Tennatron Industries (NZ) Ltd., 283 High Street, PO Box 218, Motueka, New Zealand – phone/fax 03 528 8707 (international +64 3 528 8707).

Satellite News

Bad news for SE Asia: the AsiaSat-3 launch on December 25th was a failure. The second firing came to an end after one second, with the result that the satellite is now in an elliptical orbit with no possibility of being recovered. This could delay the launch of the Astra 2A satellite – and the start of BskyB’s digital services – since the same type of Russian rocket is to be used. Incidentally SES-Astra has bypassed Eutelsat’s claim to the 28°E slot by doing a deal with Deutsch Telecom for about 250MHz of the little-used Kopernikus (28.5°E) spectrum – in effect Astra 2A will replace DFS-2 at 28.5°E.

Kirch and Bertelsmann have agreed to an EU demand to cease marketing the Kirch D-box decoder for Premiere subscribers – about 100,000 have been sold. Premiere will now await an EU decision on an all-Europe digital standard.

The Australian digital TV group Optus-Vision expects to have its pay-per-view/video-on-demand services in operation across Australia by the end of the year and might then enter the UK market.

Two pan-African TV services are being downlinked by Intelsat at 27.5°W. Minaj Africa Network has been on test recently and hopes to have services in operation this summer. African Independent Television International has been transmitted to Nigeria and neighbouring countries since last autumn. These are all C-band services.

MTV is to start its M2 European music channel this summer. Existing services will become “regionalised”, with separate feeds to Scandinavia/Eastern Europe and the Netherlands.

Ango-Dutch Shell has put out for tender an order for 11,000 VSATs (Very Small Aperture Terminals) – these are transmit/receive terminals intended for commercial use. They would handle a company’s retail and administrative operations across Europe, forming by far the largest such network.

Intelsat 704 (66°E) is now being used full time for video/TV traffic across Asia – a new satellite at 64°E has taken over telecoms/data distribution. Intelsat’s APR-1 craft is to be launched in July, providing high-level (up to 95dBW) C-band links at 83°E for single-hop Europe/Asia hook-ups. K-TV will be launched in spring 1999, providing Ku-band signals at up to 55dBW across India/SE Asia. 601’s telemetry problems have been sorted out and the satellite has been moved to 27.5°E. 806 is to be launched in March, to orbit at 40.5°W. 804 was launched on December 21st at 64°E for Indian Ocean service. Intelsat has confirmed with Ariane launches for future IX series satellites – 902/3/4. Columbia is to take over the ancient 515 craft at 37.5°W and lease several transponders back to Intelsat: use of the C-band TDRS-4 craft at 41°W will cease.

Echostar has introduced a new digital receiver, Model DSB9800, which offers free-air/conditional access operation and is claimed to be an “enthusiasts receiver”. The specification has many useful features, but the m/symbol rate coverage is only 18.5-30 – there are many signals that run at lower ms rates.

Future frequency bands being discussed are K 18-27GHz, Ka 27-40GHz, Q 36-46GHz and V 46-56GHz.
Answer to Test Case 423
- see page 325 -

To start with we need to clarify the set’s field scanning. With an ordinary picture the lines of alternate fields are interlaced, i.e. the lines of any given field occupy screen positions midway between the lines of the immediately preceding and succeeding fields. This is normal practice. The result is good picture resolution with a relatively fast large-area flicker rate of 50Hz. With a text display the line and field scan rates are the same as with an ordinary picture, but to prevent interline flicker (25Hz) while maintaining the same display-repetition rate (50Hz) the lines of successive fields are overlaid. The result is a coarser display – which is no disadvantage with the large elements in a text display – that sits steady on the screen.

In this particular chassis design text de-interlacing is carried out not by changing the start time of successive fields but by passing a switched vertical shift current through the scan coils on alternate fields. This current is just sufficient to move the raster by one line width. Hence the 25Hz feed to inverter transistor Q009 and the resistive link between its collector and the scan coils. The vital clue was right at the end this time: the waveform at the transistor’s collector should have been at 25Hz.

Transistor Q009 wasn’t working because the PC land at its emitter was not connected to chassis. A wire link had been omitted during production.

NEXT MONTH IN TELEVISION

TV/VCR Spares Guide
This essential reference material is included free with our next issue. The updated, 8-page pull-out 1998 Television TV/video Spares Guide provides addresses and ordering phone/fax numbers for brands, manufacturers and spares distributors in the consumer electronics field.

Servicing the Panasonic NVJ35/J35/F65/F70
These VCRs are now some years old but are still capable of providing superb picture quality and performance, and are thus worth servicing and maintaining. Brian Storm provides an authoritative fault-finding guide.

Las Vegas CES Report
The Las Vegas winter Consumer Electronics Show is an important international event for introducing the latest in CE equipment. This year is particularly significant, with digital TV to the fore. George Cole reports on the latest products and developments.

What’s Cooking?
The microwave oven is a common enough domestic item which is partly electronic, partly an appliance. Repairs are often required, and this is something you should be able to handle. J. LeJeune describes the basic operation and features of microwave ovens and the relevant servicing procedures.

Service Notebook
John Edwards on tackling various types of TV and video repairs.

On sale March 18th

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INDEX DISC
Version 6 of the computerised index to TELEVISION magazine covers Volumes 38 to 47 (1988-1997). It has thousands of references to TV/VCR fault reports and articles, with synopses. A TV/VCR spares guide, an advertisers list and a directory of trade and professional organisations are included. The software is easy to use and very quick. It runs on any IBM or compatible PC with 840K RAM and a hard disc. Price £35 (3.5” HD, alternatively 3.5” DD) Those with previous versions can obtain an upgraded version for £15. Please quote the serial number of the original disc.

FAULT REPORT DISCS
Each disc contains the full text for Television VCR, monitor, camcorder, satellite TV and CD fault reports published in individual volumes of TELEVISION, giving you easy access to this vital information. Note that the discs cannot be used on their own, only in conjunction with the Index disc: you load the contents of the Fault Report disc on to your computer’s hard disc then access it via the Index disc. Fault Report discs are now available for

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TELEVISION March 1998
Let us welcome letters from our readers and try to publish as many as we can. You can send them typed, handwritten, or on disc. Address them to the Letters Editor, Room L302, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS.

Electrical Safety

Colin McCormick’s letter (January, page 175) continues the discussion started by C.N. Cory in the November issue. In such a serious matter as electrical safety we need to stick to facts: these are in the British Standard (European and, with a few differences, international) BS EN60065:1994.

First, ‘double insulated’. The standard calls for two or more layers of insulation, ‘basic’ and ‘supplementary’, that meet specific requirements, or ‘reinforced insulation’ which is a single layer that meets more stringent requirements. Either basic or supplementary insulation may be provided by means of an air gap of specified minimum dimensions.

The CD player mentioned by Colin McCormick seems to have only one layer, the air gap. So the question is whether an air gap can provide ‘reinforced insulation’? Clause 9.3.4 b) in the standard specifies the width of an air gap in this situation. For reinforced insulation, with mains voltage, the minimum width is 6mm, which must not be reduced to less than 4mm when an external force of 50N (Newtons – 50N is about 5kg force) is applied simultaneously with an internal force of 2N applied to wiring or any live part. The product is expected to meet these requirements. If it doesn’t, maybe there should have been a cover over the live parts or an insulator fixed to the inside surface of the cover – either of which might not have survived previous work carried out by an unskilled or careless person.

Next, ‘floating’ circuitry. The values used in a resistor and capacitor combination that bridges a mains isolation barrier are determined by the requirements laid down in clause 9.1.1 of the standard. In effect, the impedance of the parallel RC combination must be not less than 415kΩ, which allows a maximum current of 0.7mA peak (0.5mA RMS with a sinusine current). The voltage, with respect to earth, at which the circuitry sits depends on the capacitance of the whole product to earth. There is nothing to say that it will be 110V or any other value less than 230V. It doesn’t matter, because to most people 0.7mA is only just perceptible as a ‘touch current’ and is not dangerous even if it can be felt.

The requirements are stricter for aerial terminals. The impedance must exceed 463kΩ, and the stored capacitance must be less than 4.5μC (microcoulombs). At 325V peak, i.e. a 230V AC mains supply, this represents a capacitance limit (Q = CV) of 13.9nF.

I am surprised to hear that there was a problem with the brand of receiver mentioned: once upon a time I supplied the company with a microwave receiver, and its technical surveillance was exacting. But 13.9nF (if the actual capacitance was anywhere near the maximum value, I would be surprised) charged to 325V does produce a fat spark.

The current and the stored energy values that are permitted were determined by experience and have not been changed for a very long time. They are certainly in BS415:1967, and I don’t think they were new even then.

What is new is that many more items of Class II equipment are nowadays being connected together. Each of them has a capacitance, intentional or more often just stray, between the live mains and the isolated circuitry. When several pieces of equipment are connected together, the total capacitance can create a ‘touch current’ that’s far from comfortable, though such currents are a long way from being dangerous in themselves.

Aerial riggers should be aware of the problem however, and should take extra safety precautions – the use of insulating boots and, if possible, gloves. The problem has been recognised, and an international team of experts is attempting to draw up measures to control the effect. Unfortunately there is no easy solution.


Back Injury

Readers may recall my back injury case, which started in 1981. In 1990 I won £20,000 in court from Radio Rentals/Thorn EMI (liability). But I was advised to “settle in order to get our (Radio Rentals’) personal injury insurance from Sun Alliance”. It didn’t work out like that, and I’ve had to continue the battle ever since.

Now, after all these years, a new judge has reviewed the case, which started in 1981. In 1990 I won £20,000 in court from Radio Rentals/Thorn EMI (liability). But I was advised to “settle in order to get our (Radio Rentals’) personal injury insurance from Sun Alliance”. It didn’t work out like that, and I’ve had to continue the battle ever since.

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A Tale of Two Tellys
How about this? Set A required a Nicam crystal. By strange coincidence, set B required the same. Not being an account holder with manufacturer A, a major multinational which won't even speak to us, a call was made to the company's distributor to place the order. "Special Parts Order, it'll take seven to ten days" the distributor said.

We don't have an account with manufacturer B either. This is a much less well known brand, but the company was most helpful when we phoned to ask about spares. A cheque was sent with the order, in the post on Tuesday night. Bright and early on Thursday morning the parts arrived. Brilliant. They were fitted and, within 48 hours of our first parts enquiry, a delighted customer paid his £60.91 bill and collected his set.

Set B is still awaiting parts. In due course we expect that it will be returned to the customer with an anticipated bill of £142.36.

OK, let's not be mealy-mouthed about it. Manufacturer A is Sony, manufacturer B Beko and the difference for the same job is over £80. There seems to be something wrong somewhere. Adrian Spriddell, Diss, Norfolk.

**PACE APOLLO UPGRADE**
My father has a Pace Apollo satellite receiver which, though a very good performer, has only 120-channel capability. As it is part of a motorised system this limited its usefulness. The Pace Apollo and MSS200/300 series receivers all have a 24C32 EEPROM and all use the same PCB, but the MSS300 has 250-channel capability. So I decided to make a copy of the contents of the 24C32 EEPROM in a Pace MSS300 receiver.

I have built myself a serial EEPROM programmer, but instead of using one of these you can tackle the problem in the following way. Remove the EEPROM from the Apollo receiver and put it aside. Then install a socket and a new EEPROM in an MSS300 receiver: at power up, the microcontroller chip will load its ROM programme to the new memory chip. Fit this chip in the Apollo model and it will now have 250 channels, as if it was an MSS300, making it a very useful receiver. Finally put your old chip back so that the customer settings are retained. A point to note however: if for any reason you do a factory reset, the Apollo receiver will revert to 120 channels. So it's best to fit the chip in a socket.

If you wish to have the same information in both receivers, fit the original EEPROM from the MSS300 in the Apollo receiver then use the download facility to clone the MSS300 with the new chip.

K.E. Prior, Weymouth, Dorset.

**REGULATOR DECOUPLING**
While reading the interesting article on null-method dish alignment by John Pitt-Francis (January 1998 issue) I noticed that the 7812 regulator shown in Fig. 2 has no decoupling capacitors.

78 and 79 series regulators are industry-standard devices that are available from various manufacturers. They all look much the same. Their internal arrangements are not identical however, and some become horribly unstable when operated without decoupling.

I guess that John used a tolerant one. But to guarantee successful results every time it's best to connect an 0.1uF capacitor to ground at the input and a 1µF capacitor to ground at the output. They should be mounted as close to the regulator as possible.

Keith Cummins, Chale Green, Isle of Wight.

**PANASONIC TX25AD1DP**
In my fault report on one of these sets (Euro 2 chassis) in the December issue I suggested that R668 on panel E should also be replaced when there has been trouble with relay RL6101. In fact R668 should be removed, not replaced. This is important. The CRT could again be damaged if there was further relay sticking.

Brian Storm, Harpenden, Herts.

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<th>WAS</th>
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<tr>
<td>14&quot; R/C</td>
<td>£79</td>
<td>£75</td>
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<td>14&quot; Text</td>
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<td>14&quot; Tele Video Combinations</td>
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<td>20&quot; Nicam Fastext</td>
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<td>28&quot; Widescreen Nicam</td>
<td>£450</td>
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<td>32&quot; Widescreen Nicam</td>
<td>£700</td>
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<td>CTV/VCP</td>
<td>£10.00</td>
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<td>VCR</td>
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