Guide to the

Panasonic Euro-7 chassis

Pic-based pattern generator

Memory technology developments

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**FLYBACK TRANSFORMERS**

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The software bug problem

Why do we have to put up with the huge frustrations caused by computer systems that don’t work properly? Every so often problems with a computer system for a public utility, government department, the health service or whatever hit the headlines; one suspects because they provide an opportunity to score political points. The latter doesn’t help one bit. The problem is much more fundamental. According to a recent study by the US Commerce Department’s National Institute of Standards and Technology (NIST), major software problems cost US companies some $60bn in 2001. But this is only part of the sorry situation. Most problems with computer software are suffered by smaller companies and individual users who don’t have access to an in-house IT department that can try, with varying degrees of success, to sort things out. It has been estimated that in the US the real cost of software difficulties is three-four times the NIST figure. Basically, the cause of the problem is poor quality computer code. Why does this occur?

We usually want our PCs etc. to be able to perform relatively straightforward tasks without doing a funny or producing a weirdo. And we want a good degree of compatibility between older and newer programs and programs from different sources. There has been criticism of Microsoft over the years because of its dominant position and the way in which it has achieved this. But its dominance has probably helped enormously. One dreads to think of the horrors that could have arisen from scores of software companies all trying to do something different and/or ‘better’ to try to gain customers. What’s really needed is industry standards: short of that, Microsoft serves the purpose, though not without many a glitch, snag or bug, call it what you will.

Efforts at ‘bettering’ computer systems and programs are the cause of many of our problems. We’re told we need this latest version of something or other. The cynical amongst us would suggest, often rightly, that this is because the previous version was defective. How often have you had something new installed, often as an unrequested ‘upgrade’, only to find that things don’t work as well as they did before? It has happened often enough in our editorial office. “Oh, we didn’t know you did/wanted that” comes the reply from the interfering IT person. No, you didn’t, and it’s unlikely that you will be able to come up with a solution, maybe because there isn’t one.

The electronics industry has provided remarkably reliable computer hardware over the years, with a high degree of compatibility – basic motherboards, power supplies, drives and so on. In comparison, the computer software industry seems to be a shambles. Operating systems have often been introduced without thorough testing. They are tried out, work, go on sale then someone asks the system to do something quite reasonable and it collapses. The requirement hadn’t been envisaged. “We didn’t think you did/wanted that” again. And so back to the drawing board, or whatever computer programmers use (more computers unfortunately). Some time later another version appears. It often creates its own problems.

Is one asking the impossible of software firms? Maybe. But if straightforward systems that have been thoroughly tested, without any pressure from the sales side to release something ‘new’, had been the order of the day we would have been far, far better off. Those dozens of versions of programs just seem to cause incompatibility problems.

Many of the problems stem from the tools and languages used by programmers. There have been improvements, but many programmers continue to use old computer languages such as C and Cobol. A further problem is that the software industry values new code writing more highly than the testing and debugging of products and effective integration of programs. The causes of this can be traced back to university computer courses that concentrate on program writing. What’s far more important in practice is being able to get programs from different sources to work together and provide reliable results. It seems that students don’t appreciate this, maybe because of the guidance they are given. They regard testing and debugging as the uncreative aspects of software development. According to NIST, computer science graduates are often not trained in writing basic specifications and testing. Most specifications for computer programs are written in English, which is inherently ambiguous. NIST is working on a formal language, quasi-mathematical, that it hopes will produce more reliable products.

But heaven help the man from the IT department, who is expected to be able to solve the problems caused by the training and attitudes in the software industry. We, the users of computer software, deserve better.

Unfortunately it seems inevitable that our frustrations will continue, despite the fact that the industry has had more than enough time to get it right: commercial computing has been with us for over half a century, and the IBM PC system has been in use for roughly half that time.
Blue-laser disc formats

Toshiba and NEC have jointly proposed to the DVD Forum a next-generation, high-capacity blue-laser disc format that would enable manufacturers to continue to use existing DVD plant and equipment. The proposed format covers both read-only discs, used to distribute high-definition films, and read-and-write discs. It uses a 405nm wavelength laser and the same disc technology that’s used for current DVDs – back-to-back bonding of two 0.6mm thick 12cm diameter discs. The main difference from a previously announced proposal, Blue-ray (see Teletopics April 2002), seems to be in the form of the disc. The Blue-ray discs would be supplied in a protective caddy and have a somewhat higher storage capacity.

The Toshiba/NEC-format discs have a storage capacity of 15GB for the single-sided, single-layer read-only type, and 20GB for the single-sided, single-layer rewritable type which uses land and groove recording. These capacities are doubled for dual-layer versions. The basic increase in capacity compared with current DVD discs is made possible by the use of a blue laser with new signal-processing and phase-change recording technology.

In February the DVD Forum established two sub-groups to study different approaches to the next-generation blue-laser format. One is considering an approach based on an 0.6mm disc substrate (the same as with current DVDs), the other an 0.1mm cover layer as proposed by Blu-ray. Toshiba and NEC separately promoted research on an 0.6mm disc substrate and, after verifying one another’s technology, decided to propose a unified format. The companies say that their format provides a cost-effective upgrade path for media vendors, with backwards-compatibility for consumers who have built up DVD libraries. Other advantages are absence of the need for a caddy, which enables slim drives that can be integrated into portable equipment to be built, and the fact that dual-layer discs are easy to create, as the back-to-back bonding of 0.6mm thick discs is the same as with current DVDs. The data transfer rate is 36Mbits/sec (same as Blue-ray) while the numerical aperture of the objective lens is 0.65. The new format would also meet the needs of the PC industry optical-drive business.

Beko-Grundig link?

There have been unconfirmed reports of a possible link between Turkish TV and appliance manufacturer Beko and the German consumer electronics group Grundig, which has been going through a difficult period. Grundig requires additional finance and would welcome an equity interest being taken by an outside investor. For Beko the advantage would be use of the renowned Grundig.

ITV Digital: the end

The final stages in winding up ITV Digital are being undertaken by the administrator Deloitte & Touche. Various assets, including some 100 of those knitted monkeys, were auctioned in early September. The monkeys were left over after 32,000 were sold to two customers, one of which was The Gadget Shop. The final stage will be to place the company in liquidation, but consultation with the creditors’ committee is required before this can be done. It’s understood that the administrator has been negotiating with two interested parties about the 750,000 or so set-top boxes in former subscribers’ homes. All proceeds will go to the liquidators for distribution to the creditors, which include Carlton, Granada, Sky TV, the Football League and Crown

Camera-phones

According to a report from Strategy Analytics, mobile phones that incorporate a camera will soon be outselling digital still cameras. The researchers predict that by 2007 sales of camera-phones will have reached 147 million a year.

The Dixon Tele-Lift is the answer to your TV lifting problems, eliminating all stress to the back and any other part of the body. Designed by technicians, this strong, lightweight lifting aid can be used with all current TV sets, lifting up to 100kg safely by means of suction pads. It’s stable over rough ground and on stairs, has continuously variable height adjustment and can be used as a workbench for field servicing. The Tele-Lift is manufactured in Australia and is to be launched in the UK shortly. Meanwhile it can be obtained via the internet. Sony Australia has officially approved the Tele-Lift for use in the company’s servicing and distribution operations. The website address is www.liftingsystems.com.au or you can e-mail grdixon@optushome.com.au
The green tax effect

Manufacturers and retailers of domestic electrical and electronic products are considering how to pass on to consumers the new environmental costs that are to be imposed on them. The prices of refrigerators, TV sets and PCs in particular will rise as a result of the European Union directive (WEEE) that makes manufacturers/distributors responsible for recycling products at the end of their useful lives.

Manufacturers, including Panasonic, Electrolux and Sony, feel that cost increases should be made clear to consumers. They want to impose a 'green fee' of £10 or more per item at the point of sale, in addition to the price rise required to cover the cost of recycling the item being sold. The green fee would pay for recycling products made by companies that no longer exist and equipment made ten-twenty years ago. Retailers oppose such a scheme, saying that it would impose extra costs on them and make them, in effect, tax collectors.

Fred Round, chief executive of RETRA, insists that a visible fee would mean hassle for shopkeepers - more book-keeping and implications for price tracking.

The EU is still discussing how exactly manufacturers and distributors are to be made to pay for the disposal of equipment, and whether this decision could be left to individual countries.

Technology developments

Following work by the National Physical Laboratory and the Institute of Nanotechnology at the University of Stirling, the UK Advisory Group on Nanotechnology Applications has recommended to the government that two £25m a year nanotechnology fabrication centres should be set up. The aim would be to try to keep abreast of worldwide developments in this field (see article in the August issue). It's understood that some £710m will be spent on nanotechnology development in the US next year, while there are plans to spend some £650m in Japan.

Fujitsu Laboratories in Tokyo has developed a way of growing bunches of controlled-diameter, multi-wall carbon nanotubes vertically on a silicon substrate to provide MOSFET connections. Carbon nanotubes are usually produced using laser vaporisation and arc discharge, which, according to Fujitsu, do not provide good control over the location, orientation and diameter of the nanotubes. Instead, the company is using plasma-enhanced chemical vapour deposition: a methane-hydrogen mix is decomposed in an electric field to produce growth aligned with the field. Diameter control is achieved by varying the amount of nickel or cobalt catalyst in the silicide (silicon-metal) layer on which the tubes are grown.

Intel has announced advances in its chip technology. From next year chips will be produced with 90nm features, special material that allows insulating layers just five atoms thick to be created, and microscopic copper instead of aluminium wiring to provide faster operation. In addition the chips will use 'strained silicon'. This increases the distance between the atoms by one per cent, significantly increasing electron flow and chip performance.

Video products

Thomson has launched a combined DVD player and Nicam VCR, Model DTH6000U, which is expected to retail at about £300. Features include MP3 playback, two scart sockets, RF loop-through for easy installation with other AV equipment, front AV connectors for easy recording from external equipment such as a camcorder, and the NextView link system which provides easier installation and programming when connected to a Thomson TV set.

Panasonic has launched a DVD-Audio/Video player, Model DVD-RA82, which is also compatible with DVD-RAM discs and includes a Dolby Digital/DTS decoder, a Super Hi-Speed scan facility that gives 200 times normal playback, a quick replay button that jumps back 7-10 seconds on a disc, and a 4:3 TV zoom control that's designed to eliminate black bars with widescreen discs. Price is expected to be about £250.

Philips has launched Model DVD763SA, which can handle DVD, SACD, CD, CD-RW, CD-R, VCD and SVCD discs. It will also play back MP3 sound recorded on to a CD via a PC. There are built-in decoders for Dolby Digital and DTS recordings. In addition coaxial and optical digital outputs provide PCM, MPEG, Dolby Digital and DTC signals for external decoding. Price is expected to be around £250.

DAB radio at £99

Videologic Systems has released the first digital radio broadcasting receiver, the Pure Evoke-1, to sell at the low price of £99. A limited edition to test the market was made available last year, and high-volume production has now started. It uses third-generation DAB technology and is being well promoted. This could well be a breakthrough for DAB.

Thomson Multimedia has developed this solution for those who want sound in a different room or outdoors without the hassle of having to use extension leads - wireless loudspeakers. Sound is transmitted to the stereo speakers at 863MHz. The transmissions pass through walls and are usable at up to 80m. The two speakers, type WSP740, can each deliver 3W RMS and have a volume and bass boost control. They also have a built-in charging circuit for rechargeable batteries, and magnetic shielding to prevent interference when used near PC monitors or TV sets. For further information contact Thomson Multimedia on 01732 820 920 or go to the website at www.thomson-europe.com
Memory technology developments

Moore's Law was first pronounced by Dr Gordon Moore, co-founder of Intel, in 1964. It states that the quantity of information that can be stored in a given amount of silicon will roughly double each year. The prediction held true until the late Seventies, when the doubling time slowed to every eighteen months. It has stayed there ever since. But physicists say that with current integrated-circuit technology the Law will cease to apply some time during the decade 2010-2020, when the gates that control the passage of information within a chip become as small as the wavelength of an electron — approximately ten nanometres in silicon. At this point transistors cease to work.

Of the more than 100 quadrillion transistors that Gordon Moore estimates have been produced to date, nearly all have been formed directly on the surface of silicon crystals, in two-dimensional configurations. So far IC designers have been able to prove Moore's Law by shrinking the size of each transistor, doubling their density per microchip. Expanding the chip area has also helped. But, with increasing technical difficulties, progress along these lines has started to level off. This has prompted a review of chip design and a move towards three-dimensional (3D), i.e. vertical, fabrication.

The electronics industry may be in recession, but research and development continue. Ralf Buckstone reports on developments in the memory field

It could restore the validity of Moore’s prediction — and give us greater computing power at less cost.

Physical limitations
Moore’s Law has continued to be relevant because the IC industry has been able to improve the way in which that bottom layer of silicon is used. Very large silicon crystals, 30cm in diameter with less than one part per billion of impurities, can be grown. There have been improvements in the deposition of carefully-controlled doses of doping material into the wafers cut from the crystals, and in the resolution of the photolithographic processes used to define the treated regions to form transistors and their interconnections.

But photolithography is subject to limitations dictated by the laws of physics — to continue to pack more transistors on to a wafer calls for light of ever-shorter wavelength. Mercury-vapour lamps have been replaced by deep-ultraviolet lasers that can define 30 nanometre features, putting a billion transistors on a chip. Further improvements could push the limit to 65nm, creating perhaps 16 billion transistors. Beyond this, the road gets a bit bumpy and less secure with regard to the return on effort and investment.

The 3D approach
With the limitations of 2D fabrication being approached, one might ask why silicon IC developers haven’t moved to vertical fabrication? The answer seems to be speed and reliability, both of which are optimised when an IC is formed of perfectly-aligned atoms in a wafer cut from a single silicon crystal. Once a semiconductor wafer has been coated with an insulating oxide layer, and metal conductive paths have been deposited, there’s no known way of reaching the underlying crystalline pattern: it has been described as like trying to match the pattern of a parquet floor after covering it with a carpet! And silicon deposited on to a non-crystalline (polysilicon) surface tends to be completely disordered (amorphous).

The idea of 3D (vertical) chip fabrication has been around in Silicon Valley for years without any commercial success being achieved. Several universities conducted 3D chip experiments in the Eighties, but these failed because exotic materials or unusual designs were required. As a result the traditional approach to chip fabrication has continued and engineers stopped giving much thought to 3D possibilities — until two technical developments encouraged a reassessment of 3D IC design.

Breakthroughs
The first breakthrough came from the flat-panel display industry, with the development of technology that deposits millions of transistors as a thin film spread over a large, amorphous glass substrate.
The second development, called chemical-mechanical polishing (CMP), was devised in IBM’s research laboratories in the late Eighties. This technique smooths each substrate layer sufficiently to enable subsequent layers to be addressed photolithographically while retaining correct focus.

3D circuits have been made possible by coating standard silicon wafers with many successive layers of polysilicon, as well as insulating and metallic layers, with the surface polished flat after each step. Although electrons do not move as readily in polysilicon as in single-crystal silicon, 3D transistors with 90-95 per cent of the electron mobility achieved with conventional 2D fabrication have been produced.

A first

Many companies have attempted to develop 3D circuits in the past. Matrix Semiconductor claims to be the first to have devised practical methods of producing them in high volume. The firm also claims to be able to create more circuit layers than anyone else, by using an intricate web of vertical electrical connections and layers of microscopic films. This approach enables the IC footprint to be shrunk, so that far more ICs can be obtained from a wafer, cutting costs dramatically. The first product is expected to have eight layers and to be available on the market later this year. ICs with twelve and sixteen layers are planned.

Although vertical stacking is used, standard CMOS fabrication, semiconductor material and production equipment are employed. By stacking memory elements vertically, Matrix Semiconductor claims to user a smaller wafer area for a given device density than traditional DRAM, SRAM, flash and mask-ROM designs, improving the yield. According to the company, “vertical electronics can reduce manufacturing costs ten-fold or more, and the density of 3D devices should increase at least as fast as Moore’s Law states as layers are added”.

Problems

Current ‘high-rise’ 3D technologies are not without problems. The proportion of defects in the chips means that ‘fault-tolerant’ techniques are required to work round the anticipated flaws. The chips are also slower in operation than conventional ‘low-rise’ ICs, and heat dissipation is a greater problem as so many more transistors are crowded into the same package. The history of technological development suggests however that when there’s a strong economic incentive a solution will be found.

The way ahead

For thirty years chip manufacturers have been printing ever-smaller transistor structures within a single plane. It seems inevitable that in future microcircuits will be scaled vertically as well as horizontally: the technology is possible and practical, and the benefits compelling. Yet the 2D approach is far from reaching the end of the road. IC designers continue to be able to shrink transistors and beef up performance using the more conventional approach. As an example of the continuing progress, Intel and Advance Micro Devices have announced a reduction in the size of their flash memory chips this quarter, lowering the cost while increasing memory capacity and volume.

First consumer application

The ‘8-story high’ 3D memory chip will hold 512 million memory cells of the write-once type at a cost comparable to magnetic or optical storage. The memory has enough capacity to be able to store an hour of high-quality audio (with data compression) or a few hundred photographs. It is seen as a viable alternative to disc, 35mm film and audio tape. Thomson Multimedia has shown serious interest and has agreed to use the chips. David Geise, Thomson Multimedia’s vice-president of accessories products, has announced that the company will, later this year, “incorporate Matrix’s 3D Memory in memory cards that can be used to store digital photos or music”. The cards plug into cameras, and Thomson is working on a reader that will enable users to view digital photos via TV.

Cost is apparently what makes the Thomson/Matrix card different from competing flash cards from Sony and Toshiba. Because of Matrix’s chip design, a 64MB Thomson card will cost about as much as camera film does at present close to $10 according to Matrix estimates. To strengthen the association with film, the cards will be sold under the name Technical Digital Memory Card. Versions promised later will have storage capacities of 128MB and 192MB. Taiwan Semiconductor Manufacturing Co. is producing the chips for Matrix.

The NRAM

A totally different approach to increased memory density is presented by carbon nanotube technology (see page 650, September issue, for an explanation of nanotubes). A race is on to develop a carbon nanotube-based non-volatile read/write memory that will provide at least ten times denser storage than today’s typical memory chip. The approach has been called “nanoelectromechanical”, or NRAM. The way in which these devices seem to work is amazingly like the mechanical-relay memory, such as the relay-driven binary adder used in about 1940.

Greg Schmergel, CEO of Nantero, explains this as follows. “NRAM will use an electromechanical approach to memory storage rather than using electrical charges. The building blocks are carbon nanotubes, the smallest of which are so thin that atoms must pass through in single file. By altering charges, the tubes can be made to bind together or separate, creating the ones and zeros that form the basis of computer memory. The tubes stay in the same state until a change is made, so the memory is non-volatile.”

In current memory design electrical charges are switched on or off to represent ones and zeros. Nantero’s co-founder and Chief Scientific Officer Thomas Rueckes figured out that nanotubes could be made to move up and down to represent the on and off states. Because of the small size of nanotubes, a memory the size of a fingertip could store many gigabytes of information. Nantero believes that its NRAM has the potential to “replace all existing forms of memory such as DRAM, SRAM and flash with its high-density, NV NRAM”. Its first goal is to create a 1GB commercial prototype, and there are hopes of a 1TB (Terabyte) chip within three-five years.
A serviceman’s guide to the Panasonic Euro-7 chassis

Brian Storm begins an account of the circuitry and features incorporated in one of the most complex TV chassis ever introduced in the UK. Part 1 looks at the power supplies, the microcontroller system, circuit protection and the signal processing arrangements.

The Panasonic Euro-7 chassis was introduced in late 2000 for use in high-performance, large-screen TV sets, replacing and updating the then ageing Euro-5 chassis. It has a number of features that were new to the Panasonic range, including progressive-scan technology, twin RGB inputs and twin UHF tuners.

The main features of the chassis are as follows: 3D on-screen graphical displays, owner ID storage for security, progressive-scan mode, advanced 100Hz processing, two tuners for PIP and PAP, picture and teletext (PAT), a 1,000-page teletext memory, a sub-page teletext memory, onboard operating software stored in an upgradeable flash memory, coaxial and optical digital audio inputs, AC3 and DTS audio processing, 5.1-channel onboard decoder and output stages, S2 widescreen switching with AV3S, 3-to-2 field pull-down recognition for NTSC films, and dynamic auto-focusing.

The owner ID system is identical to that in the Panasonic Euro-4 and Euro-5 chassis. It enables owners to store their name and postcode in a set’s user memory, protected by a four-digit PIN code. If the police should be involved in a recovery, a sticker on the back of the set advises...
them to press and hold the F button
in the front flap for five seconds.
The owner's details will then
appear on-screen.

Standby power supply
The Euro-7 chassis has no standby
mains transformer. Quite simply,
half-wave rectified mains voltage is
fed to pin 5 of a small eight-pin
chip, IC841, see Fig. 1. The 56Ω
safety resistor R841 in series with
the feed will go open-circuit in the
event drastic failure within IC841.
The slow-start capacitor C843,
connected to pin 1, enables the set
to resist the initial surge with a cold
start. T841, the small standby
chopper transformer, provides
mains isolation in this area.

The optocoupler D848 senses variations
in the output voltage, with D886
and D885 providing a constant
reference voltage. Feedback is to
pin 4 of IC841.

Many of the circuit diagrams I've
seen have a link missing between
D843 and pins 2 and 3 of IC841.
Draw in a line and the circuit makes
sense! Also ignore the two
components usually shown in series
with C847. Wire links are fitted in
these positions. The components are
labelled JW on Panasonic circuits,
JW standing for jumper wire. This
is not uncommon with Panasonic
circuit diagrams.

Degaussing
This chassis is designed to provide
degaussing when the standby mode
is left, hence relay RL802 which is
connected to the degaussing circuit.
This recognises that today's users
tend to leave their sets in standby.
Thus degaussing never takes place
when this is designed to occur at
mains switch on, the risk being a
discoloured raster. The Euro-7
chassis degausses every time it
comes out of standby.

Main power supply
The main chopper power supply,
see Fig. 2, is a development of the
arrangement used in the Euro-4
chassis, with the addition of the
MOSFET power transistor Q805 in
what could be described as an
active-snubber arrangement. It helps
to cater for the extra current demand
with the Euro-7 chassis.

IC801 is a self-contained chopper
power supply which is started by
applying 15V to pin 4 via R803
and R804. Once the circuit starts up,
D819 takes over provision of the
supply for IC801. This supply is
monitored by IC801 internally:
should it rise dramatically, an
internal latch is activated, switching
IC801 off. This latch is also
activated if IC801's body
temperature exceeds 140°C. To
restart the power supply, the mains
input must be switched off then
reapplied.

The voltage across R806 and R810

---

**Fig. 2: The main power supply circuit used in the Euro-7 chassis.**
is monitored at pin 1 of IC801 to detect excess current conditions. Should the current drawn by the chopper MOSFET in IC801 be excessive, the power supply will pump until the overload is removed. The free-running frequency of IC801 is set by C829 and R837. IC851 on the secondary side of the circuit acts as a 140V constant-voltage regulator, with help from the 3V zener diode D852. Pin 2 of IC851 produces a variable current output depending on the voltage at pin 1. This drives the optocoupler D823, providing regulation feedback to pin 1 of IC801 on the primary side of the circuit. In this way any fluctuations in the HT feed to the line output stage are ironed out.

The main microcontroller
An SDA6000 Infineon C166 microcontroller chip with an M2 core, IC1101, is used for system control in the Euro-7 chassis. It also generates high-resolution graphics and provides high-level teletext processing. Fig. 3 shows the internal arrangements within the chip. Use of this advanced processor makes it possible to use rewriteable flash memory for the onboard operating software.

IC1101 lives on board U, which plugs directly into the main signals PCB (board A). Because it is possible to plug this sub-panel into board A two ways, large arrows are printed on it. These point directly to the nearest edge of board A. Connecting board U wrongly will not cause any damage however.

Board U also houses an 8Mbyte flash ROM chip, IC1102, and a 16Mbyte text memory, IC1106. For test purposes board U can be swapped with one from another set, as the model specific data is stored in a standard eight-pin EEPROM, IC1104, on board A.

At least half of IC1101's 128 pins are used for reading from and writing to IC1102 and IC1106. Important pins for fault-finding are as follows:

- Pin 73 is the master reset input from IC1254; pin 106 is the 3.3V supply to the main operational section; pin 107 is the main chassis connection; pins 108 and 109 are connected to the 6MHz crystal X3501; pin 115 is the chassis connection for the 2.5V supply; pin 123 is for the 2.5V supply.

From this it's clear that IC1101 has two supplies, 3.3V which is used by most of the IC and 2.5V which is used by the sections associated with pins 110-128. Keep this in mind, because if the 2.5V supply is missing the 3.3V supply is switched off by Q1121 and Q1122 on board A.

Other important pins are as follows.

- Pin 5: Remote control data input.
- Pin 76: Enables the serial connection to AV1 for memory packs in the service mode.
- Pin 82: Activates the degaussing circuitry.
- Pin 92: Activates the mains input relay RL801.
- Pin 93: Monitors for digital errors and mutes the sound to prevent speaker damage.

- Pin 94: Monitors the 5V supply. If this fails momentarily, IC1101 has to reload all the digital processor chips with operational data and reset them. Pins 74, 75, 98, 99, 100 and 101: These are the serial data connections for control of and data loading to all the digital processor chips.

- Pins 102 and 103: These are the 100Hz synchronisation inputs from board DG.
- Pin 104: Contrast reduction output to the RGB processor chip IC1315. Reduction is activated when on-screen menus are displayed to prevent doming and discoloration in high-brightness areas.

- Pin 105: Blanking feed to the RGB processor chip IC1315 for teletext and on-screen displays.

- Pins 112-4: RGB outputs to the RGB...
processor chip IC1315 for teletext and on-screen displays.
Pins 120 and 121: Composite video inputs, used for stripping off teletext information and synchronisation of the user menus.
Pin 124: The keypad feed. As with all modern Panasonic TV chassis, this uses the voltage-sensing principle, not a key matrix. A resistive ladder is wired across the local key inputs. Whichever key is pressed determines the voltage at pin 124 of IC1101 and therefore the function.
Pin 127: This is the general protection pin for the whole set. The voltage here is normally high, at 2.5V. It's pulled low to provide protection, the set going to standby within five seconds.

Protection circuitry
Having got to pin 127 of IC1101, we must take a look at the circuitry that initiates protection. It monitors no fewer than eight parameters, see Fig. 4. Pin 127 of IC1011 is connected via R1154 to D867, D869 and the collector of Q854, which are all on board D. D867 is connected to the 14V supply and D869 to the field output stage's +15V supply. If there is a short-circuit across either of these supplies pin 127 will be taken low. It will also be taken low when Q854 conducts. The base of this transistor is connected to six monitoring circuits.

D865 is connected to the -15V supply to the field output stage. In the absence of this supply D865 conducts and Q854 switches on. Two conditions in the line output stage are monitored on the primary and secondary sides. On the primary side line flyback pulses from the junction of C554/5 are fed to the cathode of the 36V zener diode D595. Excessive pulse amplitude will switch on D595, D594 and Q854. On the secondary side of the line output stage D591 and the 10.4V zener diode D592 monitor the flyback pulses in the CRT's heater supply. D593 rectifies the pulses, charging C591. If the CRT heaters go open-circuit or the amplitude of the pulses is excessive D592, D591 and Q854 conduct. The HT supply to the line output stage is monitored by Q851, which checks the voltage across resistor R857. If this voltage is excessive (excessive current demand), Q851, D859 and Q854 conduct.
The EW circuit is monitored via D861 and D862. This circuit checks the flyback pulses coming back through the EW loading coil. If the coil starts to fail, protection will be initiated before damage occurs in the EW drive circuit.

The final monitoring circuit is on board A, for the field output stage. The main items here are D454, Q451, C451 and D452. In normal operation D452 rectifies the field scan, charging C451. Q451 is held conductive and D454 is biased off. In the event of field scan failure Q451 switches off and D454 is forward biased by the 12V supply. Thus Q854 again conducts.

No one should approach fault-finding in this protection circuitry by simply isolating pin 127 of IC1101 from the monitoring circuits and looking for smoke. Simple voltage checks will show which circuit is activating protection and thus where to look for the fault.

### PCB A

PCB A contains all the signal processing circuitry and the field and audio output stages. It follows Panasonic practice, apart from the provision of two UHF tuners, the main tuner TNR003 and the sub-tuner TNR004. The main difference is that there is no sound output from the sub-tuner, which is used to provide picture-in-picture and picture-and-picture displays.

Board DG plugs directly into board A. It provides 100Hz up-conversion or progressive scanning and all the drives for the field and line output stages etc. The surround sound stages are on board Z and the audio processing circuitry on board DP. These boards are mounted above board A.

The following is a list of the ICs on board A and their functions.

- **IC1104**: EEPROM for user and model specific data.
- **IC1105**: 5V supply monitor for power failure.
- **IC1107**: Level-shift processor for 3.3V data (PCB U) to 5V data (PCB A).
- **IC1108**: 5V regulator for the infrared receiver circuit.
- **IC1109**: Reset generator for PCB DG.
- **IC1251**: 3.3V regulator for PCB U.
- **IC1252**: 2.5V regulator for PCB U.
- **IC1253**: Sub-processor output expander, controlled by IC1101.
- **IC1254**: Reset generator for PCB U.
- **IC1315**: RGB processor.
- **IC2001**: Audio processing and switching.
- **IC2301**: Left- and right-channel audio output stages.
- **IC2302**: Headphone amplifier stage.
- **IC2303**: Right-channel acoustic feedback processor.
- **IC2305**: Sub-woofer output stage.
- **IC2306**: Left-channel acoustic feedback processor.
- **IC2307**: Audio feedback gain.
- **IC2705 and IC2709**: 3.3V regulators, mainly for PCB DG.
- **IC2706**: 5V regulator.
- **IC2707**: 8V regulator for IC2001.
- **IC2708**: 9V regulator.
- **IC3001**: Video input switching processor and widescreen switch detector.
- **IC3002**: RGB input switching.
- **IC3003**: Video gain for picture-in-picture balance.
- **IC451**: Field output stage.
- **IC459**: Line drive buffer.
- **IC4801**: Geometric rotation preamplifier.
- **IC4802**: Geometric rotation output stage.
- **IC501**: EW buffer.

### PCB DG

PCB DG carries out the picture enhancement processing in this chassis. The main processor is an SDA9415. Fig. 5 shows a block diagram for this IC, which performs the following operations:

- Motion-vector based scan-rate conversion for 100/120Hz scanning.
- Motion-vector based scan-rate conversion for progressive 50/60Hz scanning.
- 3D spacial and temporal noise reduction.
- 3D motion estimation.
- 6M onboard picture memory.
- 1.1M onboard vector memory.
- Separate inputs for sub and main picture processing.
- Picture-in-picture processing to 1/9 size.
- Picture-and-picture processing for split-screen displays.
- Automatic letterbox display processing, with flexible zoom modes.

There are also two global core video processors (sub and main) for analogue-to-digital conversion and motion-compensated luminance and chrominance signal separation. Fig. 6 shows the general arrangement. Global core processors are special Panasonic multi-standard digital-video processors that provide almost perfect digital separation of the luminance and chrominance signal components, using adaptive, motion-compensated digital processing. The result is a very clean chroma signal and a wideband luminance signal. These are essential for modern large-screen TV sets and plasma panels.

In addition there are two component interface processors (CIPs) to provide RGB input analogue-to-digital conversion and for deriving the timing signals to synchronise the whole system in the progressive- and 100Hz-scan modes.

There will be some Euro-7 models, such as the TX28PG45, that don't have picture-in-picture facilities and therefore have no subpicture global core processor on board DG. Be wary of this if swapping DG panels between sets. With five large surface-mounted processor chips and a pin count of over a thousand, Panasonic has designated board DG non-repairable. Replacement is on an exchange basis only.

### To follow

In Part 2 next month we'll look at the progressive and 100Hz scanning, dynamic focusing, audio processing, the service menus and the self-check.
Wholesalers, Distributors & Export Agents
Of Electronic Domestic Appliances,
Tel: (+44) 121- 554 8282
Fax: (+44) 121- 554 2121
49 Harford, Hockley, Birmingham B19 3EB

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VAST RANGE OF OTHER PRODUCTS TOO MUCH TO LIST
Denis Mott has designed this relatively simple portable pattern generator that’s based on a PIC microcontroller chip. It’s easy to use, producing a range of patterns for TV set assessment. A modulator is included to provide an output at UHF. The unit can be powered by four AA batteries or a 240V AC mains supply.

Many different TV test pattern generators have been designed over the years, both as commercial and build-it-yourself projects. In the early Nineties I designed a pocket pattern generator based on the Ferranti ZNA234 TV sync generator chip, with about five logic chips, a TEA2000 colour encoder and a UHF modulator. This design was OK for the purposes for which it was intended. But it had shortcomings, such as poor power consumption and a limited range of patterns.

With this in mind, a friend suggested designing a generator based on a PIC microcontroller chip. At the time I’d not heard of a PIC, but I found some literature and a source of an emulator and programmer – the John Morrison Co., which subsequently became Leading Edge Technology, Malta.

The generator had to be portable, simple to use and provide a useful range of patterns. Having been in the TV trade for over 35 years, some of this time in TV set production and quality inspection, I felt that I had a reasonable idea as to the patterns required without going overboard.

I also felt that as well as an RF output a composite video signal and an audio signal should be provided. The result is the project described in this article.

**The patterns**
The unit generates five patterns, as follows.

- **Colour bars:** EBU-standard white, yellow, cyan, green, magenta, red, blue and black.
- **Grey-scale:** Bars start with white at the left and go through to black at the right in equal luminance steps.
- **White/grey split screen:** When setting the colour balance with pre auto grey-scale receivers, and with later ones that have adjustable drive/cut-off levels set by software, the highlights and low lights have to be set up, preferably without adjusting the brightness and contrast controls. This adjustment is much easier with a white and grey signal, especially when a colour-balance meter is used.
- **Red raster with white markers:** A red raster is required for checking purity.
Fig. 1: Circuit diagram of the PIC-based TV pattern generator.
Fig. 2: Suitable mains-adaptor circuit for the unit. The diodes and IC are available from Farnell Electronic Components under order codes 365-117 and 412-594 respectively.

![Mains-Adaptor Circuit Diagram]

Markers were added at -3 per cent underscan, plus a vertical and horizontal white line at the centre. The -3 per cent underscan lines are for setting the height and width; set these so that the lines are just visible from top to bottom at each side.

The centre lines are for setting the vertical and horizontal centre, using the extra dots in the CRT shadowmask’s horizontal centre plane to view the line.

Crosshatch: The outermost lines are again at -3 per cent underscan. The pattern can be used to check convergence and set the scan linearity.

**Circuit description**

Fig. 1 shows the pattern-generator circuit diagram. IC1 is the 16F84 PIC microcontroller chip (20MHz version). There are amazingly few peripheral components for such a powerful device. X1 is a 20MHz crystal, with C1 and C2 providing phase change. R11 is connected across the 5V supply to discharge C3 when the microcontroller goes to sleep. If it’s not fitted, IC1 may not come out of sleep when required. R13/14/15 are pull-down resistors to keep the inputs from the pattern-select switches SW2-6 tied to earth. To minimise the microcontroller input requirements, the switches are strobed.

The pattern output elements appear at ports RA0 (blue), RA1 (red) and RA2 (green), with a composite sync output at port RA3. The RGB outputs are at 5V TTL level and must be attenuated to feed the colour encoder chip IC2. R5-R10 provide this attenuation.

SW1 is a reset switch, to bring the microcontroller out of its sleep mode. It defaults to colour bars. Thus SW1 is also the colour-bar select button.

IC2 is the colour encoder. A TEA2000 was used in the original design. It requires a luminance delay line and doesn’t have RGB outputs. The Sony CXA1645P subsequently became available and, though larger, doesn’t require the delay line. In this application its RGB outputs (pins 23, 22 and 21 respectively) are not used, but they are in a laboratory version of the pattern generator. The CXA1645P was chosen as the standard encoder for both versions. Its RGB inputs are capacitively coupled to pins 2, 3 and 4. The composite video output is at pin 20, and is terminated at 75Ω. R18, which is connected to pin 18, is an unusual value (16kΩ), but this is what the device specification calls for. The 4-43MHz colour subcarrier is generated by the crystal oscillator Q2/X2 and is fed to pin 6 of IC2. It’s a standard oscillator circuit with one addition: Q1 stops the oscillator when switched on by IC1, in order to provide the monochrome patterns (grey-scale, white/grey and crosshatch).

Over the years I’ve tried various UHF modulator chips. The first was the Philips TDA6800, which needed a separate audio subcarrier oscillator. Then there was the Plessey SL5162, which had a simple configuration and an onboard subcarrier oscillator. Both these devices are now obsolete and difficult to obtain. The present design uses the Philips TDA8722 (IC3), which is even more versatile than the SL5162. It can be frequency synthesised via an I²C bus system. In the present application this is not needed, as the frequency stability is very good.

L1 is the UHF tank coil. It’s a strip-tuned inductor on the PCB, trimmed by the surface-mounted, subminiature preset capacitor TC3. The audio intercarrier oscillator is tuned by L2 (a 15μH choke), TC2 and C24.

The TDA8722 is a surface-mounted device.

The RC feedback oscillator that consists of Q4 and the associated components produces an audio signal. I’ve used the circuit many times. It’s simple and in this application distortion is not a critical factor. Q3 is added as an on/off switch, controlled by IC1. The oscillator’s output is fed to the modulator via VR2 and is sent to the mini DIN socket SK3 at full amplitude.

The unit is designed to be powered by either four AA cells or a mains adaptor (Fig. 2 shows a suitable circuit), not by rechargeable cells. If the voltage applied to the unit is excessive, the Wickman fuse F1 will blow since zener diode ZD1 is rated at 6.8V.

Power saving is carried out by relay RLY1, Q5 and software in IC1 (see later). LD1 is a dual-colour LED that shows green when the unit is in operation and red when it’s in the sleep mode. Power consumption is about 150mA when the unit is working, 5mA in the sleep mode – most of the latter is because of the red LED.
Construction
The majority of the circuitry is on the main PCB, with only the pattern-selector switches and the LED on the front-panel PCB (see Fig. 3). Both PCBs, also preprogrammed PIC ICs, are available from the author. In the prototype F pins were used to connect the two PCBs. If these are not available, tinned copper wire will do.

As the main PCB is single-sided, several wire links are used. One link passes the length of IC2, between the IC and the board. There are fifteen surface-mounted components: IC3, R11-14, R27/8, R30, C13, C24, C27-30 and TC3. All the other components are of the conventional wire-lead type.

The prototype is housed in a Vero-style case from Farnell, see parts list. The front panel is a copper-etched board with the legends highlighted, though the front panel supplied with the case can be used. Drilling and making the holes is an exact job and care is required to get it right.

A small, tinplate screening can is recommended to fit over the UHF and audio tank circuits. The dimensions for this are 15 x 20 x 3 x 0.3mm, see Fig. 4.

Software development
Those versed in PIC software development may find the following notes of little interest. To others they may provide useful insight into the work that had to be done during evolution of the unit. Setting the basic specification for the unit was the first step – the patterns required, how they are selected and the scanning standard, i.e. progressive or interlaced. The latter is the main difference between TV and PC signals. With interlaced scanning, as used for TV, there are 625 lines (European standard). The first (odd) field starts at line one and ends half way through line 313. At this point the beam is deflected to the top of the screen, and lines 313 (second half) to 625 are then interleaved between the initial set of lines, providing the second (even) interlaced field. Interlacing decreases the flicker that would be noticed with a non-interleaved picture at the same field rate.

A close study of the video waveform showed how the patterns had to be generated to achieve fully-interlaced scanning. Everything is sequential, which is nice as a PIC microcontroller also works in a sequential manner. A clock frequency of 20MHz is the fastest at which a 16F84 can run safely. After internal division this gives a duty cycle of 200 nanoseconds for most instructions. Thus turning an output on or off takes 200ns. The duration of a 625-line scan is 64µsec including the flyback, or 52µsec of forward scan time for the video. This is the basis on which patterns have to be created.

The colour bars were written first, starting with the frame sync sequence. This has to include line-equalising and odd/even-field pulses. After the field sync pulses the PIC looks for an odd/even flag so that it can follow an even or odd routine. Line 17 is the housekeeping line, which is where the control buttons are scanned. At this point we have 52µsec to do all sorts of things. Video starts at the end of line 17. For colour bars this means toggling three outputs to provide the correct binary information to produce them.

In the original design a thumbwheel switch was used to select the patterns. Small button switches were chosen for the portable version. This involved a considerable change in the housekeeping software in line 17, but plenty of space is available. In fact 260 single operations can be performed in this time.

Another development was power saving. At the start of the setup (power on) a register is set to count the number of times the software loops back to Vert. After about five minutes the PIC goes to sleep, turning off relay 1 and reducing the power requirement to 5mA, or virtually zero if the red LED is not used. To wakeen the PIC, either switch the unit off and on again or press the colour-bars select button.

The trouble with most microcontroller chips of this type is that they have 8-bit data registers, giving a total of 256 counts. Since each field consists of 312.5 lines, and lines are being counted to perform functions, the line counter has to be loaded twice to produce a full scan. This was done by loading the line counter with 20 hex = 32 decimal and decrementing it to zero, then decrementing the line counter again from FF hex = 256 decimal to zero. At zero the sync-only output would be used. Visually the problem was a small kink in the top part of the screen, at line 32 visual. This was overcome with a small (200ns) NOP (no operation) pad, which had to be at exactly the right place.

Once the colour bars were acceptable the other patterns were developed. Some were more difficult than others.

One criticism of this design is the thickness of the vertical lines, especially in the crosshatch pattern. As mentioned earlier, it takes 400ns to turn an output on and off. Thus with a 20in. CRT and a visible horizontal line of 16in., each vertical line will be 10in. wide. But this seemed to be a small price to pay to keep it simple.

The author can supply fully-programmed...
Part list

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* Farnell Electronic Components (phone 0870 1200 200) unless otherwise specified.
† The BC338A has a different pin out from the BC338, BCE instead of EBC. Only the BC338 is available from Farnell. So, unless the 3-pin version is available, the legs must be rotated to fit.
‡ It seems that two versions of the PCB-mounted RCA phono socket are available. The PCB has been designed to use both, but because of earthing track requirements one pin must be removed with the 3-pin version.

PIC microcontroller chips (see Parts List).

Testing
The instrument is very simple to set up and test, as the patterns are pre-programmed. After building it, check for any obvious short-circuits—a couple of very close supply line tracks were unavoidable. If the microcontroller chip ICI is mounted in a socket, which is useful for software updates, insert it. Connect an external supply (not batteries) with the current limiting set at approximately 150mA. Use a scope to check the outputs at pins 1, 2, 17 and 18 of ICI. Composite sync should be seen at pin 2 and square pulses at the other pins. If no outputs are seen, re-check at pin 15 to ensure that the crystal is oscillating. If there are no oscillations, the microcontroller chip may not have had its internal fuses set correctly for 20MHz operation.

Next check for a video output (colour bars) at pin 20 of IC2. If this is present, connect the unit's output to a TV set's scart input. Adjust TC1 for stable colour bars. If you want to be precise, use a frequency counter to set the oscillator to 4433619MHz.

Select the other patterns and ensure that they are OK. There are no other adjustments for the basic patterns.

Use the scope to check for a reasonable sinewave at the collector of the audio oscillator transistor Q4. If there is no oscillation here, the gain of the BC107 transistor used could differ from that of my stock. If necessary adjust the value of R24 to achieve oscillation. SW6 is the audio on/off button: check that it stops the oscillator. The software is designed to turn the audio oscillator on when any pattern button is pressed.

If the UHF modulator chip has been fitted, check its RF output by connecting this to a TV set's aerial input socket (or any other suitable monitoring instrument). Adjustment of TC3 will vary the output between approximately 460MHz and 630MHz. If RF is present, adjust VR1 for good picture quality—be careful not to over-modulate the pattern.

Adjust TC2 for minimum audio buzz when the TV sound is turned up. Then adjust VR2 for a good audio tone, without over-modulation. Finally readjust TC2 for a clean tone.

I varied the DC supply over 4-6V without any noticeable frequency shift. But this is not recommended, as the devices are made during this time.

In conclusion
This instrument was designed over a five-year period, mainly because of difficulty in finding good UHF modulators from reliable sources. Various software changes, mainly in the power-saving routines, were made during the time.

The unit is in daily use and has proved to be very reliable. It would be an asset in any serviceman's toolbox.
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Fax: (020) 8903 6126 Website: http://www.grandata.co.uk
# CD Pick Ups and Mechanisms

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**Special Offer** Prices valid until 31 August 2002 or while stocks last

## CD Spindle Motors

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## Digital Capacitance Meter

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- **Price**: £2.00 + vat

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- **Order Code**: CDMOT2
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<td>IR 9510</td>
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TELEFUNKEN
| IR 9624   | FB330, FB340, FB345, FB1330, FB1340 |

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THOMSON
| IR 9639   | 14GM53, 14GM56, 14MS70, 21DS70, 21MG51, 21MS76 |

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TOSHIBA
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| IR 9953   | CT9626, CT9784, CT9785, CT9859 |
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<td>SLX8B</td>
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Thomson’s ICC17 technology

Part 4 of Mark Paul’s description of the circuit technology used in this chassis deals with the microcontroller, signals switching and audio sections.

In this concluding instalment in the series we’ll take a look at the microcontroller system, signals switching and the audio section of the chassis. The microcontroller, IR01, belongs to the SGS/Thomson ST92 family. It’s an 80-pin flat-pack device which is mounted on the solder side of the main PCB. It controls all functions via a single I2C bus and several in/out ports. An innovation with the ICC17 chassis was the integration of the teletext decoder into the microcontroller chip.

Microcontroller system

As mentioned in Part 1 (July) the microcontroller chip is not powered in the standby mode. This is done to save power. Because of this, a wake-up system is required, see Part 1. When the set has been brought out of standby, IR01 and the associated devices are powered by the +5V up supply, which comes from pin 9 of the TDA8139 chip IP95 (see Fig. 1). This supply is fed to pins 10, 34 and 52 of IR01. IP95 also provides the reset for pin 54 of IR01. The reset line goes from low to high some 40msec after the voltage at pin 9 of IP95 reaches 5V: the delay is produced by CP98 (see Fig. 2 July). Detection of a mains supply or line output stage failure leads to the ‘power fail’ line (at the collector of TP86) going from low (normal state) to high. This line is connected to pin 27 of IR01 which, when it detects a fault condition, takes pin 4 of IP95 low, switching off the 5V supply (which is used by the timebase generator circuitry in IV01). The switch-off command appears at pin 39 of IR01, and is fed to IP95 via TR60. The control line from TR60 is labelled PO. TR60 also takes the reset line low.

IR01 has a 4MHz crystal, QR01, connected between pins 11 and 12. The frequency is used as a reference to generate an internal clock frequency of 22MHz by means of a voltage-controlled oscillator and a phase-locked loop. The PLL components (RR95, CR95 and CR97) are connected to pin 55 of IR01. The microcontroller chip works in conjunction with two memory chips, an EPROM (IR02) and an EEPROM (IR03). The device used in the IR02 position has a capacity of 512Kbytes; it stores IR01’s operating programmes and the service-mode default values. There are sixteen address lines and eight data lines between IR01 and IR02, also three control lines that are used for address bus extension. The EEPROM IR03 has a capacity of 1Kbytes and is used to store the user adjustable values (brightness, contrast, colour etc.), channel tuning information and the standby status information. It’s connected to IR01 via the I2C bus, which also provides communication with the video/deflection processor chip IV01, the audio processor chip IS40 and the tuner. IR01’s I2C pins are 32 (clock) and 33 (data). The bus frequency is 80kHz. When a device connected to the bus fails to send an acknowledgement to IR01, the standby LED GE01 will produce the relevant fault code (see later).

IRO1 requires two inputs to generate on-screen menus, VSYNC at pin 48 and HSYNC at pin 49. The former comes from transistor TF01 (see Fig. 8, August), the latter from pin 1 of the LOPT (see Fig. 6, August) via attenuator network RR82/81. A frequency multiplier controlled by the components connected to pin 53 (CR92, CR93, CR95) is used to determine the pixel grid for the menus.

Teletext

IRO1 incorporates all the circuitry required to process teletext data and produce text and graphics for display. Composite video (CVBSTXT) is fed to pins 60 and 61 via CR98 (82pF) and CR99 (0.47µF) respectively. It comes from emitter-follower TV10 (BC846B), which takes its feed from pin 54 (selected CVBS output) of IV01. A PLL is used to regenerate the teletext clock: its filter components CR96 and RR96 are connected to pin 57.

Video programming system (VPS/PDC) information can be...
extracted from line 16 of field one and wide-screen signalling (WSS) information from line 23. The signal fed to pin 61 is used for the former, the signal fed to pin 60 for the latter. A voltage-controlled oscillator and PLL are used to extract the WSS information: tuning is provided by RR90, which is connected to pin 50, and filtering by CR90, RR91 and CR91, which are connected to pin 51.

Menu or teletext text/graphics is sent to IVO1 in RGB form from pins 47, 46 and 45 respectively, with fast blanking from pin 44.

**Timer mode**

In the timer mode pins 19 and 20 of IRO1 are low and pin 39 is high. When pin 19 is in this condition TR13 and TR15 (see Fig. 1) are off and the red standby light remains illuminated. Power for the infra-red receiver and the front-panel keys is provided by the U stby line, with zener diode DK01 (5.1V) for regulation.

With pin 20 low TR20 is off, TP71 is on, TP67 is off (see Fig. 2, July) and the current flow via the LED in the optocoupler ceases. This unbalances the input to IP20, its output at pin 7 rises towards 6V and the main power supply starts up.

With pin 39 high, TR60 is on and pin 4 (PO) of IP95 is low. The 8V supply at pin 8 of IP95 is thus switched off.

**On mode**

The following conditions apply in the on mode. When the CRT is warm, pin 19 of IRO1 goes high. TR13 and TR15 switch on and the red standby light goes out. The IR receiver and front-panel keys continue to be supplied by the U stby line. Pin 20 of IRO1 remains low. Pin 39 goes low, TR60 switches off and pin 4 of IP95 goes high, switching on its 8V output at pin 8. IV01 and the green front-panel LED are powered. Normal power supply regulation is initiated, as described in Part 1.

**Other pins of IRO1**

Various other pins of IRO1 are worth noting, as follows.

**Pin 28 (mute):** This pin goes low to mute the sound when changing channels, during automatic and
Fault-code signalling

The red standby LED is used to provide fault-code signalling. This arrangement was adopted as being easiest to implement when the PIC bus has stopped operating and the voltages produced by the deflection stages are missing. Fault conditions are indicated by a two-digit number with a pause for separation (see Table 1). The indication is repeated at least four times. A maximum of 81 codes can be shown in this way.

Note that the chassis uses a bi-coloured standby LED. Thus the colour displayed when signalling a fault may not be just red. If the switched +8V supply is present at pin 8 of IFP5, orange and green may be visible.

Signal switching

The ICC17 chassis is equipped with two scart sockets (AV1 and AV2) and, depending on the cabinet design, optional front-facing video and audio input phono (cinch) and S-VHS sockets (AV3). Switching between the different signal sources is carried out by the signals/deflection processor chip IV01 and the audio processor chip IS40. In addition IX01 (BA7604A) provides switching between AV2 and AV3 sources.

The earthy end of the attenuator networks is connected to chassis via transistor TR23, which is switched off in standby (when there is no +5V supply). The voltage at pin 8 of the scart sockets can then be used to force the set on, via RR52/RR53 and diode DR23, which is connected to the base of transistor TP71 in the power supply. TR23 is held on when the set is on.

Pin 40 (AV3 port): The output at this pin is used, with sets that have AV sockets at the front, to switch the BA7604A chip IX01 between AV2 and AV3 inputs. High selects AV2 signals, low AV3 signals.

Pin 41 (P switch): The output at this pin is used to switch TL55 in the line output stage (see Fig. 5, August) to provide additional scan-correction capacitance. A low at pin 41 means 16:9 or zoom 1 mode, a high at pin 41 centred 4:3 mode.

Pin 42 (trap information): The output at this pin is used to change the tuning frequency of the vision trap in the sound IF section.

Pin 43 (format/BCC): The PWM output at this pin is fed to TL59 in the line output stage (see Fig. 6, August) to adjust the beam-current limiting and average white for different tube types and picture formats.

The CVBS output from the tuner is always present at pin 19 of scart socket AV1. It comes from pin 26 of IV01 via the emitter-follower transistor TX15 (BC547B). The CVBS signal selected by IV01 appears at pin 54 of this IC and is fed via emitter-follower transistor TX45 (BC547B) to pin 19 of scart socket AV2. Two bits, CS1 and CS0, via the PIC bus determine which signal appears at pin 54 of IV01.

The collectors of TX15 and TX45 are fed from the +8V supply via the current-limiting safety resistor RX17 (10Ω).

Audio signal processing

The ICC17 chassis has been designed to cater for various audio requirements from mono sound to Dolby Pro-Logic. Basic audio signal processing is carried out by either an MSP3400C IC or, where Nicam sound processing is required, an MSP341D IC (IS40). This takes its inputs from IV01. For stereo sound the audio outputs drive a TDA7269 dual audio-amplifier chip, IS80.

Where Dolby Pro-Logic or Virtual Dolby processing is required, the MSP chip is replaced with either of two separate modules, AMDP 17010 00 for Dolby Pro-Logic or AMVD 19100 00 for Virtual Dolby. An auxiliary power module, AM/DP 17000 00, provides the extra speaker drives for Dolby Pro-Logic.

A new feature introduced with this chassis is the Automatic Volume Limiter, which is switchable. When activated, the volume remains constant during channel surfing and advertising periods.

IS40 has two supplies, 5V at pin 39 for analogue signal amplification and processing, and +5V ON at pins 7, 18 and 57 for digital signal processing. Both inputs are well filtered to prevent switching noise interference from the chip. The only other important item here is an 18.432MHz crystal (QS40) to provide the main internal clock signal. It’s connected to pins 62/3.

After level-shifting by TS01 the demodulated FM/Nicam input is fed to pin 58 of IS40. It’s then passed through a gain-controlled amplifier to the complex digital demodulation and decoding block, where all available FM mono, FM stereo and Nicam signals are detected and processed.

IS40 is controlled via the PIC bus (SCL pin 9, SDA pin 10). This provides signal selection and bass, treble, stereo base width enlargement, pseudo stereo, balance and master volume adjustment as...
required. The stereo outputs are at pins 28 (right) and 29 (left).

The TDA7269 stereo output chip has a 33V supply at pin 3 and can provide 2 x 10W RMS at 8Ω. It’s internally protected against shorts and thermal runaway. IR01 and a single level-converter transistor (TS81) control the audio mute function.

Dolby variants

For Virtual Dolby operation the on-board processor (IS40) is replaced with a sub-module, the remainder of the audio circuit being the same. The sub-module contains an MSP3410D audio processor (IS100) and a DPL3518 Dolby processor (IS200). The latter decodes the digital data produced by IS100, creating Virtual Dolby data that’s returned to IS100 for further processing.

In Dolby Pro-Logic models the on-board processor and stereo amplifier are replaced by a sub-module and an auxiliary audio power amplifier board. The Pro-Logic sub-module uses the same IC complement as the Virtual Dolby version, but has additional interconnections between the ICs and extra sockets. The auxiliary audio power amplifier board has two TDA7269 stereo output amplifiers (IA001 and IA002) and an MC33076 stereo amplifier (IA003) that powers the headphone socket. The board has phono output sockets for left and right channels, subwoofer and surround channels. IR01 and a two-level converter transistor circuit (TA021 and TA02) control the audio mute function. To prevent overloading, the 33V supply is monitored by a current-sensing resistor (RA080) and a switching transistor (TA080). When a fault condition is detected, the switching transistor triggers a latch circuit that consists of two transistors (TA072 and TA077). This mutes both power amplifiers via steering diodes DA074 and DA075.
DTT channel revisions

In my letter on possible interference from digital terrestrial TV transmissions in the February 1999 issue of *Television* I mentioned the likelihood that DTT from Sutton Coldfield would interfere with analogue TV reception from Emley Moor, and vice versa. This did become a problem. We don’t do much business in North Derbyshire, but have had a few customers out that way with snowy analogue reception caused by DTT interference. I’d be interested in any comments from readers who trade in the Emley Moor/Sutton Coldfield overlap areas.

That channel clash turned out to be one of many. Four of the Chesterfield DTT multiplexes are co-channel with Emley Moor DTT, and problems arose as soon as Chesterfield DTT transmissions started. This channel allocation was the talk of the trade in South Yorkshire for some time, and I believe that representations were made to the ITC about it. The recent ITC publication *Note for Applicants on Coverage for Digital Television* (April 25, 2002) includes a proposal to change the Chesterfield channels, the main reason being to remove the “co-channel relationship between Chesterfield DTT and Emley Moor DTT”. It’s good that the ITC is trying to get it right this time.

I think everyone accepts that DTT coverage will have to be increased considerably if digital TV is to be a success. The only question is how to do this. Some of the ITC’s new proposals are radical, involving a number of analogue transmitter channel changes to achieve one DTT improvement. There seems to be a shift to providing improved digital TV coverage to the detriment of analogue reception. I suppose we have to accept this, as DTT is the only way forward, and you can’t make an omelette without breaking eggs. To implement a six-multiplex DTT network in parallel with the existing five-channel analogue network must be fiendishly complicated. But, even so, let’s hope that there aren’t too many mistakes this time. The ITC acknowledges the downside of many of its new proposals, but does seem to have missed a few possible problems.

Changes at The Wrekin would involve a move at the Derby regional relay transmitter from channel 30 to channel 28. I’m sure that if this happens Belmont BBC2 would interfere with reception from the low-powered Derby relay. Sheffield DTT channel change proposals involve a move at the Wincobank analogue relay transmitter to channels 54, 58, 61 and 64. These channels are used for analogue transmissions from Waltham however. It so happens that a large part of the Wincobank reception area is high up on a south-facing slope, with a very good view in the direction of Waltham. This is one of the few places in South Yorkshire where Waltham delivers a significant signal level. Wincobank transmits less than 2W ERP and the field strength, even in the primary service area, is low. I don’t need to say more, do I? This is the sort of thing that a computer prediction of coverage and interference levels might not identify because the area in question, although a significant part of the Wincobank target area, is very small. I suppose that, in the ITC’s grand plan, reception at a few streets in Wincobank is not that important. But I wonder how many other small, and some not so small, problems will arise as the new transmission plans roll out?

Although the broadcasters and planners have a long history of ignoring grassroots technical information, readers might think it worthwhile taking a look through the ITC document and use their local knowledge to identify and point out potential problems. Who knows, if we act quickly enough we might end up with a reasonably bug-free DTT transmission plan. Let’s hope so, because it will be with us for a long time!

The ITC proposals make fascinating reading, and can be downloaded from:


The channel changes are in tabular form at:

http://members.lycos.co.uk/ukdtttx/chang_e.txt

Bill Wright,
Rotherham, S. Yorkshire.
Wriggseterals@aol.com

Faulty scan coils

Other readers may well have had the fault I’ve experienced with the Matsui Model 1409R. Several weeks ago I was called to one that was dead, with a squeal coming from the line output stage. A quick check showed that the line output transistor was short-circuit. I fitted a replacement then, not being able to find any other shorts or any dry-joints, I switched on. The new transistor went short-circuit almost immediately, but not before I saw

Red P1 and no RC operation

In the August issue Bob Flynn mentioned a problem with the Ferguson Model C51F (ICC6 chassis) - a red P1 at the left of the picture and no remote-control operation. I would like to add that the same situation occurs with the ICC7, ICC8, ICC9, ICC10, ICC17, ICC19, IKC2, TX91 and TX92 chassis.

Vincent,
Hammonds Ltd. (Gibraltar).
a flash and a puff of smoke from the scan coils. As the coils were not bonded to the CRT, I removed them and could see quite clearly where the damage was. I phoned CPC to try to get a price for a set of coils and was told that the coils are available only with the CRT, the price being £120 plus VAT!

I would normally assume that this was an exceptional case of very bad luck for the customer. But last week I received another call to a dead Matsui 1409R: the circumstances were the same as before, with the damage to the scan coils in exactly the same place. The number of faulty scan coils I’ve come across during over thirty years in this trade can be counted on the fingers of one hand, so there does seem to be a manufacturing problem here. Of even more concern is the fact that both sets were only about fifteen months old.

Surely, if this is going to be a regular fault with these sets, the manufacturer should make the coils available separately at a reduced price?

Matthew Biddecombe, West Wight Vision, Shorwell, Isle of Wight.

Fuse problem

The Matsui 1091 mains/battery portable has a well-hidden and poor-quality fuseholder that lives in a very warm area beside the line output transformer. Until now it has been easy to get a dead set going by removing the 4A fuse, retensioning the holder then refitting the fuse. But I know that this is not good enough.

I spent literally hours with one of these sets checking every part I could think of to try to get it to start up. All the components I tested read, and indeed were, good. In the end I triple checked the 4A fuse. In standby there was a difference of about a volt between one end and the other. I removed the fuse, retensioned the holder and cleaned it. When the fuse was refitted the set still refused to start up and there was still the 1V difference. In desperation, I soldered a bit of fusewire (not a nail!) across the fuse. The set then started up first time. Once the fuse and holder had been replaced the set was OK. I can only conclude that the set needs a huge ‘gulp’ of power to start up, and the fuseholder was acting as a resistor. For a lasting repair a replacement is necessary.

The same basic chassis is used in the Alba/Bush CT100. The fuse concerned is in the DC feed to the 11V series regulator circuit. There’s a separate AC mains fuse.


Tripper construction

As part of a project to refurbish a professional widescreen TV (not PC) monitor, I’m about to try to make my own tripper – as a replacement for a failed unit for which I can find no source of supply. Making a tripper myself has the advantages that I have control over the design and physical form.

I will use six BY8416 diodes and five 1,000pF, 15kV capacitors, with fifteen series-connected high-voltage Resistors to bleed 100µA from the 28kV EHT – this provides feedback to the control stages of the EHT generator, which is separate from the line output stage. A solid-carbon 4.7kΩ, 2W resistor in series with the output will provide surge limiting. I’ll use flying leads for the chassis, the focus-voltage tap, EHT and bleed current connections, and a pin to take the wire from the EHT transformer. The diodes and resistors will be strung between a couple of polypropylene strips, with the capacitors on the outside, and the whole lot will be encapsulated in a small ABS potting box using epoxy resin. The professionals apparently “pull a vacuum” to eliminate air, but I’m told that heating the resin to 50°C and pouring it gently into the lowest corner of the box (with the jig tilted at first) should suffice as a DIY alternative.

Has anyone else tried doing this? I’m not sure what my chances are of producing in this way a tripper that works properly and reliably, but thought I’d give it a go. Incidentally I’ve experimented with an unpotted doubler that could be driven to provide about 18kV before the sparks and bangs made it clear why encapsulation is needed! My e-mail address is SBURGESS@Channel4.co.uk

Steve Burgess, 2 New Coppice, St. Johns, Woking, Surrey GU21 8US.

Pioneer laser lenses

In the September issue Robin Beaumont mentioned the problem of detached Pioneer laser lenses. I’ve come across this problem on many occasions over the years, and have never found it necessary above. Examples are Figs. 1 and 2 on page 589 in the August issue and Fig. 2 on page 527 of the July issue. We are trying to establish the cause of this.

We have been asked about the last line (omitted) of the leader in the June issue (page 451). It should have read “faces an uncertain future”.

Well, one or two human failures, one or two computer ones. Computers aren’t new, so why are we still experiencing trouble? The answer seems to be different versions of software that lack compatibility in some respects. Anyone know why my PC’s insert key no longer works after some new software was installed (bog standard Windows Word)? It’s a real pain.

J.A.R.
to replace the laser. As Robin says, the missing lens is often to be found rolling around in the bottom of the unit. It will need a good clean inside and out before proceeding.

The manufacturer uses several blobs of a tacky, stretchy adhesive, similar to EvoStick impact adhesive, to secure the lens. This type of glue is easily broken down by cleaners such as alcohol. If owners use wet-type cleaning discs, this may be the reason why the lenses fall out. It’s essential that the old glue is completely removed from both the lens and the carrier on the focus/tracking motor. If this is not done, the lens will not sit flat in the carrier and the tracking motor/servo may not have sufficient range to pull it back in parallel with the disc. To remove the old glue I start by using a fine-tipped scalpel to get the bulk of it off the lens rim and the carrier. I finish off with alcohol on a cotton bud, then use a powerful magnifier to examine both of these items to ensure that all traces of the original glue have truly gone.

Reposition the lens in the carrier. Then use scalpel tips to push down firmly on opposite edges of the rim. Check with the magnifier to ensure that the lens is absolutely flush with the face of the carrier. Once you are satisfied that the lens is positioned as perfectly as possible it can be reglued, using super glue applied on the end of a needle. Put four tiny blobs around the periphery of the lens: being quite a fine liquid, it quickly gets into the minute gap between the lens and the carrier, and rapidly cures to provide a permanent bond.

Then go through the set-up procedure. The laser power can be checked by looking for a 1-1.2V peak-to-peak eye pattern at TP1, adjusting the tiny potentiometer on the laser flexiprint as necessary (unlike most manufacturers’ lenses, this is a valid set-up parameter for Pioneer lenses). Finally, check and set the focus and tracking offsets, then the servo gains.

This might sound like an involved procedure but, in my opinion, it’s far preferable to the high cost of a new laser unit for these models and the very tricky procedure for diffraction grating adjustment with a replacement unit. In cases where the lens has been lost through one of the ventilation slots in the case, I have successfully replaced it with a lens from a scrap laser unit of different manufacture. You can even use a lens from a Sony KSS series pickup. There will doubtless be screams of horror from those knowledgeable in optical matters, but all I’ve ever found it necessary to do is to reset the focus offset, presumably to compensate for a slightly different focal length. Any replacement lens is usually a tight enough fit in the carrier to remain in place temporarily. This enables different lenses from different scrap lasers to be tried. Lenses are easily removed by gentle prying around their edges with a curved-blade scalpel.

Geoff Darby, Moniteech, Earls Barton, Northampton.

Telephone checks
When I tried the phone number given in the letter with the above heading in the September issue it didn’t work. The number I use, which seems to work anywhere, is 17070. There are voice prompts for different tests.

Allan Snow, Tewkesbury, Gloucestershire.

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Closed circuit television

Closed Circuit Television (CCTV) surveillance is one of the fastest growing areas in the security industry. This book is an essential guide for all security professionals and CCTV installers. However, unlike most existing books on CCTV, this is not just a discussion of security issues, but a thorough guide to the technical side - installation, maintenance, video recording, cameras and monitors, etc. This book provides the underpinning knowledge required for the level 3 NVQs from SITO / City & Guilds. The concise, accessible text makes it an ideal coursebook, and this accessibility also makes it ideal for hard-pressed practitioners.

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Analogue TV in Band I is still alive and reasonably well. Signals received during the 2002 Sporadic E season had an odd propagation characteristic: they were of short duration, rising to good levels then fading out within a few minutes. There were certainly fewer SpE openings that lasted for several hours. Reception was generally along a north-south path, from Scandinavia down to Italy and the Iberian peninsula. No two successive SpE seasons are ever the same!

Satellite sightings
Summertime means more sports activity, which is usually reflected in the satellite feeds. I missed the Tour de France cycling event this time. Over the years the French have honed their coverage of the race, achieving real excellence, for example live air shots of the cyclists speeding round mountain passes and shots from the backs of motorcycles. But Edmund Spicer (Littlehampton) found the French cycles at Telecom 2A (3°E), in a four-channel package at 12.606GHz V (SR 27,500, FEC 3/4). The four channels were provided by different cameras, with the service identifiers GCR/PGM/RMX, GCR/PGM2, PGM3 and PGM4. The first three were land-based, the fourth being the helicopter camera — with sound effects (left) but no audio commentary. Interesting that a BBC SNG truck was seen using 2A, identified as BBC UKI-365 P2, at 12.522GHz V (27,500, 3/4) with a live transmission from Albert Square, Manchester for BBC news at 1300 hours. This was an item about the 10CC group. It might have been a good slot to check for OB downlinks during the Commonwealth Games.
The same satellite carries Turkish CNN in FTA form at California. Recreation area. Not a very good July 4 Independence day for the north of LA, where a light plane had crashed into a lakeside. Pictures were also appearing from a crash site some 35 miles to head of the FBI, the mayor, the fire chief and the police chief. Live news broke. There were statements to the press by the local being carried away, helicopter shots and the general confusion as much of the output of the local TV channel KNBC-4, including report was carried by NSS-7 at 11.462GHz V and took over forced to the floor and shot by an El Al security official. The El Al flight booking desk, hitting several before he was airport was seen. An Egyptian gunman had fired on people near the Pope present. There were lots of flags and marching athletes. The Pope made a speech and acknowledged the athletes who were presented to him.

On the 20th I found BT’s TES-34 truck relaying via Intelsat 801 (31.5°W) from a venue outside Leeds Football club. The live report, at 10.956GHz V (5,632, 3/4), was for Sky Sports News. Edmond Spiar reports frequent TES-34 downlinking via 801 at 10.960GHz V (5,632, 3/4) with colour bars plus identification. I checked this frequency at 1500 on the 27th and found a signal that was trying but failing to lock. I’m beginning to suspect a problem somewhere in my system and will be replacing the LNB shortly!

Roy Carman (Dorking) alerted me to the fact that Fox News Kabul via Europe*Star-1 (45°E) has moved from 11.675GHz to 11.553GHz V, with changed parameters (SR 5,470 and FEC 3/4). This NTSC feed is fired up on most evenings, with colour bars and identifications or actual reports for US networks. With war battles over, it’s the only active link via this satellite. But it pays to be alert. While checking Europe*Star-1 at 1830 hours on the 16th I came across Globecast Africa-2 with a significant news item from APTN’s Johannesburg bureau. Pictures showed a Kuwaiti minister or official being shown around an arms site, viewing guns, tanks, aircraft. etc. The picture cut to a large room in which a presentation was being given, showing pictures of military hardware with “this is what we will be using when we go into Iraq” clearly stated. Globecast Africa-2 can be found at 11.512GHz V (5,632, 3/4).

Just after the last column was sent in there was the unfortunate wedding-party bombing incident in Afghanistan. This led to a number of reports. I found BBC UKI-302 Bagram at 11.661GHz, BBC UKI-579 via Taridan Scopus at 11.553GHz and the Fox News outfit using its old frequency, 11.675GHz. These feeds all used 5,632, 3/4.

At 1800 hours on the 20th I found Meridian 8mbit TES-9 feeding air display action to Meridian Tonight. This was via 801 at 10.974GHz V (5,632, 3/4).

From about 2230 hours on July 4 live action at Los Angeles airport was seen. An Egyptian gunman had fired on people near the El Al flight booking desk, hitting several before he was forced to the floor and shot by an El Al security official. The report was carried by NSS-7 at 11.462GHz V and took over much of the output of the local TV channel KNBC-4, including several live interviews. Pictures included the dead and injured being carried away, helicopter shots and the general confusion as live news broke. There were statements to the press by the local head of the FBL, the mayor, the fire chief and the police chief. Pictures were also appearing from a crash site some 35 miles to the north of LA, where a light plane had crashed into a lakeside recreation area. Not a very good July 4 Independence day for California.

Hugh Cocks (Algarve, Portugal) mentions that Canal Plus is still present in analogue form from Telecom/Atlantic Bird-2 (8°W), at 12.606GHz V. The Turkish TRT1/2/3/4 services are still present in analogue form from Telecom/Atlantic Bird-2 (8°W), at 12.606GHz V. The Turkish TRT1/2/3/4 services are typically present being tested. Tests are also being carried out in Shenzhen. China*

China: A digital TV service in Shanghai will enable bus passengers to view programmes during their journeys. It’s at present being tested. Tests are also being carried out in Shenzhen and Beijing. On July 1 China Central TV (CCTV) launched its English-language service CCTV-9 on the main Hong Kong cable system.

Afghanistan: Two European satellite TV operators are providing

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Changes to NSS-7 downlink frequencies.

Broadcast news

China: A digital TV service in Shanghai will enable bus passengers to view programmes during their journeys. It’s at present being tested. Tests are also being carried out in Shenzhen and Beijing. On July 1 China Central TV (CCTV) launched its English-language service CCTV-9 on the main Hong Kong cable system.

Afghanistan: Two European satellite TV operators are providing
Baltimore, Maryland.

A day at the races: goodnight from the Pimlico Race Course, four geostationary satellites, along with internet, e-mail and other aircraft while in flight. The global service will be transmitted from 24-hour news channel and other TV programming for passenger An S-band satellite service, AirTV, is to provide the BBC World Satellite news providers. The announcement was made on July 19. TV 12 Future TV 12 plans had included expansion to Chichester in West interesting alternatives - such as live Cowes Week yachting. service. It wasn't exactly riveting viewing, but did offer commercials, and was probably the longest-running RSL-TV service, with more hours at the weekends, using locally-produced and bought-in material and repeats, interspersed with charitable group. TV 12 had maintained a seven-hour weekday broadcasting, which will be retained primarily as local or regional services. The only national broadcasting networks will be the state-owned TVRI (TV) and RRI (radio) services. The ITC decided not to renew the Isle of Wight TV station TV 12's four-year RSL licence, which has instead been awarded to Solent TV, an offshoot of Island Volunteers, a non-profit charitable group. TV 12 had maintained a seven-hour weekday service, with more hours at the weekends, using locally-produced and bought-in material and repeats, interspersed with commercials, and was probably the longest-running RSL-TV service. It wasn't exactly riveting viewing, but did offer interesting alternatives - such as live Cowes Week yachting. Future TV 12 plans had included expansion to Chichester in West Sussex. Solent TV will offer "localness and community involvement... exploiting links with local news, training and education providers". The announcement was made on July 19. TV 12 reacted by hitting the off button, and soon after ch. 54 went dark.

Satellite news

An S-band satellite service, AirTV, is to provide the BBC World 24-hour news channel and other TV programming for passenger aircraft while in flight. The global service will be transmitted from four geostationary satellites, along with internet, e-mail and other data services.

The Iraq government is to allow selected satellite TV channels to be received. Initially viewers in Baghdad will be able to receive the approved satellite programming as a terrestrial pay-TV service, which will be encoded and require a subscription card. In the next phase of expansion the service will be extended to Ninawa and Basra.

BBC World has upset the Chinese government, which has cut the uplink to Sinosat-1. The BBC had screened an item about the Falun Gong spiritual movement.

The European service funded by the Chinese Phoenix channel is to start 24-hour operation shortly - it’s been on-air in Europe for over ten years. Additional programming will be obtained from Hong Kong and North American Chinese TV channels.

The Czech channel TV3 has gone blank following an end to funding by European Media Ventures.

Finally a correction. In the August column, page 612, I said that James Murdoch, chairman of the Hong Kong based Start TV, is no relation of Rupert. In fact he is Rupert’s youngest son.

CCTV interference

The following account of an unusual interference problem is based on a report by columnist Lawrence Harris, who writes a monthly article in Short Wave Magazine on weather satellites (NOAA, Meteosat etc.). One of his contacts, Kevin Hughes (Tamworth), had been suffering from interference during NOAA-14 passes (receiver at 137-620MHz), the symptom being wavy lines on received images. His ‘turbstile’ aerial – crossed dipoles and reflectors – was checked and found to be OK, there were no problems with his domestic mains-powered equipment, and the mains input was monitored and found to be clean. Kevin decided to contact the Radiocommunications Agency and, as he is registered with NOAA for downlink image reception and the 137MHz weather satellite band is a protected service, the Agency swung into action.

Agency investigators disconnected the mains supply to Kevin’s house, then used an external generator to power specific items of equipment. All were found to be clean, but an off-air interference signal at about 137MHz was noticed. The investigators disappeared to trace its source.

Meanwhile Kevin checked with his Icom PCR1000 ‘computer radio’ and found that the rogue signal was at 137-640MHz. The investigators were informed. They reappeared and confirmed that a signal was indeed present at this frequency – the PCR1000 performed rather better than the Agency’s Racial and Rhode and Schwarz equipment. Directional aerials were then used to determine the bearing of the interference, which was eventually found to be caused by a fault in a CCTV system at a large Safeway’s distribution depot some 4km away. Once the defective item had been replaced, the wavy lines disappeared.

Moon-bounce reception

Last month I mentioned experiments on moon-bounce reception carried out by Anthony Mann in Australia. He has now sent further information, via Hugh Cocks. His recent experiments had exploited the possibilities with very narrow audio bandwidths, down to 2Hz. However a US radio amateur (K3PGP) in New Jersey had, back 1972-5, successfully received two ch. A68 transmitters via this propagation mode, using a 24ft, 0.6f/d dish and a ch. A68 feed. This channel was selected because no nearby transmitters used the frequency. The two stations received were in New Jersey and California. Pointing a high-gain aerial in the direction of the New Jersey transmitter confirmed that direct reception was not possible at K3PGP’s location.

As the moon appeared over the horizon, EME signals were received from the New Jersey transmitter. They faded out as the moon rose higher. Further confirmation was provided by the Doppler shift in signal frequency. About three hours later, as the...
It's simply used to show any/all activity from a given satellite spikes at the left-hand side of the screen, see Fig. 1. Any signals found appear as a band (satellite IF) tuner and a ramp generator that's used to monitor or TV set. The spectrum monitor box contains an LNB is to a satellite receiver (analogue or digital) then the simplicity itself to use. The signal path from a Ku- or C-band spectrum monitor box, whose video output is connected to a Labgear head amplifier with a 1.8dB noise figure, and a scanner. The saga continues, and any successes will be reported.

**Low-cost satellite spectrum monitor**

The June 2002 issue of the NZ publication SatFACTS contained a review of a low-cost satellite spectrum monitor that's simplicity itself to use. The signal path from a Ku- or C-band LNB is to a satellite receiver (analogue or digital) then the spectrum monitor box, whose video output is connected to a monitor or TV set. The spectrum monitor box contains an L-band (satellite IF) tuner and a ramp generator that's used to sweep across the IF spectrum. Any signals found appear as spikes at the left-hand side of the screen, see Fig. 1.

This is not a complex, accurately-calibrated test instrument. It's simply used to show any/all activity from a given satellite once this has been found and a polarisation has been selected. It strikes me as being an ideal tuning/search aid to enable sat-zappers to check for satellite downlink signals. The unit is made in Sweden by Emitor and is known in Europe as the Spectralook. Down under it's distributed by AV-Comm Pty Ltd., Australia. I am trying to obtain a unit to try out and hope to report back on it.

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**Test Case 478**

Cathode Ray has been going through a bad patch recently. There had been the CD player for which he had ordered an expensive laser unit, only to find that it didn't cure the problem; the Sony fiasco, when he had blown up a 100-pin processor chip because he forgot to replace his earthing wristband after a visit to the toilet; and the disgraceful business of the Coca-Cola chip because he forgot to replace his earthing wristband after a visit to the toilet; and the disgraceful business of the Coca-Cola chip because he forgot to replace his earthing wristband after a visit to the toilet; and the disgraceful business of the Coca-Cola chip because he forgot to replace his earthing wristband after a visit to the toilet; and the disgraceful business of the Coca-Cola chip because he forgot to replace his earthing wristband after a visit to the toilet; and the disgraceful business of the Coca-Cola chip because he forgot to replace his earthing wristband after a visit to the toilet; and the disgraceful business of the Coca-Cola chip because he forgot to replace his earthing wristband after a visit to the toilet; 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Local-oscillator setting
Mr James phoned to complain that ITV was missing. He said everything else was all right. While questioning him I asked him to go to EPG no. 190, Hallmark. This was also missing, but whereas ITV produced the message "no satellite signal is being received" Hallmark came up with "there is a technical fault with this channel, please try later". As ITV and Hallmark are both low-band signals, it was certain that either the LNB or the receiver was the cause of the trouble.

Before getting involved with the LNB on the roof, I used our signal analyser to check the signal coming down the cable. The LNB seemed to switch correctly from high- to low-band, and between horizontal and vertical polarisation. According to our in-line LNB voltage, current and tone checker the digibox produced the 22kHz switching tone for high-band operation and switched it off when ITV was selected. Time to look at the digibox's installation menu.

Once into the installer setup menu, after pressing 0 then 1 then 'select' on the remote-control unit, I headed straight for option 1, the LNB setup submenu. The cause of the problem was immediately clear (see Photo 1): the low-band local-oscillator frequency was set at 9.8GHz instead of 9.75GHz. The factory-default settings can be obtained by pressing the remote-control unit's red button. Once this had been done (see Photo 2) ITV and Hallmark were received normally.

Mr James swears that no one had got into the installation menu to alter the settings, but I suspect that his video game playing teenage son was the culprit. It's not a good idea to use this menu to practice remote-control unit skills! C.H.

Digital channel update
The latest channel additions at 28.2°E are listed in Table 1 - where assigned, the EPG number is shown in brackets after the channel name.

UK Gold 2 has been moved from EPG 110 to 111 to make way for UK Gold + 1 hour. The latter was testing in July with a "UK Engineering Test" caption (see Photo 3) and unrelated sound and picture content. Photo 4 shows the BBC Radio 1Xtra launch caption. Casino TV has been seen testing via Eurobird transponder D5S with colour bars and a caption, see Photo 5. The I Race channel started tests in early August via Astra transponder 13, see Photo 6.

Teamtalk 252 radio (transponder 33, EPG 910) and Einstein TV (transponder D7S, EPG 576) have ceased transmissions. C.H.

C-band reception
Many services that are not usually available in Europe as Ku-band transmissions can be received in Band C (4GHz). A larger dish is required: a 1.5m or 1.8m dish will provide good reception of a number of signals. I intend to take a look at
This is 1Xtra, the digital dial tuneur at 6.04 GMT. Miss the best in kreo dancehall, UK Garage, hip hop and drum and bass, 24/7.

1Xtra BBC

NOW

Search Channel | Search Favourite

WWW.DISC.TU

Further schedule information is not available

Table 1: Latest digital channel changes

<table>
<thead>
<tr>
<th>Channel and EPG</th>
<th>Sat</th>
<th>TP</th>
<th>Frequency (GHz/pol)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BBC Radio 1Xtra (919)</td>
<td>2A</td>
<td>5</td>
<td>11.798/H</td>
</tr>
<tr>
<td>BBC Radio Nan Gaidheal</td>
<td>2A</td>
<td>5</td>
<td>11.798/H</td>
</tr>
<tr>
<td>Big Entertainment Network (238)</td>
<td>EB</td>
<td>D11S</td>
<td>11.662/H</td>
</tr>
<tr>
<td>Casino TV (tests)</td>
<td>EB</td>
<td>D5S</td>
<td>11.546/H</td>
</tr>
<tr>
<td>I Race (tests)</td>
<td>2A</td>
<td>13</td>
<td>11.956/H</td>
</tr>
<tr>
<td>Moto Radio</td>
<td>EB</td>
<td>D9S</td>
<td>11.623/H</td>
</tr>
<tr>
<td>Simply Nature (579)</td>
<td>2B</td>
<td>37</td>
<td>12.422/H</td>
</tr>
<tr>
<td>Sky Travel Extra (146)</td>
<td>2A</td>
<td>4</td>
<td>11.778/V</td>
</tr>
<tr>
<td>Stop and Shop (660)</td>
<td>EB</td>
<td>D5S</td>
<td>11.546/H</td>
</tr>
<tr>
<td>UK Gold + 1 hour (110)</td>
<td>2A</td>
<td>13</td>
<td>11.956/H</td>
</tr>
<tr>
<td>Wonderful</td>
<td>EB</td>
<td>D9S</td>
<td>11.623/H</td>
</tr>
</tbody>
</table>

TP = transponder. 2A = Astra 2A, 2B = Astra 2B, EB = Eurobird.

various C-band satellites over the coming months. We’ll start with Intelsat 903 at 34.5°W. This is the home of KNR TV from Greenland and Canadian Forces TV. KNR TV is at 3.716GHz with left-hand circular polarisation, a symbol rate of 2,716 and 7/8 forward error correction. It originates in Denmark, with programming from the main Danish networks. When programmes are not being transmitted (time three hours behind the UK) a test pattern is seen, see Photo 7. Canadian Forces TV lives just above KNR TV, at 3.721GHz, with right-hand circular polarisation, a symbol rate of 7,898 and 1/2 FEC. It’s aimed at Canadian Forces overseas and provides a mixture of programmes from Canadian TV networks. One French- and one English-language TV channel is transmitted together with four radio stations, two in each language. The TV signals are in 525-line format. Most modern digital receivers designed to be able to handle a low symbol rate can cope with this and, if the TV set has an RGB input, the programmes will be seen in colour even though the set doesn’t have an NTSC decoder. See Photo 8. The signals are sometimes scrambled, but when this happens two of the radio stations remain in the clear.

Until recently and as far back as Early Bird in the mid-Sixties the 34.5°W slot was used for numerous news feeds and programme exchanges, in both PAL and NTSC form. These were at the top of the band (4.150-4.175GHz) with right-hand circular polarisation. The occasional digital feed may still be found in this part of the band, but these signals have largely ceased – because of the multitude of other satellites available for transatlantic links. H.C.

Panasonic TU-DSB20

When this digibox came on it said it was “searching for listings”. But no matter how long you waited no listings appeared. A check in the services menu revealed that the unit was receiving a good signal, and quality and lock were OK, but there was no network ID and no transport stream data.

Checks at the 208-pin ST2OTP3BX5OS chip IC421 showed that MPEG data was entering at pins 69-76, so a front-end tuner or AD converter failure was ruled out. The next step was to check for digital activity at the memory address pins 1-28 and memory data pins 30-67. They were all stuck high at 3.3V, so the bus had stopped. A replacement chip cured the fault. M.D.

Pace 2200

If one of these digiboxes is stuck in standby, check for oscillation at the modem crystal X700 (29.4912MHz). If the clock signal is missing, try a replacement crystal before, if necessary, fitting a new DSP1675 modem chip.

Another possibility is loss of the 27MHz clock signal at pin 110 of the ST20TP3 chip U300. If it’s missing and the chip is cold, check at pin 3 of the buffer U370. If the signal is missing here, suspect failure of the 27MHz crystal X370. Be careful when replacing it, as the print is very thin here. M.D.
MONITORS

Fault reports from
Gerry Mumford
Dean Ratcliffe
Allan Horsfield
and Ian Field

We welcome fault reports from readers – payment for each fault is made after publication.

Reports can be sent by post to:
Television, Fault Reports,
Anne Boleyn House,
9-13 Ewell Road,
Cheam,
Surrey SM3 8BZ

or e-mailed to:
tessa2@btinternet.com

Daewoo 531X
This monitor powered up with the green LED on, but there was no display. A few checks revealed the cause: no line drive. The supply to the scanning processor chip was missing because of a short across the 12V line. After much hunting the culprit was found to be decoupling capacitor C506 (330μF, 16V) – which is just next to the scanning processor chip! A replacement restored normal operation. G.M.

Fujitsu E156 (Model P1115A)
There was a dim display with thin, black horizontal lines across it. In addition a loud buzzing noise came from inside the monitor. Visual inspection showed that the mains rectifier’s reservoir capacitor C608 (180μF, 400V) was faulty with a bulging top. When tested it was virtually open-circuit. The unit happily accepted a replacement capacitor with the more readily available value of 150μF, 400V, which cured the fault. G.M.

Taxan EV750TC95 (Mitsubishi chassis)
This monitor was dead, tripping loudly and blinking its LED. The 2SC5331 line output transistor Q503, the 2SJ306 B+ regulator FET Q504 and the 2SD1073 EW output transistor Q505 were all short-circuit, while the feed resistor R512 (0.82Ω, 1W fusible) was open-circuit. Once these items had been replaced the monitor powered up and worked, but when it was put on soak test it repeatedly failed after a few hours, damaging the same components. The cause of the trouble was eventually traced to D503 (ERB93-02), which was slightly leaky. It took almost as long to find a replacement capacitor with the more readily available value of 150μF, 400V, which cured the fault. G.M.

Hansol 710A (Model B17CL)
This monitor’s display was on an over-bright, white raster with flyback lines visible on it. The brightness control worked correctly, so there was obviously a problem in the tube’s first anode supply. In this design there’s no A1 control on the LOPT, adjustment being carried out in the service mode. Fortunately the cause of the fault was simple: R711 (1MΩ, 0.5W) was open-circuit. It forms part of a potential divider for the A1 supply. A replacement restored normal brightness. G.M.

Jean JD156H
The problem with this monitor was excessive width. The width control was inoperative, and there was no pincushion correction. Checks in the line output stage showed that the transformer’s scan-drive pin was dry-jointed. The thing to do is to check the LOPT for dry-joints and resolder as necessary. Also check the 31DF6 switching type diode (3A, 600V). D.R.

Axion CF1754
There was no operation because the 2SC1312 line output transistor Q411 was defective. As this type of transistor appears to be unobtainable at present I used a 2SC4916 as the replacement. The cause of the failure had been a dry-joint on the deflection plug. D.R.

Dell 1025HE
This monitor produced a very healthy discharge at switch on. When I investigated I found that the EHT was arcing across the top of the line output transformer. An internet search revealed that it’s a common problem with this model, also the Nokia 447.

Since new transformers are rather pricey I decided to have a go at repair. Halfords clear silicone sealant was used to cover the area affected, and this did the trick. No more arcing, and a monitor restored to health. In fact the hardest bit was to get the case off! A.H.

Relisys RE1420K
This monitor’s mains fuse had blown. I found the 2SC3460 chopper transistor short-circuit, though no immediate cause was apparent. Its 0.512Ω, 2W emitter-current sensing resistor was intact, but its 2SC2655Y base-bias control transistor Q102 had been destroyed. The CNX82A optocoupler had survived. As this device has no optotransistor base connection, testing it requires a bit of effort. A DMM diode check can be used for the LED section: the forward voltage should be about 1V. But with no base connection the same method can’t be used for the optotransistor section. The only way to check this is to drive the LED. With a LED current of 10mA, the transistor section should pass about 2mA when fed from a 5V rail via a 100Ω resistor.

Almost every component in this self-oscillating circuit was checked, but still no cause of the fault was evident. So the damaged components were replaced and the unit was powered. There was voltage at the collector of the chopper transistor, but little else happened. I decided to check the rectifiers on the secondary side of the circuit. D110 and D112, type BYT36, were both badly discoloured. As I didn’t have this device in stock I fitted a pair of USF406s. These ran a lot cooler (judging by the discoloration of the originals) when the monitor was powered again, and to my relief everything now worked.

This chassis uses an old-style EW transductor to width-modulate the B+...
supply. It's interposed between D110/D112 and the relevant chopper-transformer pin, and is controlled by the DC that passes through the "exciter winding".

The failure of D110 and D112 could have been the basic cause of the fault, but I was suspicious about the chopper transistor's fixing screw - it was barely more than finger-tight!

There are four small electrolytics on the primary side of the power supply. C108, C109 and C130 are all 10µF, 50V while C107 is 470µF, 10V. It's advisable to replace all four.

I didn't have 2SC3460 and 2SC2655 transistors in stock and instead fitted a 2SC886A and a 2SD1207. They are both considerably better than the originals. Note that while the 2SC2655 and 2SD1207 have b-e pinouts the PCB has an e-b-c hole layout, so the transistor's leads have to be pre-formed. I.F.

Dell VC10CEN

These 'bare-bones' interlaced-only SVGA monitors remain popular, and are usually easy money - just replace the three small electrolytics on the primary side of the power supply, and preferably add non-electrolytics to the primary side of the power supply. It's interposed between C107 and D407, to switch a single regulated HT winding.

I decided to adopt the A1 supply circuitry used in the 14in. Liteon monitor - remember the ones with the 'dummy' A1 preset on the LOPT?? But the fault may have resulted in cathode glazing from ion bombardment. So I shorted out first one then the other in M1 electrolytic, leaving just the 10kΩ, 1W fusible resistor, the RGP02-20 diode, the 4.7nF, 2kV reservoir capacitor, the 4.7µF preset and the 2.2kΩ "bottom-lift" resistor trailing from the collector of the line output transistor. It took five minutes of peak-rectified collector voltage at the tube's A1 pin before the cathodes decided to shake a leg!

This substitute A1 supply would have worked very nicely, but there still seemed to be internal arcing in the LOPT - the picture flickered for a few seconds when the monitor was first switched on. A search through the salvaged LOPT bin produced a spare Vi428E transformer. The Vi428E looks identical to the VIC10CEN to me. If there's a difference I've not spotted it. The LOPT's part number is also identical. Unfortunately the salvaged LOPT turned out to be short-circuit - it does happen, though the symptom is usually mistaken for a common power-supply fault.

A further search, this time through the scrap chassis pile, produced a chassis complete with LOPT. The transformer was OK, and with the correct A1 supply the tube's cathodes made a further unexpected recovery. It's possible that the flickering had been due to the condition of the CRT's cathodes rather than a fault in the original LOPT!

While on the subject of eliminating troublesome electrolytics, most monitors use them to couple the video outputs to the CRT's cathodes. This monitor uses 1µF, 100V electrolytics with InF disc ceramic capacitors in parallel. The latter improve the resolution considerably. I removed and checked the video-coupling electrolytics and found that their ESRs were between 2-3Ω, which is probably not bad for electrolytics of this type. But I decided to use the two pairs of mounting holes in each channel to fit an 0.68µF, 100V capacitor and an 0.33µF, 100V capacitor in parallel. This reduces the ESR to negligible proportions, and the improved resolution is noticeable! I.F.

Supercom Multisystems SK1428GN

This 14in. SVGA monitor looks similar to the small Acer models externally, but not inside. The sync chip bears the number KD$9008, while most of the other chips are of GoldStar origin. The complaint with this one was "smell of burning". It had undoubtedly come from C424 and C425 (both 220µF, 25V), which are in the LOPT-derived ± H-shift supplies. The PCB track had burnt up between the cathode of D409 and pin 4 of the LOPT (assuming the collector connection to be pin 1). In addition one of the IN4935 H-shift rectifiers (EG409) was short-circuit. No other damage was found, and the monitor worked normally once the burnt PCB track had been cleaned up and linked across, and a new pair of electrolytics and a new IN4935 diode had been fitted.

The design of this monitor predates the use of PWM-type B+ supply control. It uses a pair of npn power transistors, Q406 and Q410, to switch a single regulated HT line to one of three taps on the line output transformer's primary winding. One tap is always connected, via D409, to the commoned emitters of the two transistors. The two 'boost' tappings are switched in when the display mode requires this. D405 and D406 prevent reverse current flow into Q406 and Q410.

Somehow this repair seemed too easy! So I decided to use the monitor for a while after it had been on soak test for a few hours. Sure enough the brightness was fluctuating - only slightly, but the customer was bound to complain. The soldering on the main PCB was mostly OK. What was hidden under the CRT-base screening was a totally different story. In addition the three 1µF, 50V non-polarised electrolytic video-coupling capacitors C623, C629 and C634 had well and truly 'gone home'. The ESR readings of all three were off-scale (over 750) with my home-made meter. If you can find non-electrolytic capacitors with at least equivalent capacitance value and voltage rating, without being too big to fit the available space, they will provide a visible improvement in resolution and contrast. Their ESR will be much lower than even a top-quality electrolytic capacitor.

Many cheap monitors have only cascode Class A video output stages, without the complementary emitter-follower pair. This one does have the latter, providing a very low output impedance to drive the CRT's cathodes. The two extra transistors were wasted with the non-polarised electrolytic coupling capacitors originally fitted. They are not wasted with the non-electrolytic capacitors I fitted. I.F.

Elonex MN009 (Philips TY619 324 008625)

I acquired two of these monitors for stock. Since one had the swivel base missing, I decided to use it for spares. The one nominated for repair had a label that said "badly out of focus". In fact there was no video. When the setting of the first anode preset was advanced a blank raster appeared. In addition the horizontal shift control did nothing, I decided to tackle the focus fault first, and found that adjustment of the focus control did work. A good display was obtained with the CRT in the other case, but after a soak test focus was lost and the A1 level was erratic. There was no doubt that the first CRT was faulty: it had probably damaged the presets, because a transformer swap solved the problem.

When the monitor was checked through the scan modes it refused to sync at 600 x 800 and 1,024 x 768. There are two H-frequency and two H-phase presets, just inboard from the field output heatsink and on the front of the upright subpanel respectively. The settings of these presets have to be 'juggled' to obtain lock on all the specified modes without the display being off to one side. After over an hour I decided to be content with all the specified modes, with 640 x 480 and 600 x 800 being correct at the extremes of the H-shift control. Dirty presets are a common problem with this chassis, and the application of pressure to each in turn will reveal the culprit, but on this occasion I wasn't so lucky! I.F.
Philips VR510/07 (Apollo 12 chassis)
This machine's E-E picture kept disappearing, as if it was switching to the AV input. The clue was that there was no sound in any mode. I found that the TDA9605H audio processing chip's 9V supply was low, with excessive voltage drop across the 100mA fuse F1509. While I was carrying out checks the fuse failed completely, and I was able to confirm that the IC was faulty. A new fuse and IC restored normal operation. R.B.

Panasonic NVHD640B (Z mechanism)
This machine would shut down at random during play or record. I initially tried replacing the reel sensors, but the cause of the trouble was loss of take-up tension. A new clutch assembly (part no. VXP1732) and drive gear (part no. VDG1221) were required. R.B.

Sharp VCM26HM
This machine's stop/eject button was broken and the tape couldn't be ejected. Not a real problem, but when I checked the Sharp website I found that a modification is available - an additional plastic bracket that restricts the travel of the buttons and thus reduces the likelihood of breakage. There are two versions of the bracket, depending on the particular model being repaired. R.B.

Philips 14PV200/07
This combi unit was stuck in standby with no bus-line activity. The fault can sometimes be caused by a memory problem, but in this case the TMP93C071 microcontroller chip IC7900 was faulty. Replacement is not a job for the faint-hearted: the IC has 120 pins! The same microcontroller chip is used in the Philips Apollo 20 VCR chassis, in which it can cause similar problems. R.B.

Sanyo VHR776E
We had a pig of a fault with this machine. The tape loaded, but there were no functions and the drum was spinning far too fast. IC351 and the stator motor were replaced without curing the trouble, the cause of which turned out to be C3525 (0.47µF, 50V). It's connected to pin 29 of IC351. The capacitor read all right when checked with our test gear. N.S.S.

GoldStar P1341
This VCR seemed to be completely dead. But when the power supply was removed the fuse was found to be intact, and on test all outputs were present and were clean when checked with a scope. When the power supply was plugged back into the main PCB the +6V supply showed terrible noise on load. C19 (1,000µF, 10V) had dried up. For improved reliability I used a 1,000µF, 16V 105°C type as the replacement. This got the machine going again - all the other supplies were clean when checked. R.M.

LG S909
This rather nice VCR was dead. Its power supply can be removed and run, up to a point, as a separate unit. Cold checks failed to reveal any problems with circuit protectors or start-up resistors, but CP06 (33µF, 25V) on the primary side of the circuit read low and was replaced. On power-up I had, as expected, some secondary voltages. Some of the secondary voltages will always be present, others will be switched by the microcontroller chip on the main board. So, was there a fault in the power supply or on the main board? The clue was the voltage at pin 8 of PP501. This is shown on the circuit as 5.3V, but in fact should be nearer 6V. The reading I obtained was 5.1V. Now, there isn't a great difference between 5.3V and 5.1V, but there is between 6V and 5.1V! This voltage is provided by two 1,000µF capacitors, CP12 and CP13. Both read low in value, and replacements restored the VCR to life. M.S.D.

JVC HRJ660
This machine was brought in because it had chewed a couple of tapes. It behaved itself on my bench however. I've found that with machines that use this deck the mode switch and a couple of idler items, as follows, should be replaced: item 102, idler lever, part no. LP30236-002B; item 89, idler arm assembly, part no. LP40114-006B; and item 106, rotary encoder, part no. QSW0554-003. It seems that the main culprit is item 102, which occasionally sticks. M.S.D.

Sanyo VHR279E
The fault report said "tape jammed". On investigation I found that with the cassette loading operation was lazy, sometimes loading and sometimes stopping half way. According to the fine men at Sanyo Technical, this is due to the motor draws more than 30mA it should be replaced. I haven't discovered how to measure this, since the motor sits beneath the deck in what is a now standard mid-mount mechanism. A replacement motor cured the fault however. The part no. is 645 029 7014. M.S.D.

Panasonic AG5260
This VCR showed error 5 in its display.
When I checked its mechanical operation I found that the tape was being accepted and laced up but the pinch roller didn’t engage, because the plastic locating pin on the assembly had broken off. A new pinch-roller assembly and general clean restored normal operation. I.L.

Panasonic NVHD90
There was a tape stuck in this VCR’s mechanism. I had to strip the mechanism down completely and retime it. After fitting a new clutch, idler and roller and cleaning the very dirty deck I found that there was no test signal. The cause was dry-joints in the RF modulator. I.L.

Panasonic AG5260
This VCR produced a blank screen with normal sound. Checks showed that there was no video at pin 28 of IC3001 and that the IC’s supply (SW5V) at pin 6 was low—only 2.5V. The cause of this low voltage was Q6101, which was open-circuit. I.L.

Ferguson FW71LV
A tape was jammed inside this machine. Removal of the top revealed a Toshiba deck that suffers from a common fault: the plastic pulley at the base of the capstan motor splits and drops off. Deck removal confirmed my suspicions. Normal operation was restored once a new pulley had been fitted. D.G.

Akai VSG240EK
When asked to rewind or fast-forward this machine would display “error” and stop. The fault can be cured by removing, stripping and cleaning the mode switch. D.G.

Samsung VIK306
This machine would power up for a few seconds then die, with no display or anything. Checks in the power supply revealed that, as expected, the electrolytic capacitors were to blame. One in particular, C35 (470µF, 16V), had leaked. I replaced this and, as a precaution, all the other electrolytics. The result was a fully-restored machine. D.G.

Panasonic NVHD660
This machine sometimes displayed F3 or F4 in the display when rewind or fast-forward was selected. It might work for two-three days before the fault put in an appearance again. This sort of thing is caused by a defective mode switch or a defective loading-motor coupling. D.R.

Toshiba V856B
There was no E-E or playback picture. Scope checks showed that the video output at pin 11 of the video processor chip IV001 didn’t reach the buffer transistor TV011 because RV011 (100Ω) was open-circuit. The part no. for this resistor is 24872101. D.R.

Sony SLV715
There was no reverse operation and no rewind function. The cause was R003 (5.6kΩ) on board MD49. Its part no. is 124942611. D.R.

Hitachi VT700E
This elderly Nicam machine had run faultlessly for over ten years but had now developed a capstan servo fault. The servo ran in and out of lock cyclically for the first fifteen minutes of playback, during which time the off-tape time display was permanently stalled. The cause of the fault was C613 (47µF, 16V), which was open-circuit when cool. Recording was not affected by the fault. K.C.

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Sony HCD-MD373
This was one of those faults whose symptoms make you groan. When the unit was first taken out of standby or put back, the CD spindle motor would run backwards at high speed for about three seconds. If the laser unit was moved away from its ‘home’ position manually, it didn’t attempt to return at power up. The conditions at the sled and spindle motor outputs from the motor drive chip IC102 seemed to be about right, but application of a meter probe to the spindle motor channel input pin instigated the high-speed reverse-spin condition. This pin is connected via a single resistor to the servo and DSP chip IC101. A few quick voltage checks around IC101 showed that something was amiss: there was just over 2V at the 5V supply pin 59. This took me back to the 5V regulator IC911 on the main PCB. Its input was correct at 9-7V, but there was only 2-2V at its output. As it wasn’t hot, which would have indicated that it was in the current-foldback condition because of an overload, I fitted a replacement. This restored the 5V supply and normal operation of the unit. G.D.

Panasonic SA-AK18
The owner of this unit complained that the on/off switch didn’t work properly and that it couldn’t be turned off. When the unit was initially powered it lit up like a Christmas tree, with every light and function indicator, including the vacuum fluorescent display, performing a light show of which Pink Floyd would be proud. When the unit was switched to on, the indicators and the display settled down to what you would expect and it worked normally. When off was selected the display said “goodbye” then went dark, except for some Zs (sleep mode?) and unset clock dashes. This seemed to be OK, but fifteen seconds later a relay clicked and once again the light show appeared. The unit was clearly going into a demo mode, but getting it back out defeated me. I tried every combination of buttons I could think of, including the obvious demo button, to no avail. Finally, in frustration, I called Panasonic Technical. I was told that you have to press and hold the demo button for at least five seconds. Can’t think how I failed to figure that out for myself... But when this procedure was carried out the unit went off completely, and stayed off when the on/off button was operated. G.D.

Technics SL-HD501
This is the CD part of a multi-unit mini system. If you get one that won’t play discs, before doing anything else remove the disc clamp (two screws) and look to see if the laser unit is at the far end of its travel, i.e. at the outer edge of the disc. It’s common for the laser unit to stick in this position, the sled drive motor not having the power to pull it back. I don’t know why the laser unit finishes up in this position – possibly the reason is failure to read a scratched or dirty disc. Once the deck has been taken out (four screws) it’s a simple matter to remove the laser unit’s PCB (three screws and four soldered joints to the motors), then the sled motor mounting plate (two screws). The mechanism can now be freed. Relubricate it, then wind the sled up and down its worm by hand a few times to ensure that there are no other mechanical problems. Reassemble in the reverse order. You should find that the deck now operates normally. G.D.

Sony HCD-CP33
There was an odd set of symptoms but, for a change, the cause was straightforward. About two seconds after coming out of standby there would be an almighty bang from the right-channel speaker. After that the channel worked normally – until switch-off, when the bang was repeated. The cause was dry-joints at the right-channel output chip. Two of its pins are called ‘mute’ and ‘standby’. It was probably the mute pin that caused the trouble. It should hold the IC off until the supply rails are fully established. G.D.

Aiwa NSX-V90
If the drawer in this or any other music centre fitted with the same CD mechanism won’t stay shut, replace the five-way ribbon cable. It’s available from CPC under part no. AW84-ZG1-614. Also check the CD turntable belt, as this can sometimes cause problems. J.S.O.

Hitachi DA6000
If this CD player blows fuses, check C706 (220µF, 16V) in the power supply. It tends to go short-circuit. J.S.O.

Aiwa LCX108
This recently purchased mini hi-fi was brought back to us because it was completely dead. The mains transformer’s secondary winding was open-circuit. It’s item 38, part no. SA-CLD-642-010. There didn’t seem to be any reason for the failure, and a replacement put matters right. Maybe this could become a stock fault? M.S.D.
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There was a black mark on the picture, most noticeable when the aerial was disconnected. In addition there was slight bottom field foldover when the set was cold. It took me a while to find the cause, because I had already tested the faulty component with my ESR checker which said it was OK. Eventually, when I removed C423 (470μF, 25V), I found that its value had fallen to 120pF. You will find this capacitor next to the standby relay. M.D.

Bush WS6672
This set came in because it was tripping. I found that the BU508SAF line output transistor was short-circuit. The cause was capacitor CD08 (560nF, 250V) which is part of the EW modulator arrangement. It was open-circuit. M.D.

Samsung CI5012Z (P58SC chassis)
The complaint with this set was no sound. The audio processor/output chip is IC602, type TDA1013A. There was an audio input at pin 8, but no audio was present at pin 6, the output from the volume control section of the chip. A meter check at pin 7, the DC voltage control input, revealed that everything was OK here - the voltage could be varied over the range 0-6V. As the IC’s supply (pin 3) was correct at 18V, it seemed that the IC was faulty. The situation was the same when a new chip had been fitted however. I was now at a loss as to what the cause could be, since even a short-circuit at pin 5 (input to the output section of the IC) would produce some audio output at pin 6. I resorted to cold checks on the IC’s peripheral components, and eventually found the cause of the problem: R617 (220kΩ) was open-circuit. It’s connected between pins 3 and 4. Strange, because this is part of the audio output section of the IC. Anyway a replacement resistor cured the fault. M.D.

Philips 17PT166A (Anubis A-AC chassis)
This set was in the shutdown mode, with a dead short reading between the collector and emitter of the line output transistor. The cause is usually a winding-to-earth short in the LOPT, but not this time. The culprit was the scan-coupling capacitor C2450 (330nF, 250V). M.D.

Sony KVX2172U (AE2A chassis)
This set had very low, distorted sound. The bar moved up and down when the volume control was operated but the audio level didn’t change. The mute button worked however. When a signal was fed in via the scart socket the picture would change but the low, distorted off-air sound remained. At this stage it was clear that repair would be impossible without a service manual. Armed with this, I found that the digital volume control/switching chip IC201 (TDA6622-5) had off-air sound going in at pins 1 (left) and 3 (right) and scart sound going in at pins 7 (left) and 8 (right). But very little audio was present at the output pins 16 (left) and 15 (right). The correct 12V was present at the power supply pin 21, so it seemed that the IC must be faulty. A replacement cured the fault. M.D.

Mitsubishi CT21M1TX (Euro 10 chassis)
For a funny sideways picture wobble, replace C905 (470µF) and C906 (47µF) which are on the primary side of the chopper power supply. M.D.

Sony KV32FQ75U (AE5A chassis)
These are horrible sets to service. The dead set symptom is not uncommon. If you find that IC6604 in the power supply is short-circuit you will also find that the 0.1Ω safety resistor R6666 is open-circuit. Don’t just replace these two items and switch on, as they will blow immediately. Check the FET Q6806 which will be short-circuit source-to-drain. I learnt this the hard way! The part nos. are IC6604 8-729-045-40, R6666 1-202-933-61 and Q6806 8-729-047-59. P.S.
Bush 2571NTX (11AK19 chassis)
Field collapse was the trouble here. From experience of these sets, the procedure is to check whether the 100Ω safety resistor R704 is open-circuit. If so the TDA8351 field output chip IC701 is short-circuit. This time R704 was OK, but the 15V supply at pin 3 of IC701 was missing. It’s derived from pin 6 of the line output transformer, via the rectifier circuit D606 (BA157)/C632 (1,000µF, 25V). D606 was open-circuit. Once a replacement had been fitted the set worked normally. P.S.

Toshiba 21504111
Dead set with the red LED blinking is a fault you get with this model. The 630mA fuse FD802 is open-circuit because of shorted turns in the line output transformer T444 (part no. AZ363004). P.S.

Bush 2160NTX (Grundig G1000 chassis)
There was sound but only a bright raster with this set. It didn’t take long to discover that the red LED was being applied to the CRT base panel. Tracing back to source, I found that R315 (10Ω) was open-circuit. It’s connected to pin 9 of the LOFT. P.S.

Beko 25411ND
Another set with sound and a bright raster. The picture could be restored by turning down the setting of either the focus or the A1 control on the LOPT. The controls worked normally when the CRT base was removed, proving that the tube itself was the cause of the fault. The tube, type A59EM253X07, was sent away for rebuilding. This proved to be the answer, though at some cost. P.S.

Bush 2872NTX (11AK19-E3 chassis)
Here’s a new problem we are getting with this model. The symptom is a dead set, with 300V DC at the input but no HT present. The cause was C833 arcing against the chassis, and C833 and C833 are connected in series. P.S.

Toshiba 50WH18B
It seems that stuck in standby is becoming a common fault with this projection set. The cheapest and easiest solution is to replace the text panel, part no. 23786696, which can be obtained at £21.70 plus VAT. P.S.

Sharp 66CS-03H (CS chassis)
This chassis can be a headache. Field collapse at the top of the screen, improving as the set warms up, is a known fault however. The cause is C512 (22µF, 50V). P.S.

Bush BT17
I’ve had several of these sets, and the Matsui versions, that were stuck in standby. A modification kit, part no. BT171V7MODKIT, that consists of a small plug-in PCB with full instructions, usually restores normal working order. But I would recommend obtaining a service manual and thoroughly checking that all the option bytes are set correctly before the set is returned to the customer. P.L.

Toshiba 1400ORB/1400RBW
The picture had gradually decreased to a single horizontal line. The DC voltages at pins 13 and 14 of the TA8718N colour decoder/timebase generator chip IC501 were the same, so the linearity feedback loop was working. But the voltage was only 4.5V instead of 6.7V, and didn’t vary when the height control was adjusted. When I checked the ramp generator capacitor C303 (2.2µF) I found that it had a 2MΩ leak. A replacement (tantalum type) restored the height, but the picture was not centred vertically because of noticeable non-linearity in the top third of the screen. C317, another 2µF electrolytic, in the linearity feedback circuit was then found to have a 90kΩ leak. A tantalum replacement (35V instead of 50V) cured the non-linearity. P.L.

Mitsubishi CT25A5STX (Euro 14SF chassis)
This set came in with field collapse and a quick check revealed that circuit protector Z251 had blown. The AN5521 field output chip IC501 was OK however. Cold checks showed that IC5E1 (TEA2031A) on the EW sub-module was short-circuit. A replacement lasted only a few minutes before it failed however, the cause being shorted turns on the EW sub-module was short-circuit. This restored correct operation, but I would still recommend obtaining a service manual and thoroughly checking that all the component suppliers. R.M.

Mitsubishi CT2525TX
“Dead” was the somewhat unhelpful fault description with this set. In fact it was far from dead: the red power lamp was alight, and most of the power supply, including the HT section, was working. The cause of the problem was loss of the 5V supply at the microcontroller chip IC701. I found that there was only 4V at the input of the 5V regulator IC952, which was therefore unable to produce an output. Reservoir capacitor C956 (2,200µF) had dried up – and leaked for good measure. A replacement restored 12V or so at the input to IC952 and the correct 5V output.

But the set still refused to come out of standby. Some time, far too much in fact, was spent checking the circuitry around the standby control transistors Q950 and Q951 before the penny dropped. The owner had removed both batteries from the remote-control unit! D.I.S.

B&O 31/63
Despite its striking looks this twelve-year old set’s circuitry appeared to be largely conventional. The problem was that it kept reverting to standby. It didn’t take long to find the cause, fatigued joints at the edge connectors that link the two power boards together. Many of the electrolytic capacitors had clearly seen better days however – some even appeared to be leaking. So they were replaced as a precaution against further trouble. This restored correct operation, but I wasn’t over-impressed with the picture quality. It seems to me that the dark Perspex outer screen serves only to reduce the picture colour contrast and, especially, brightness to unacceptably low levels, requiring over-correction with the controls. D.I.S.

Samsung WI28W6VD (SCT53A chassis)
At switch on the set would be OK and work for about ten minutes. There would then be a strange sound from the power

TELEVISION October 2002
Normal operation was restored once this which was the 7.5V zener diode DZ808. powering up and tripping. Use of freezer This would be followed by continuous Tatra T28NE51 (E1W and E1N chassis) The problem with this set was flyback lines reset. B.B. the service mode and carry out a factory EEPROM corruption. You need to go into supply and the set would go to standby. The symptoms with this set were sound but chassis) Sharp 56FW-53H (DA100 chassis) There were no picture, because there was no line chassis) Sharp 59DS-05H (CA10 chassis) There was no picture with this set. Checks in the line output stage showed that D610 (1N4933) was short-circuit. A replacement restored normal operation. It’s as well to check for dry-joints at C613. B.B. Sharp Toshiba 2505DBT The symptoms with this set were reduced height with wavering bars all over the picture. There was a common cause, C317 (2-μF, 50V) in the field linearity feedback network. There was a good picture once a replacement had been fitted. B.F. Daewoo CP365 chassis The cause of an intermittent crackle on sound, with no visible effect on the picture, was traced to an ‘invisible’ poor connection at C808 (270pF, 1kV), which is connected to pin 3 (primary winding) of the chopper transformer. B.F. Panasonic TXC21 (U4 chassis) The cause of failure to power up with no action from the relay was traced to R1351 (0-68kΩ, 0-25W fusible) on the front M board. No reason for its demise could be found, and its replacement followed by a long soak test proved that all was then OK. B.F. Thomson 72MK89D (ICC11 chassis) We sold hundreds of these sets, some of which are now returning with various fault symptoms. One common problem is loss of luminance. A look at the manual is somewhat daunting, as the Y signal path is via a lot of discrete-component circuitry (approximately fifteen surface-mounted transistors), half of which is on a vertically-mounted screened video module. The circuitry can be broken into mid-way by connecting a scope to pin 14 of plug/socket BB12 from the power board. The supply was pulsing up and down, so there was a blown output chip. Unsoldering pin 10 of Q601 and Q602 in turn proved that Q601 had failed. At this point the owner revealed that somewhere along the cable run he had wired in a third surround speaker of dubious origin. He had used Elastoplast in lieu of insulating tape, and then fixed the connection under his carpet on a nice sharp gripper rod! Why do people spend a small fortune on a TV set that’s too big for their house, too heavy to lift, and then do such stupid things? After fitting a new LA4282 chip, part no. 23318413, and some new wiring all was well. M.S.D.
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<td>Input capacitance</td>
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<td>Input capacitance</td>
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<td>Compensation range</td>
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As some of you will probably have guessed from my recent writings I'm now semi-retired. This means more holidays but, unfortunately, less technical stuff to write about. We've just returned from Greece, where I managed to damage my mobile phone while disconnecting it from my Apple Mac iBook computer after attempting to send e-mails. It had worked fine in the UK.

Next day my wife drove us along the treacherous mountain road from Stoupa to Kalamata so that I could buy a replacement. Once we'd parked in the town we headed for the nearest taverna for lunch. When I went to the bar to pay I asked whether there was a telephone shop nearby. There was, just around the corner. It had a Panasonic sign above but was dark inside – and neither the proprietor nor his assistant spoke a word of English. So I had to resort to "telefono kaput". This seemed to work, because the proprietor took my phone and scrutinised it closely.

"It went off when I disconnected it from my computer" I explained.

"Nai kimpootor. Ego echno ena kompootor. Teelefono leeootiree?" he replied.

"Great" I said, "can you fix it? We're here for only a few hours. Could you do it now?" I was told to come back at two, before the shop shut for siesta.

We looked around the town for an hour then returned. "Is it fixed?" I asked.

It was, and some further tricky conversation elicited the fact that the memory chip had had to be replaced. As I couldn't gather what the cost was the proprietor scribbled 65 on a scrap of paper. Good grief, sixty five euros! The phone was working again but I didn't dare reconnect it to my lap-top PC. I found an internet café and asked how much they charged per hour. The owner looked surprised – apparently he usually rents use of the equipment for no more than twenty minutes at a time. But there were 170 e-mail messages awaiting my attention. Most were junk, but some required answers. So I sat down at the monitor for an hour while my wife went to look in shop windows.

A PC fault

When we arrived back in England we were welcomed by the usual Manchester rain. Which fool had thought of holding the Commonwealth Games here? They didn't expect sunshine, surely?

It felt strange to be back in the workshop next day. I soon had a caller, who presented me with a computer motherboard. "Look at those capacitors" he said.

There was a row of 1,500µF electrolytics, several of which were bulging. I didn't need my Genie ESR meter to tell me they were dead.

"The PC's been playing up for weeks"
he continued. "Thought it was Windows until I opened it up and saw them. Do me a favour and fit some new ones."

The PCB had plated-through holes, which made it difficult to remove the faulty electrolytics. I managed it by holding my soldering iron in one hand to melt the solder and my desoldering iron in the other hand. After half an hour I’d replaced all eleven capacitors. I had no way of testing the board, but Glyn phoned next day to say that the repair had been a success. The board carried the identification ABIT BX133/raid.

Very few shops bother to do component level repairs on computers. It can be worthwhile in a case like this.

**Digiboxes**

The subsequent hot, humid weather brought lightning storms and a spate of digibox repairs. Curiously, the majority of the injured boxes were Panasonic ones. Most required nothing more than a fuse and a 1N4007 diode. There have also been some other faults. I’ll return to these in a minute.

**The CPU heat problem**

All CPU (central processor unit) chips, e.g. microprocessors and microcontrollers, give off heat. The faster they run, the more heat they give off. The temperature at the centre must not exceed about 200°C – at this temperature the outside casing will certainly be hot enough to hurt if you touch it.

Provided a digibox is kept in a cool room with plenty of ventilation and air movement around it, the CPU chip will probably be safe. Unfortunately many digiboxes are installed in rooms that have central heating, where the ambient temperature can be as high as 24°C in winter and 30°C in summer. To make matters worse, the digibox may be installed in a tight space, perhaps even in an enclosed cabinet.

A gap of a few centimetres above a digibox is simply inadequate. Hot air doesn’t move sideways without help. It needs a minimum gap of 100mm to move upwards before it can spread outwards and escape. In addition there must be plenty of room beneath and at the sides for cooler air to enter. Hot air can’t come out unless cool air goes in – otherwise there’d be a vacuum!

SatCure (http://www.satcure.co.uk) provides a solution to this CPU reliability problem. It takes the form of a cooling fan kit with heatsink. Here’s how it works.

The CPU chip is in a large square plastic moulding, see Photo 1, but the active silicon bit is actually quite tiny – a few millimetres in diameter. The heat it gives off has to pass through a layer of plastic, then be taken away by direct radiation (not very effective with the cover in the way) or air convection (not very effective in a closed box). The heat will be removed more quickly if a metal heatsink is placed over the plastic encapsulation, with the air gap between the IC and the heatsink filled with thermally-conductive cream. The gap is extremely small, but would provide good thermal insulation – hence the importance of the thermal cream. But only a tiny amount of cream is required.

The heat spreads out quickly into the metal heatsink, whose fins provide a large surface area. The result is more efficient dissipation of heat by radiation and air convection. While the heatsink helps a lot, the addition of a fan will provide further improvement. See Photo 2.

Why don’t manufacturers do this? The obvious answer is cost. There’s also the noise, and dust that may cause problems can be drawn in. In addition most digiboxes will run for years with the CPU just below the critical temperature.

Back to some specific problems.

**Cures**

I had suspected for some time that problems I’ve come across with Panasonic digiboxes could be caused by high CPU temperature. Unfortunately Panasonic doesn’t seem to supply spare parts or service information to independent repair shops, so we are left to guess. A TUDSB20 I had in recently would switch itself to standby after about twenty minutes and wouldn’t come back on. It seemed an ideal candidate for the CPU cooling treatment.

The heatsink plus fan provided a complete cure. I left the unit on and checked it periodically for over two days during very hot weather. It worked perfectly throughout the test. The customer was very happy, as I’d originally quoted £100 for the repair.

A TUDSB30 would go to standby after about an hour and not come back on. The heatsink alone cured the problem this time. But I was concerned that the customer might still manage to make it overheat in an enclosed cabinet (as they do?) so I fitted the fan as well.

Yet another cause of the stuck-in-standby symptom with this model has been reported by Michael Old. He says the front-panel ribbon connector should be cleaned and reinserted in its socket in the motherboard.

In all models whose number ends in S3 or above, e.g. the 2500/04, Pace uses a ball-gate array CPU that’s similar to the one in the Panasonic boxes. This device also runs quite hot but, thankfully, Pace is willing to supply parts and advice.

Michael Dranfield has replaced several of these CPUs, but he had to spend several thousand pounds on the equipment required (see Photo 3).

If you happen to own one of the digiboxes mentioned above, you could save money by fitting a SatCure CPU cooling kit before it goes wrong.

Michael Old has also reminded me that one of the causes of the “no satellite signal” message with the Amstrad DRX100 digibox is a faulty U104 chip – the one with the heatsink glued to it. The ‘glue’ is actually thermally-conductive adhesive, which is not cheap. Other causes of the symptom, previously mentioned in this column, are the tuner and, less often, a faulty 15MHz crystal. As far as I know U104 is not available as a spare part.
Fault reports from Geoff Darby

Philips DVD701
This player was dead following a power cut. Meter checks revealed that the power supply was tripping. When cold checks were made on the secondary side of the power supply I found that D6240 was short-circuit. A replacement restored normal operation.

Toshiba SD200B
The picture produced by this machine intermittently froze. A replacement laser unit, which comes as a ready-mounted and mechanically-aligned deck assembly, cured the problem.

There are no fitting problems with this model. You simply screw the new deck in as a replacement for the original one then connect it. The laser shorting points have to be opened of course before you test the player.

Sony DVP-NS300
The complaint with this DVD player was that "it jumped around on all discs". I tried the player and found that when it had been running for a while it started freezing and 'blocking'. This is typical of laser trouble, but the DVP-NS300 uses a deck assembly (KHM-250AAA) which we don't usually have in stock. So I thought that, as a first move, I would run the internal diagnostics and auto set-up.

This procedure is normally carried out using the remote-control unit. It involves use of the numerical buttons to select various items from the service menus. I pressed Title, Clear and On/off in sequence to get into the main service diagnostic menu, but could get no farther as this machine's handset doesn't have numbered buttons, and no other buttons would enable me to get to option 1, auto set-up, then option 0 for "all" (disc types). I eventually used a handset for another Sony machine as this one did have numbered buttons.

After resetting the EEPROM data you carry out the first auto set-up with a standard, single-layer disc. Initial recognition and spin-up were OK. The focus servo was then switched on and appeared to lock. The adjustments continued to be OK until the sled motor was switched on. At this point the process consistently failed and set-up was automatically terminated, with disc ejection.

So a replacement deck assembly was ordered and fitted. When I ran the auto set-up to match the new deck to the electronics, the single-layer disc set-up, then audio CD and finally dual-layer DVD set-up progressed faultlessly. The final data stored in the EEPROM was within the correct ranges for a normally-functioning player.

A final soak test in the ordinary play mode proved that all was now well.

Hitachi DV-P250E
If the problem with one of these units is no display, check the green protector F3 in the power supply. It's in the +5V feed to the VFD inverter. When you find that this protector is open-circuit, a repair kit, TP12121, has to be obtained. It comes with fitting instructions.

The modification involves replacing the two base bias resistors, uprating the transistors and changing the feed point for the bias supply. The latter change calls for a print cut and a link.

Sanyo JCX AVD-B501
This is a home theatre system. If the tray refuses to open, plug in a monitor to see what the on-screen display tells you. If "locked" appears briefly when the open/closed button is pressed, press it again and hold it in for five seconds or so, until the word "unlocked" flashes up at the top left of the screen. The tray will then open and close normally.

The lock mode can be re-engaged by pressing and holding the open/close button from the tray open condition.

Panasonic DVD-RV31
Shortly after it started to play a disc this unit just froze. I invoked the built-in jitter meter (operate the front-panel Pause and Stop buttons and the remote-control 5 button together) which produced a reading of 011, i.e. 11 per cent, while the unit played. In theory this is within tolerance but, as previously mentioned in this column, it's higher than one would expect from experience with a correctly-functioning laser.

A replacement optical block was ordered and fitted. When checked this one produced an immediate, and long-term stable, jitter factor of 078, i.e. 7.8 per cent. No further adjustment was required – this is a very good figure, unlikely to be bettered by mechanical tilt adjustment.

We welcome fault reports from readers – payment for each fault is made after publication. See page 744 for details of where and how to send reports.
As promised last month, this time some notes on servicing the Beko C14 chassis and on cheap Daewoo VCRs.

The C14 chassis
I have to say that I like this chassis, which is manufactured in Turkey by Beko Electronics. As with any chassis, there are a few faults to which it is prone. But overall it’s reliable, produces good results and is straightforward to work on. You come across it in a number of sets, of both the 4:3 and the widescreen variety, from various distributors. In the Bush range it superseded the 11AK19 chassis. There are various options, such as a built-in digital decoder and an internet box, and a range of sound systems from standard Nicam to Dolby Surround.

The power supply is based on an MC44608 control chip, with a 2SK2545 as the chopper FET. So far it has proved to be very reliable, and I’ve yet to encounter a fault in this area. However in some models the 2.5A fuse, ST601, has failed for no apparent reason. If you do come across a set with a short-circuit FET on the primary side of the power supply, I suggest you also replace D609 (RGP10J). In addition R601 will have failed.

Apart from the 145V HT line, all the circuits on the secondary side of the power supply are protected by either fuses or fusible resistors. This traditional approach makes for easy fault-finding. Again I’ve yet to encounter any problems here, but the most likely suspects in future will be the regulator ICs.

A tripping set indicates that there’s a problem in the line output stage, the LOPT being the number one suspect. It usually develops a hole in the top and surface -mounted ones, and these can cause some bizarre fault conditions. Should you encounter a weird sound fault, examine the surface-mounted capacitors closely with a magnifying glass. You will quite often find that one of them has split. Failing that, refer to the following list of faults I’ve encountered. If necessary, replace all the capacitors in the list.

1. Randomly varying sound in one channel: Replace C310 or C312 (10μF, 63V).
2. Loud clicks from one channel with no sound: Replace C348 or C350 (100nF).
3. No sound at all, but sound appears when the voltages around IC301 are checked: Replace C235 (100nF).
4. Oscillation in one channel: C348 or C350 has changed value. Should be 100nF.
5. Mono sound only, though the set displays stereo: Replace C301 (2.2nF).
6. No surround decoding: Replace C308 (1.5pF).
7. Loud click when changing channels: Replace C304 (100nF).
8. Channels unbalanced: Replace C316 and C319 (1nF).

Finally, to enter the service mode you need a special engineer remote-control unit. It’s available from SEME.

Cheap Daewoo VCRs
I’m sure that most of you will at some time have found a cheap video on your bench. You know the type I mean, one of those machines that costs only £59.99 and the customer thinks it should last for twenty years! You are expected to mend it with change out of twenty quid…

Sadly, some of the parts used in these machines are lucky to make it through the guarantee period. There are Daewoo machines that seem to break down the moment you wave a video cassette anywhere near them! Now don’t get me wrong: Daewoo produces a range of excellent electronic products, including good-quality budget TV sets, but the reliability of its cheap videos is not good.

Fortunately they are not too difficult to repair. A high percentage of faulty ones can be returned to their owners quickly, without them having to re-mortgage their homes in the process! Poor heads are the number one problem. The slightest amount of tape dust can cause complete loss of the picture. It would seem logical to replace the heads but, apart from the cost consideration (no pattern heads seem to be available yet), this is often not required. As with many other cheap VCRs, the back tension is set unnecessarily high. After cleaning the heads thoroughly, reduce the back tension by turning the adjuster 180° clockwise. This should prevent the unit returning for a weekly head clean.

If the VCR has gone mad, suspect the mode switch.

Most of the other problems are associated with the power supply. The cheap electrolytic capacitors quickly dry up and cause all sorts of faults. The worst offenders are the orange ones, so pounce on these first. If the machine has a separate can that contains the switch-mode module, unsolder and dismantle it then replace all the electrolytics in it. Don’t ignore the primary side of the supply: there’s a small 47μF electrolytic here that’s critical for reliable operation. It’s quicker and cheaper to change all the capacitors than to try to trace the cause of a fault to an individual one. I’m sure that kits will soon appear. Use 105°C, low-ESR types throughout and you will have a machine that might still be giving good service in ten years’ time. Well, maybe.

Next month
Next time I’ll report on a widescreen Daewoo TV set that wouldn’t turn on when the video timer was on or the cooker was in use! Yes, it’s true – but you’ll have to puzzle over why until next month.
It was a welcome surprise when Digger Pates phoned the other day to report TV trouble. “Harvey Pates?” I asked, “not Digger Pates, my old oppo of the Hampton Ford days? Blimey! Remember that ‘certain thing’ we slipped into young Miss Prude’s handbag just before her first date with the Curate? Boy, we were something then!”

I’d not seen Digger since our first school get-together over fifty years ago. Just the same as ever! Always a decent, easygoing chap. The sort I might have been had the devil not meddled with my genes. Sony sound trouble. Should be easy! Said he would pop his set in later that day or tomorrow. Couldn’t wait to see him.

Confusion all round
Mr Halwin interrupted my golden thoughts as he headed for the door carrying a huge Fidelity TV set. Pity he tripped over Mr Millford’s poodle on its fifteen foot extendible lead. The fuss delayed his entrance. Still, it gave me a chance to answer the phone.

“Listen, Snoddy, I’m coming to put a clout on you!” it bawled. I drew myself up. “How dare you!” I bristled, “but your confusion. I’ve been mistaken for an aged and knackered Kirk Douglas on occasion, but balk at being mistaken for Snoddy!”

I gripped his hand warmly. “Hello Mrs Bullock” he said. “Forgot where I was!”

Diagnosis
Paul helped me carry it over to the bench. It was a 32in. set, Model CTV3288. As it got warm the picture clicked off. The sound remained.

“Ah, the line output stage” I said. “But you haven’t got the back off yet!” Paul exclaimed, “I suppose you’re just clever!”

I looked at him. Yep, I thought, that’s old Digger! Anybody’s money on that! I gripped his hand warmly. “Hello Digger old chap” I exclaimed. “Wonderful to see you after all these years!” I yanked up his trouser leg and tapped his angle. “Remember that disgusting trick we played on old Chalky Hargreaves with Dobson’s hungry ferret? Boy did that ferret find his way about! Should have been classified as a dangerous weapon, that ferret!” As I laughed away I noticed him giving me a strange look.

“Fact is, Snoddy’s have had my Hitachi set for ages, and this weekend we’ve got visitors from Australia.” “Never mind the television set. We do a nice line in tranquillisers” I quipped. “But bring the Hitachi in.” Then Mr Halwin made it through the door, flew flying over a set which had just been placed on the floor and landed his Fidelity set on the counter. “Did you see that lunatic out there with that mobile trip wire?” he exclaimed. “Told me to look where I was going! Cheek of the man.”

I looked at his set. “What’s the trouble?” I asked.

“No, the set” I said. “Ah, the set. Just shuts down after a while. Riles me, I can tell you…”

Paul took the job on, because a pleasant chap had come in and wanted to see me. He had a Sony set with him, and I heard him mention the sound.

Repairs
“This Fidelity” Paul said, “there was HT but no line drive. I found the fault heat sensitive. Cause turned out to be the 2SC1573A transistor Q580. A new one’s cleared the fault.”

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got intermittent sound problems." It turned out to be a Model KVDX2112U (AE1 chassis). Sound was OK when we switched it on. "Another iron and freezer job?" Paul said, seeking the audio output section. He soon found that the fault was to do with the audio output chip, IC251. By careful use of heat and freezer he managed to remove one channel at a time, or both of them together. A new LA4280 chip restored reliable sound.

**Intermittent operation**

Then the chap with the Hitachi set that had been to Snoddy's came in. The back was off, and I saw a panel tumbling about inside. He fished in his pockets for the back screws, and produced these as well.

"Have I had trouble?" he said, "set all in bits, and that. thin Snoddy chap tried to charge me 25 quid! Said they'd found the cause of the trouble but wanted 95 quid to put it right. I roughed him up a bit, I can tell you."

"Of course I replied understandingly, looking at the mess and hoping I could end up without getting a clout. "What name is it?"

"Basham" he replied. I eyed him soberly and wrote it down. When I'd settled the loose panel back in place I tried the set. It was a Model C2548TN (A6 chassis) and was stuck in standby, though the standby light reacted. I disconnected the set and checked one or two things, then plugged it in and tried it again. It worked. I noticed an empty teacup rattling in its saucer. Honestly! "Try this time tomorrow" I said.

And off he went. The set was a Sanyo C28EH27NB (EB3A chassis). It's not one with which we are familiar.

Steven decided to have a go. "Needless to say, we don’t have a circuit diagram" he commented. "Times have changed" I said.

"There was a time when we had easily understandable, comprehensive manuals for pretty well all the sets that came in. Armed with an Ekco or Philips manual, set repair was straightforward. Now Ekco is no more, and I can scarcely read a Philips manual!"

"Can’t imagine such an easy life" Steven said, turning to the set. When he applied power there was no sound, but there was a faint raster.

He started to check around the chopper circuit. "That’s odd he said after a while, ‘every voltage is right, yet we’ve got these two problems. What can it be?"

He tidied a few bits and pieces off his bench, blew his nose, turned off the test set, and resettled himself on his stool. Thus prepared, it wasn’t long before he found that the signal path wasn’t working. He compared the voltages around the microcontroller chip with those shown on a circuit we did have for a similar model. The supply from somewhere was missing.

Checks at the tiny standby transformer T381 showed that there was voltage at one end of the primary winding but not the other. It was open-circuit, and there was of course no output from the associated rectifier, which feeds a simple 5V series regulator circuit.

We e-mailed an order for a replacement transformer, which arrived next day. When it had been fitted the set sprang to life.

**A CD player**

Our next visitor was Ribby Ellis, the practical joker. For once he was serious. "My bird’s packed me up, Don" he told me.

"Don’t blame her, Ribby? I replied. "You’re a non-stop headache. Ladies need a chap who is brainy, successful and full of charm. A chap like me, not a walking disaster like you."

"Thanks for those kindly words" he said, "but the problem’s to do with her audio thing, not me. Said I could mend it, but I can’t get it going."

I felt sorry for him. "Where is it?"

I asked.

He brightened up, went out to his car and returned with a Sharp DXR355 CD payer. "It probably isn’t much" he said, "shall I get a cup of tea going?"

"How do you know that?" I asked, "what’s wrong with it?"

"Dunno" he replied.

There was a disc in it. I plugged it in and tried it, but nothing happened. I soon found that the block drive motor wasn’t working. I tried to help it, gently, and it responded. So I put the tiniest trace of thin oil on its shaft, then stopped to have a mug of tea with Ribby. He makes a good cup.

When we’d finished we tried the player again. It worked merrily. "There you are, Ribby" I said.

"One trace of oil, half a penny. Knowing where to put it, twenty four pounds, ninety nine pence and half a penny. Total £25, to you."

"That’s exactly the price I charge for my tea-making skills" he said.

"You’re a pal, Don. Quits, eh?"

**Set’s outside**

As Ribby left a strip of rough-looking misery, about a hundred years old, came in. He wasn’t very gracious.

"Set’s outside" he barked, "too heavy for me. Anyway it’s your job, not mine. Got somebody to bring it in?"

I went out and collected the set, then looked for a job card. "What name is it?" I asked.

"You ought to know that" he replied. "Spoke to your boss about it earlier. Name’s Pates. Now, I’m in a hurry for the set. Wife’s on my back about it. Can you look at it now?"

I looked at him. "Mr Pates?" I said, "Harvey Pates?"

"How did you know that?" he barked. "You some sort of smartie? Before you answer, just watch your lip. I know your boss, see. Dopey little chap. Likes things right, but never could manage it. Any messing me about and I’ll make things hot for you."

"Right sir" I said, "Sorry sir, I’m sure. Now what was the trouble with it . . . ?"
Solution to Test Case 478

- page 741 -

It's fortunate that the LA7295 chip is not an expensive device, because the one that was removed - though it may have been traumatised a bit - worked as well as its replacement. This is proved by the fact that the original chip was reflowed in the machine, which was returned to Cynthia in full working order. Her son's £49-35 is, or was, in Pam's till, while the new IC languishes in our stores, probably never to be used.

Having established where everything ended up, we had better describe how the repair progressed! The fault condition and the voltage readings remained the same when the new IC had been fitted, so Cathode Ray turned his attention to the oscillator itself. It consists of transistor Q401, transformer T401 and some tuning capacitors. Checks on the transistor revealed that it was very leaky collector-to-emitter, reading just a few ohms each way with Ray's test meter. Storages couldn't provide a 2SC3553C, but ECA's little yellow book pointed our young man in the direction of an equivalent that worked perfectly well.

Not exactly high-tech stuff by today's standards, but all got to the mill and money in the till. Ironically, the same VCR had to be written off a couple of weeks later because of a lightning strike. At least this one can't bounce back on Cathode Ray, can it?

NEXT MONTH IN TELEVISION

Guide to the Thomson TX92 chassis

The TX92 chassis and its variant the TX92F (with frequency- instead of voltage-synthesis tuning) was used in a range of Thomson and Ferguson models with screen sizes 21in. upwards. Mark Paul provides a description of the circuitry adopted for these chassis.

Motorised garage door control

Remote-controlled garage doors have become very popular. Their control systems represent another area of diversification that should be of interest to video/TV technicians. Keith Cummins describes the operation of motorised garage doors, their control systems, and how to add an infra-red beam system that provides improved safety by preventing door closure if anything obstructs the entrance.

Sky+ update

BSkyB has recently updated its Sky+ personal video recorder, adding new features and functionality. The company has also announced that more features will be launched either late this year or early next year. George Cole describes these developments.

Sony chassis guide update

Our last update on Sony models/chassis was in July 1998. Giles Pilkington brings us up-to-date with releases since then.

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