

Tips, guides and reports for people repairing televisions and electronic equipment

# TELEVISION

AND HOME ELECTRONICS REPAIR

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**JVC's progressive-scan  
video technology**


**Test report:  
The Ersa IR500A PCB  
rework station**

**Television control software**

**Vintage transistor repair**



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# TV politics

Anyone with some respect for television and its traditions must wince, to say the least, at the carryings on that have in recent years become a feature of the Edinburgh International Television Festival. I refer to the way in which leading executives in the TV world use it as an opportunity to indulge in unsavoury politicking while seeking to boost their over-inflated egos. This year's event took place against the background of the dispute between the government and the BBC over justification for the Iraq intervention. There is also the fact that the BBC's charter comes up for renewal in 2006. This is concentrating the minds of TV executives no end. So politics it had to be.

The BBC has been in a tricky situation ever since the advent of commercial TV. If it seems to be doing badly, with poor ratings, it is criticised as a waste of public money, catering for minority audiences at great expense. If, on the other hand, it achieves success in the ratings game and makes a profit as well, it is criticised for being in an unfair position, backed by public funds while making life difficult for the commercial broadcasters. It can't win!

When giving the key James MacTaggart memorial lecture at the festival Tony Ball, chief executive of BSkyB, took the opportunity to put forward two proposals that could have a considerable adverse effect on the BBC. He called for the BBC to be forced to adopt 'programme syndication' for its most popular features. The idea is that the BBC should select six of its most popular programmes each year and offer them for auction to the commercial broadcasters. "Just as public money is used to fund scientific research, but not to fund the commercial applications of that research, so public funding should not be used to continue to fund programmes when it is clear that they can find a commercial home" he declared. Sounds plausible initially, doesn't it? But, apart from the sheer gall, it was a specious piece of special pleading designed to eviscerate the BBC - to BSkyB's advantage of course. Mr Ball was not comparing like with like, a classic error with contentious arguments of this sort. Scientific research and TV programme making are not the same sort of thing at all. Mr Ball should have been able to appreciate that - had he not been motivated by dislike of the very idea, let alone success, of public-service broadcasting.

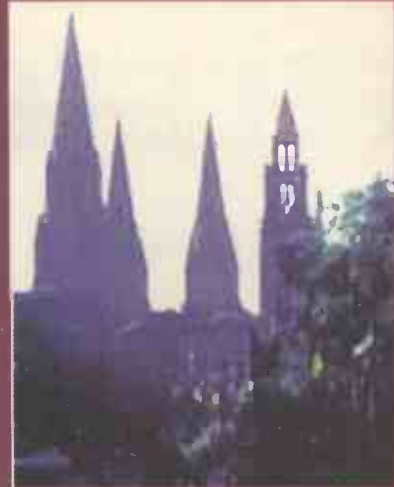
His other main proposal was that the BBC should be prevented from bidding for foreign programming, especially US hits. He feels that public money shouldn't be used for this purpose. In other words he

doesn't want the BBC to be able to act as a normal broadcaster. It makes life tough for the likes of BSkyB. Better to consign the BBC to some obscure niche. BSkyB already has approaching seven million subscribers, and expects to have eight million by the end of 2005. What more does it want? Oh yes, a monopoly would be nice.

The following day Greg Dyke, the BBC's director general, enlivened the proceedings by suggesting that ITV should be absolved of the £300m a year charge it pays to the treasury for the use of spectrum space. This because ITV is in such a poor condition financially, as a result of falling audiences and advertising revenue and the ITV Digital debacle. Greg Dyke seems to think that a balance of different types of broadcaster, in this case the BBC, ITV and BSkyB, is desirable. Fair enough, it guarantees choice. It remains to be seen how ITV will fare once the decision on the merger between Granada and Carlton has been made.

It's interesting, in all this, to note the way in which the term 'public-service' to describe broadcasting seems to have changed. It originally meant no adverts. It now seems to mean a non-subscription service with certain obligatory commitments. Watch out, your advert-free TV may become a thing of the past!

We will doubtless have to endure a lot



**We will doubtless have to endure a lot more TV politicking as the time for the renewal of the BBC's charter gets closer.**

more TV politicking as the time for the renewal of the BBC's charter gets closer. Certain broadcasters would like the BBC to be muzzled in one way or another. It all seems a far cry from Lord Reith's "people talking to people" concept, and decidedly tawdry in comparison. It reflects a world in which idealism has succumbed to a day-to-day bean count. In the immediate future the important thing, as *The Independent* put it, is that "the BBC should be defended as a priceless national asset". It sets a worldwide benchmark in terms of broadcasting independence. That must be preserved.

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# TELETOPICS

## Panasonic's servicing move

With the decline in the number of servicing operations throughout the country in recent years, as a result of reduced demand mainly because of the low cost of new products, manufacturers have been finding it difficult to get their products repaired. Some manufacturers have resorted to in-house servicing to deal with the problem of under-guarantee repairs. This was highlighted at the recent RETRA service conference (see report last month). Panasonic has since announced that it hopes to set up about a hundred specialist service centres for its high-tech products, based on independent dealers, a move that has been welcomed by the trade.

Panasonic has sent letters to its dealers with a survey that asks about their servicing facilities and willingness to

participate in the scheme. "It is your choice" the letter says, "to influence the future strategy of not just Panasonic but potentially the whole consumer electronics service industry." It points out that "commitment and investment on all sides" would be required. Peter Hamblin, Panasonic's deputy managing director, points out that "with the increasing move towards digital technology in consumer products the role of the traditional service department is changing fast – the need to deal with products that are integrated into a network and contain increasing amounts of computing power, on densely-populated PCBs, presents challenges for us all." He adds "I am sure that all manufacturers and dealers are studying similar issues."

The move, which has been welcomed by

RETRA, should be a considerable encouragement to those involved in the servicing side of the industry. Someone has to take on the servicing responsibility, which is best carried out at a local level. There will continue to be a need for service centres with well-qualified staff.

Panasonic has also increased its R&D staff at Cardiff, creating a technical centre for new-product innovation. According to Mike Jones, Panasonic's director of corporate planning and human resources, "the objective has been to move the entire operation up the value chain." He adds that "our R&D business has been enormously successful, and now we literally conceive the future for a vast array of Panasonic digital products, even exporting our ideas back to Japan."



A new range of six flat-screen CRT receivers from Philips incorporates an upgraded version of the company's Pixel Plus technology, featuring a Movie Plus mode specifically developed for larger screen sizes to improve fast-moving action sequences with broadcast movies and other film sources. Pixel Plus increases the number of lines from 625 to 833 and doubles the number of pixels per line from 1,024 to 2,048. Models 28/32/36PW9318 have Dolby Digital sound, MPEG 5.1-channel sound for digital movie sound

tracks, and Dolby Pro-Logic II sound processing to create a full five channel output from stereo sources. There are six on-board speakers plus a sub-woofer and two rear cordless flat-panel speakers. Four on-board speakers can be used with Dolby processing to create virtual surround sound without the need for rear speakers. These models also incorporate a twin tuner. Models 28/32/36PW9308 have Virtual Dolby sound processing.

## PowerHouse receivership

PowerHouse, the UK's largest independent electrical goods retailer, has been placed in administrative receivership after credit insurers withdrew cover. Deloitte and Touche have been appointed receivers, and have closed 93 of the 223 stores, with 815 redundancies. The company was formed in 1992 from the retail arms of three regional power companies, Southern Electric, Midlands Electric and Eastern Group, and bought 98 more stores from Scottish Power in 2001. There were several setbacks last year, when a fire gutted one of the company's warehouses, destroying a third of its stock, and the company's in-store credit checking system failed during the crucial Christmas/New Year sales period.

The receivers have had a number of inquiries from parties interested in buying the business or parts of it, and Dixons hopes to recruit redundant staff.

## Germans first to switch off analogue TV

The Berlin Brandenburg region of Germany has become the first in the world to switch to DTT and switch off analogue terrestrial TV services. The move, on August 4, is part of a phased programme. More than 170,000 DTT STBs have been sold, at prices starting from the equivalent of about £70. The German digital roll-out will extend to Cologne/Bonn next April, followed by Düsseldorf and the Ruhr area in the autumn of 2004. DTT transmissions will also start in Hanover/Braunschweig and Bremen/Bremerhaven. By the end of next year DTT coverage will include Hamburg/Lübeck, Munich and the Rhine-Main area, which includes Frankfurt.

Italian public-service broadcaster RAI is to set up two DTT multiplexes that will provide 50 per cent coverage of the Italian population by the end of this year.

According to the Digital Television Group the UK is at present world leader in digital TV, with 44 per cent of homes having some means of digital TV reception.

## Car radio problem

Problems have been reported when a DAB radio is installed in some cars, because the existing aerial incorporates an amplifier whose bandwidth is insufficient to pass the DAB signal. About a third of all new cars are fitted with an active aerial, which requires 12V DC from the receiver.

# Sony's new camcorders

Sony has announced a camcorder, Model DCR-IP1, that's the size of a playing card. It uses the MicroMV format and has a one Megapixel CCD imager, Carl Zeiss Vario-Sonnar lens, a 10x optical zoom and 120x digital zoom. Other features include an integral automatic lens cover that slides open automatically when the power is on, a USB terminal, an iLink interface and an AV connector with an S-video terminal. It can be connected to a TV set or PC via a docking station and is PictBridge compliant, which means that still images can be printed out directly via the docking station's USB port and a PictBridge-compatible printer, without the need for a PC. PictBridge is an industry standard that enables digital cameras, camcorders and other image-capture devices to connect to and print directly from photo printers and other output devices.

USB streaming, which converts the DCR-IP1 to a webcam, is also possible via the docking station when used with a PC that has the appropriate software and an internet connection. The DCR-IP1 has a

click-to-DVD facility for direct DVD authoring when connected, via the docking station's iLink interface, to a Sony Vaio PC. A multi-picture search mode enables the DCR-IP1 to display a thumbnail view of up to eleven separate scenes on a tape. The DCR-IP1 is to be launched this November.

Sony is also to launch two DVD-based camcorders this year, Models DCR-DVD100 and DCR-DVD200, which use 8cm, 1.4GB DVD-RW and DVD-R discs. Sony says that the discs can be played back by most consumer DVD players, also compatible PCs with DVD drives and Sony PlayStation 2 consoles. They hold up to an hour of video recording, and the same disc can be used for both stills (JPEG format) and video recording at variable resolution. Model DCR-DVD200 has a one Megapixel CCD imager while the DCR-DVD100 has an 800,000 pixel imager. Other features include a Carl Zeiss Vario-Sonnar lens, a 10x optical zoom, a 120x digital zoom, a 2.5in. LCD screen and a USB 2.0 interface to provide high-speed PC connectivity.

## The digital home working group

Seventeen leading manufacturers of consumer electronics products, PCs and mobile devices have formed the Digital Home Working Group (DHWG), which aims to make it easier for digital material – music, photos and video – to be shared by various products around the home. Members include Fujitsu, Gateway, HP, Intel, IBM, Kenwood, Lenovo, Matsushita, Microsoft, NEC, Nokia, Philips, Samsung, Sharp, Sony, ST Microelectronics and Thomson. The idea is to establish an interoperability system based on open-source standards. The group will issue guidelines which companies can adopt when developing products that can share content via wired or wireless networks. Examples are PCs, TV sets, STBs, printers, stereo audio equipment, mobile phones, PDAs, DVD players and digital projectors.

A number of conflicting standards and

media formats are at present in use, making it difficult to set up and manage a domestic digital network. The interoperability framework and design guidelines produced by the DHWG will provide the basis for developing multi-branded products that will work together successfully. The goal is to issue guidelines that result in compliant products becoming available during the next twelve months.

The DHWG's design guidelines will be based on established standards such as internet protocol (IP), universal plug-and-play and Wi-Fi. They will evolve to include emerging and subsequent versions of existing standards.

The group also intends to establish marketing and promotional programmes to make the benefits of the digital home known to consumers and manufacturers alike.

by the end of 2005 with average revenue per subscriber £400, up from £366 last year. Total revenue last year was £3,168m, with operating profit before goodwill and exceptional items £371m, an increase of 94 per cent. The churn rate was 9.4 per cent. The number of Sky+ subscribers increased to 105,000, surpassing Sky's target.

## Sky's results

BSkyB's results for the year to the end of June show that the number of subscribers is now over 6,845,000 and that, including cable and Freeview homes, some 12,226,000 households in the UK and Ireland can receive one or more Sky channels. New targets are 8m subscribers

Thurlby Thandar Instruments has recently introduced the PFM1300, a UK-built, hand-held frequency meter that covers 5Hz to 1.3GHz. It's low price of £99 plus VAT is comparable to that of hand-held multimeters. Despite this the PFM1300 incorporates many advanced features. In particular it uses the 'reciprocal-counting technique' to achieve high measurement resolution at all frequencies. Reciprocal counting uses multiple period measurements followed by computation of the reciprocal value: the result is a high-resolution measurement regardless of the signal frequency. The system yields at least 7 digits of resolution per second of measurement time, and can resolve low frequencies to 0.001mHz (0.000001Hz).

The display, which has 11.5mm high characters and very high contrast, incorporates 15 annunciators covering measurement function, measurement time, units, overflow, trigger activity and low battery. A low-pass filter can be selected if required. Signals can also be displayed in terms of period as an alternative to frequency, from 5Hz up to 25MHz. A hold key enables readings to be frozen on the display. Low power consumption circuitry ensures long battery life. A push-to-measure facility provides an immediate reading at the press of a key, followed by automatic power-down after 15 seconds, thus ensuring maximum battery life when continuous signal monitoring is not required.



## Microsoft's Media Center

Microsoft is to launch a new breed of PCs that will act as both TV sets and desk-top PCs – the first should be available in the UK by Christmas. Microsoft's Media Centers will incorporate a TV card, fast connections, new graphics cards, remote control, a 200GB hard drive that will be able to store and manipulate an hour of video material, and a DVD reader/writer to provide additional storage. Microsoft believes that broadcasting and the internet are set to converge. One possible development the company sees is video rental companies distributing their titles using the internet to select titles and broadcast to download them.

## Test report:

# The ERSA PCB rework station

Some sophisticated equipment is required if you want to be able to repair the latest digital consumer electronic products, for example digiboxes. In particular the complex ICs they use, with connections such as the ball-grid array, can be replaced only by employing advanced rework equipment. Michael Dranfield has been involved in this type of work for some time and relies on an ERSA IR500A rework station. It's an expensive investment, but has proved to be the answer to the problem



Photo 1: Michael Dranfield's ERSA IR500A PCB rework station. The overhead radiator is at top left.

**W**hen faced with a steady decline in the number of VCRs and microwave ovens coming in for repair, because of the low price of new ones, I decided that it was time to diversify and look for an alternative way to boost the takings. Having been devoted to all things electronic since the age of about six, and self-employed since I opened my first shop in 1985, I wanted to stay in the industry I knew.

### My first digibox

About two and a half years ago a dealer who has a shop over the road from me brought over a Pace 2200 Sky digibox that he had sent to Pace for repair. It had been returned with a note to say that six ICs had been replaced, that this had failed to cure the problem, and that the digibox had probably been subject to a high-voltage surge down the telephone line, making repair uneconomic.

I obtained a service manual and played about with the digibox on and off for the next four weeks. Eventually I found the cause of the problem and fixed it, much to the amazement of the dealer who had brought it to me. Over a period of time he brought me more digiboxes for repair, and I gained much valuable experience.

### Equipment

Replacing chips with a simple Pyropen was a slow and tricky job. So, with the money this work had brought in, I decided to invest in some high-tech equipment – a top-of-the-range Pace MBT250 digital desoldering station, a real-time digital storage oscilloscope, etc. I was soon repairing more and more digiboxes, but subsequently came across a problem.

The then new Pace 2500S uses a microprocessor with a special type of encapsulation called a BGA (ball-grid array). The BGA consists of 256 solder microballs that are arranged in a grid pattern beneath the chip itself – no pins or contacts are visible around the outside of the chip. See Photo 2.

This type of chip started to fail regularly, causing various symptoms such as stuck in standby, no sound, etc. More and more manufacturers then began to use chips of this type, and I was suddenly coming across digiboxes I couldn't repair, because I didn't have the specialist equipment required for replacing BGA chips.

I spent the next few weeks searching the internet at home during the evenings, typing in the key letters



'BGA'. This brought up thousands of references and, after sifting through them to find UK companies that offered BGA rework machines, I sent off for some catalogues. One I received was from a company in Coventry called Blundell Production Equipment. The rework machine for which this company is the UK agent really took my eye: its features and technical specification are very impressive.

### Demonstration

After a long chat with the sales representative at past seven o'clock in the evening I booked a demonstration for a Wednesday, when the shop is closed. He turned up at 3.30 p.m. as promised, with a sample machine. It's made by a German company, Erska. The demonstration lasted till well after 7 p.m. I was so impressed by what I had seen that I bought a machine there and then. Actually when I made the appointment I had asked the representative to bring a new machine along in case I decided to buy one. This would avoid the need to pay a delivery charge. The machine I bought, see Photo 1, is an Erska IR500A, whose heating system uses medium-wavelength (2-8 $\mu$ m) dark infra-red radiation.

I had considered the Pace hot-air system. The main drawback with this was the running cost. You need a different nozzle for each different size of chip. These nozzles cost anything up to £90 each, so you could spend almost as much on accessories as the station itself.

The Erska IR500A uses a patented aperture system. Four control knobs on the overhead radiator, see photo 3, enable you to set the X-Y aperture size from anything between 10 and 50mm, which covers most of the chips you are ever likely to come across. There are no running costs part from the need to replace, quite frequently, the silicone suction cups used by the automatic vacuum chip lifter. They lead a hard life. I've just received some extra long-life samples, but have not yet had time to try them out.

### Use

I originally bought the IR500A for BGA rework, but soon found that it can be used to remove and replace not only BGAs but any leaded chip. PLCC and even PLCC sockets can be fitted. A big advantage with the IR500A is that any leaded chip can be removed from a PCB without a single pin being out of place. This is a very important factor when you consider that some digibox chips cost upwards of £30 each. If you replace a chip and this doesn't cure the fault, the old chip remains reusable.

Photo 3 shows a 208-pin ST20 microprocessor chip that has just been removed from a Pace 2500B digibox. Not a single pin has been damaged. Photo 4 shows the PCB after cleaning up with desoldering braid. As you can see, no damage has been done to the tracks and the PCB is ready to have a new IC fitted.

BGA ICs cannot simply be reused after removal. With the use of specialist equipment however they can be 'reballled' and used again. Blundell sells reballing equipment but, unless you are reworking large numbers of these chips, the investment would probably not be worthwhile. There's an alternative: you can send the chip away to a specialist reballing company to have it done. This can cost anything up to £15, which is still relatively cheap when you consider that the microprocessor chip in a Panasonic TU-DSB30 digibox costs £60 plus VAT.

Replacing a BGA chip requires critical under-board heating. This is taken care of with the IR500A.

Removal of all chips with the IR500A is semi-automatic. Simply place the PCB in the board holder

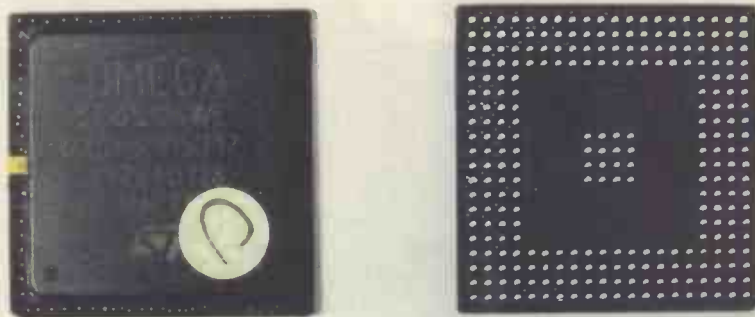


Photo 2: The 256-pin BGA microprocessor chip type STI5512SWE used in the Pace 2500S3 digibox, top and bottom views.

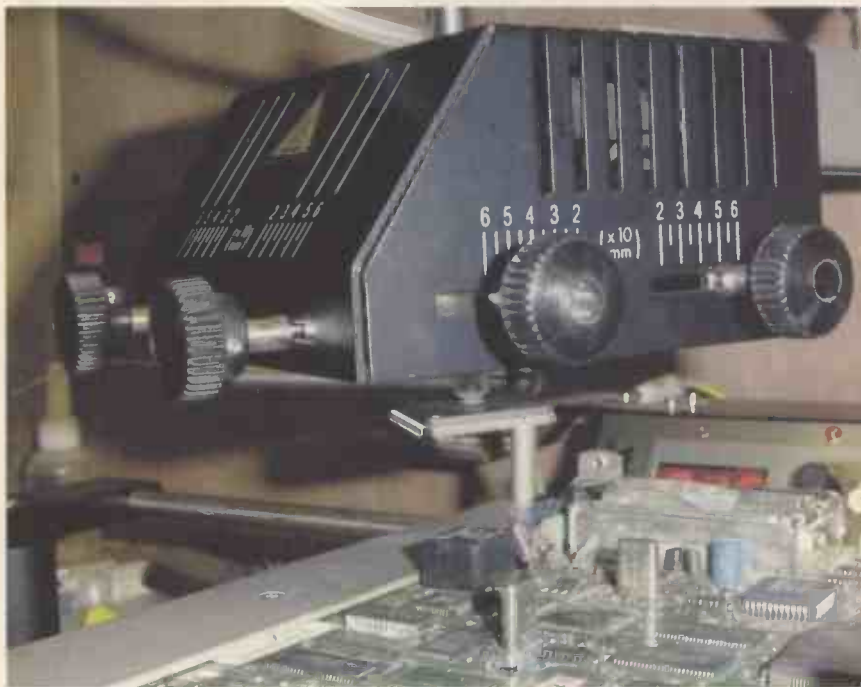


Photo 3: The overhead IR heat radiator, with its suction cup holding a 208-pin ST20 microprocessor chip that has just been removed from a Pace 2500B digibox PCB. There's not a pin out of place, and if the chip proves to be OK it can be reused.

and use the fixed-axis laser-positioning device to find the centre of the IC to be removed. Next set the X-Y aperture size, using the four control knobs on the top infra-red heater – add 5mm all round to the overall size of the chip. Then place the K-type thermocouple as close as possible to the chip. Switch on and preheat the underside of the PCB to 60°C. The ramp rate is set by the left-hand potentiometer. When the LED display indicates that 60°C has been reached, rotate the top IR radiator and lower it down over the IC. The upper radiator ramp rate is set by the right-hand potentiometer. At about 150°C, indicated by the LED readout, push the spring-loaded suction pad down on to the top of the chip, and click the mouse switch to start the vacuum. The chip will automatically be lifted from the PCB at reflow, which occurs at approximately 179°C.

When the chip is lifted off, swing the top IR radiator over on to its rest position and click the mouse to end the vacuum: the IC will then drop off on to the catching plate. Slide the PCB over to one side of the board holder and allow it to cool. The whole process, from start to finish, takes only a few minutes.



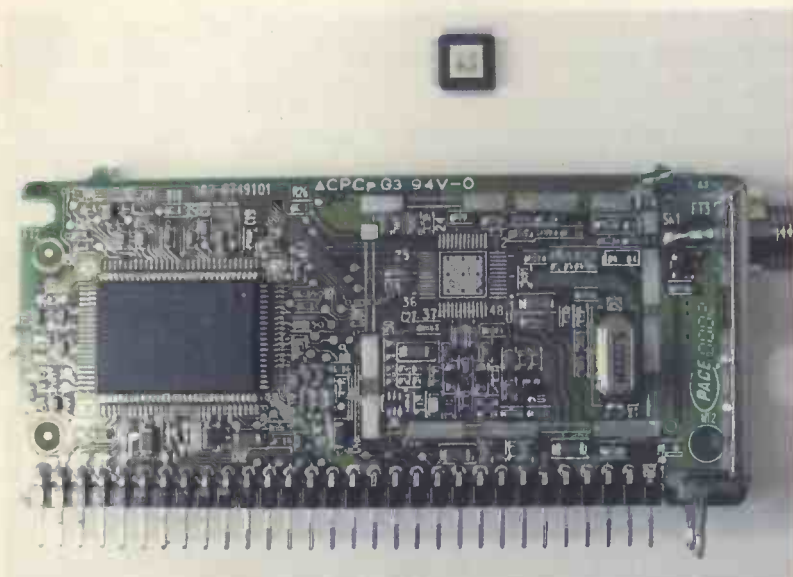
**Photo 4:** PCB after removal of a 208-pin IC and cleaning up with desoldering braid. No PCB or track damage has occurred.

When a new MAX2104 ZIF chip has to be fitted in a Pace tuner the metal square on its underside, see Photo 5, must be soldered to the PCB groundplane – this is not only the RF groundplane connection, it also provides heatsinking for the chip. This job is impossible with conventional soldering gear. It's so simple with the IR500A. A pre-settable on-board temperature alarm can be set up to sound when the correct temperature has been reached, leaving you free to get on with another job.

Consistent and repeatable results are achieved time after time.

### Manual operations

The IR500A comes with a built-in digital temperature-controlled soldering-station module that can drive up to four soldering devices at the touch of a button. From



**Photo 5:** A MAX2104 ZIF chip (top) after removal from the tuner (below) used in the Pace 2500B digibox. The metal section at the bottom of the chip, shown in this photo, has to be soldered to the board. This is impossible with conventional soldering gear.

the hot-SMD tweezers to the micro-soldering iron, this is ideal for rework and touching up. Four soldering tools and holders, with sponges and spare bits, are supplied as standard with the IR500A package.

I would thoroughly recommend the SMD micro-soldering iron. A whole range of micro-well and micro-soldering bits is available. By pre-heating the PCB first, say to 100°C, soldering at low temperature can be achieved with really excellent results.

### Back-up

I must say how very helpful I found the sales representative Paul Cooper. Nothing was too much trouble to him. He mentioned how reliable the IR500A had proved to be: not a single failure to date. So it was inevitable that mine was going to go wrong, and it did! After the first two weeks, when swinging the top IR heater backwards and forwards the PCB temperature display would suddenly jump to 200°C, despite the fact that the board was cool. The cause was probably only a loose connection.

If the station had been out of warranty I would have had a look myself. But I didn't want to invalidate the guarantee, so it had to go back. The repair service provided was second to none. I phoned at 9.30 a.m. to report the problem and by 3.30 p.m. the same day a van had arrived to pick up the equipment. That's what I call service. Since that little problem the IR500A has performed faultlessly.

Manual BGA chip replacement requires a little practice if you have not done it before. But Paul Cooper was keen to demonstrate an easy technique – he had a pack full of dummy BGA chips and practice PCBs. Once I had mastered the technique I replaced the STi5512SWE microprocessor chip in a customer's digibox, the best test of all, with complete success.

Different jobs require different fluxes. BGA chips require a no-residue, no-clean flux. Blundell can supply all that's required. Paul brought a selection with him to demonstrate the various reflowing and resoldering techniques.

### Summary

A year has passed since I bought my IR500A, and I can't describe how pleased I am with the unit itself and the after-sales service provided by Paul Cooper of Blundell. He gave me his mobile phone number, and is always on hand to answer any questions.

My one and only criticism of the IR500A is the position of the on/off switch. It's under the component catching plate, behind the thermocouple mounting bracket, the most inaccessible place possible. Why couldn't it have been on the front panel, say next to the turbo-heat button?

If you repair digiboxes regularly, your workshop needs this machine. I recommended it to a friend in London who bought one and has been pleased with it.

At the time of writing this review the price of the IR500A package, complete with four soldering hand tools, spare bits, a tip-changing tool, board cooling fan, hand-held temperature-meter, PCB holder and soldering-iron stands, is £4,650 plus VAT and delivery. Blundell Production Equipment also sells a vast range of rework and manufacturing equipment. The firm can be reached on 02476 473 003, fax 02476 694 155 or email

sales@blundell.co.uk

There's a website at [www.blundell.co.uk](http://www.blundell.co.uk)

You can phone Paul Cooper on his mobile 07880 546 380 to arrange a free demonstration. Some parts of the country are served by another representative. ■

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Input Impedance	BNC Connector, 75Ohm / High Switchable
Cabinet	Plastic
Resolution	1000 TV Lines
Linearity	Horizontal 15% Max Vertical 10% Max
CRT	14
Operating Temperature	-10°C to +60°C
Dimensions (WxHxD)mm	315 x 340 x 315
Weight	10.20Kgs

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Video Output	1.0 Vp-p / 75 ohm, 2 distribution out
Video Gain	From Attenuation to amplifier, 0.8 to 1.4 Vpp
Video Bandwidth	20MHz - 3dB
Max Video Input	2.0 Vpp
Cross talk input to input	Better than 40dB
Switch Internal	Approx. 1 to 15 sec
Channel Switches	Bypass / Auto / Home
Power Consumption	3W Max.
Video Connectors	BNC
Position & Power Lamp	Long Life LED
Working Temperature	-10°C to +60°C
Construction	Steel, with gray enamel finish
Dimensions (WxHxD)mm	218x44x96mm
Weight	Approx. 0.82Kgs

£39.95

Order code: AV-1071

### 4 CH COLOUR DUPLEX MULTIPLEXER

#### SPECIFICATION:

VIDEO SIGNAL	TV System	NTSC	PAL
	Digital Memory	720x480	720x576
	Video Input	4 cameras / 1 VCR	
	Video Input Signal	1.0Vp-p 75 Ohms	
	Video Output	4 Looping/2 monitors/ 1 VCR	
	Video Output Signal	1.0Vp-p 75 Ohms	
	Scale	Yes	

ELECTRICAL	Power Supply	100-240V, 50/60Hz (Free Voltage)
	Power Consumption	Approx. 10W

VIDEO FEATURES	Display Format	1, 4 Screen
	Sequencing Dwell	1 - 9 sec
	Segment Border	Narrow Black Line

CONNECTOR	Video Input	4 BNCs
	Video Output	4 BNCs
	Monitor Output	2 BNCs
	VCR Input	1 BNC & 1Y/C
	VCR Output	1 BNC & 1Y/C
	Alarm In/Out	25 Pin D-Sub
	Power Jack	DC Jack

MECHANICAL	Dimension (WxHxD)	44 x 430 x 300 mm
	Weight	4.5Kg (Rack Mountable Type)

ALARM FEATURE	Alarm Inputs	4 Inputs (NO/NC selectable)
	Alarm Outputs	1 Relay Output (3A max)
	Multiple Alarm Display	Sequence
	Alarm Duration	1 - 60 sec
	Video Loss Indicate	Alarm with Blue Screen

ENVIRONMENTAL	Operating Temperature	0°C - 50°C
	Humidity	10 - 90% Relative, Non-Condensing

#### FEATURES:

- High Quality Digital Processing.
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£229.00

Order code: AV-6022

### 1/4" COLOUR WEATHER-PROOF BULLET CAMERA

#### SPECIFICATION:

Pick Up Device	1/4 Colour Interline Transfer CCD
Picture Elements	NTSC/EIA: 510 (H) x 492 (V) PAL/CCIR: 500 (H) x 582 (V)

Synchronization	Interface
Horizontal Resolution	330 TV Lines

Lens Mount	Board Lens 3.6mm / F2.0
Auto White Balance	25000K - 95000K

AGC	Yes
Gamma Characteristics	0.45

Electronic Shutter	Shutter 1/60 (1/50) to 1/100,000 (1/10,000) SEC Linear
Power Source	DC 12V - 10%

Power Consumption	120mA Max.
S/N Ratio	More than 48dB

Video Output	Composite 1.0 Vp-p / 75 ohms
Minimum Illumination	0.5 LUX / 75 ohms

Storage Temperature	-10°C to +50°C
---------------------	----------------

£64.95

Order code: AV-1420

### 14" HIGH RES COLOUR MONITOR

#### SPECIFICATION:

Picture Tube	14 Diagonal
Scanning Frequency	NTSC: H:15.734 KHz V: 60 Hz PAL: H:15.625 KHz V: 50Hz
Synchronization	Internally derive from composite video signal
Video Signal Input	1.0Vp-p / 75 Ohms
Input Impedance	75 Ohms / High Switchable
Horizontal Resolution	NTSC: 450 TV Lines PAL: 500 TV Lines
Audio	Built-in sensitive speaker
Sound Input	400mV 1k ohm
Sound Output	2W
Speaker Impedance	8 Ohms
Power Source	NTSC: AC 110-120V / 60 Hz PAL: AC 220-230V / 50 Hz
Power Consumption	70W
Dimensions (WxHxD)mm	356 x 335 375
Weight	Approx. 12.5 Kgs

£129.95

Order code: AV-1056

### BLACK & WHITE BULLET CAMERA

#### SPECIFICATION:

Image Pick Up Device	1/3 B/W Interline Transfer CCD
Scanning System	2:1 Interlace (NTSC Standard) / 2:1 Interlace (PAL Standard)
	525 Lines/60 Fields/30 Frames / 625 Lines/50 Fields/25 Frames
Scanning Frequency	15.734KHz(H), 59.94Hz(V) / NTSC : 15.625KHz(H), 50Hz(V)/PAL
Effective Pixels	768(H) x 494(V) / NTSC : 752(H) x 582(V); PAL
Image Size	6.00mm(H) x 4.96mm(V)
Video Output	1.0Vp-p NTSC Comp / 1.0Vp-p PAL Comp
Electronic Iris	1/60-1/100,000sec / 1/50 - 1/100,000sec
Sync. System	INT Only
Resolution	More than 380 TV Lines
Gamma	r=0.45
S/N Ratio	50dB (AGC Off)
Power Source	DC 12V 200mA 4.5W
LEDs	6 LEDs Built-in
Minimum Illumination	0 Lux
Dimensions (WxHxD)mm	35 x 35 x 50
Lens Type	Regular Lens

#### FEATURES:

- Built-in 6 LEDs to observe the security area under dark of 0 Lux.
- Can be used under water of 30m.
- Extremely low power Consumption.

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Order code: AV-1540

### DVR STAND ALONE 4 CHANNEL

#### SPECIFICATION:

Operation Mode	Front Panel, OSD
Resolution	720 x 480
Display Mode	Single channel (#1,2,3,4), Auto - sequence (2-9 sec, adjustable) quad
Recording Speed	720 x 240: 1-10 Frames/sec (adjustable) 360 x 240: 1-15 Frames/sec (adjustable)

Audio Recording / Live Audio	1 CH
Compression	MJPEG
Screen Division Mode	1, 4 Division
Camera Input	4 CH BNC (NTSC/PAL)
Video Output	Composite Video (BNC) x 2
Playback Function	Playback - forward, reverse Fast Forward Fast Reverse Forward one frame Zoom In

HDD	40GB 80GB
Search Mode	Date, Time, Camera
Operation Temperature	5°C to 40°C
Power Supply	AC100V - 240V, 50/60Hz DC 12V/4A
Power Consumption	20W
Dimension (W x D x H)mm	313 x 255 x 44
Weight	3.1Kg

#### FEATURES:

- Up to 30 frames per second video display.
- Simultaneously recording, live view display.
- Automatically detects NTSC/PAL.
- Tapeless recording replaces conventional time-lapse recorder.
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- Automatically returns the original operation when power recovery from failure.

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Weight	Approx. 1.2Kgs

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# Television software

Since the introduction of digital signal processing in the early Nineties there has been a major change in TV sets – a rapid increase in the use of control software. Brian Storm takes a look at the way in which software use has evolved and how it operates. He concludes with a summary of typical fault conditions that can be caused by corrupted data

A major change in TV sets occurred with the introduction of digital signal processing in the early Nineties, namely a rapid increase in the use of control software. Early digital TV sets contained a large number of digital processing chips for sound, vision and text processing and scan generation. Software then mainly involved sending initial loading data to each chip at switch on, and of course providing control data during use. This loading/system data was usually stored in a non-volatile EEPROM. In addition the EEPROM held the setmaker's specific user and service menu structure.

This use of on-screen menus and digital signal processing enabled setmakers to standardise a chassis and add or subtract features for particular models and markets by means of software changes.

Since the early days of digital TV processing chipsets have been considerably reduced, to the extent that we now have basic one-chip (apart from the power stages) TV chassis, for example the Panasonic Z8, Sharp GA20 and Philips L01.

This reduced hardware complexity has been more than matched by an increase in software complexity. Most significantly, software now has to be written to select the correct tuning, decoding and language systems worldwide. Hardware costs become cheaper for the setmaker as there are fewer parts to source and fit during production. But the software, though cheap to duplicate, has become more complex to write and has to be proved throughout the world. Even software written specifically for Europe has to cover a large number of different tuning-system and language options. These must all be recognised by the software and dealt with accordingly.

## Options

One way of dealing with this wide variety of choices is to write software that incorporates various options. These so-called model options can be hidden in the service menus and selected as required. Alternatively a region-dependent EEPROM can be used. This tends to be more expensive, and adds complexity as a number of different EEPROM versions have to be produced to cover Europe and the world, and the spare parts system has to be geared up to deal with them. Many a tear-stained service manual has been caused by the supply of incorrect EEPROM variants. To make matters worse there are chassis that have EEPROM variants and EPROM variants as well. On the plus side, a non-volatile EEPROM is more resistant to heat/static build up and of course CRT flashovers.

## Typical software options

Software options are usually set out in tables, using bytes whose

eight bits select various options. For example, the first byte may be used for tuning options, with the bits employed as follows:

Bit 0 for tuner type, e.g. 1 = Alps, 0 = Philips  
Bit 1 for system L sound, e.g. 1 = yes, 0 = no  
Bit 2 for the colour system, e.g. 1 = PAL, 0 = NTSC  
and so on.

There could be six such option bytes as follows:

Byte 1 for tuning options  
Byte 2 for CRT options (variations in size and aspect ratio)  
Byte 3 for OSD language/text options  
Byte 4 for sound options (surround, stereo, etc.)  
Byte 5 for various features (child lock, parental control etc.)  
Byte 6 for worldwide channel sorting options.

It's clear from this that software problems can generate an impressive list of apparent faults – most engineers will have had such experiences. With this type of option-bit system you can check the ones and zeros to make sure that they are correct – assuming that you have vision. Typically they may appear as follows:

Byte 1	11000110
Byte 2	10001000
Byte 3	00100011
Byte 4	11110000
etc.	

Philips however employs an option-bit binary-weighting system, with the result that the option bytes appear as a decimal representation of the binary number. Thus, to take the above binary options, they will appear as follows on the screen of a Philips set:

Byte 1	198
Byte 2	136
Byte 3	35
Byte 4	240

## Foreign options

Some engineers have experienced problems when attempting to alter option bits for exporting/importing sets to and from Europe. Generally a European set will have the hardware to work in the UK (though it may not provide Nicam sound), but a UK set's hardware will seldom include a multi-band tuner and will usually

not decode Secam colour.

So, even if you have a list of all the option settings for a TV chassis you have to make sure that the hardware is present to support changes you make in the software.

## I<sup>2</sup>C EEPROMs

Probably the least reliable but cheapest approach is to programme part of an EEPROM chip with the system/loading/menu data and use the rest for customer channel and picture/sound settings. Nowadays these EEPROMs are universally controlled by the main and possibly only microcontroller chip via an I<sup>2</sup>C bus. I<sup>2</sup>C-based EEPROMs are produced by several different manufacturers, and all use the same read/write protocols. The main manufacturers and their IC types are as follows:

Manufacturer	IC type nos.
Thomson	ST24Cxxxx
Xicor	X24Cxxxx
Catalyst	CAT24Cxxx
Philips	PCF85Cxxx
Atmel	AT24Cxxxx

The 'xxx' part of the number indicates the capacity of the EEPROM.

Here are some examples.

**X24C02:** Capacity 256 bytes arranged as one page x 256 bytes. Possible base addresses A0-A2-A4-A6-A8-AA-AC-AE. Page addressing: Page 1 base address.

**X24C04:** Capacity 512 bytes arranged as two pages x 256 bytes. Possible base addresses A0-A4-A8-AC. Page addressing: Page 1 base address, Page 2 base address + 2.

**X24C08:** Capacity 1,024 bytes arranged as four pages x 256 bytes. Possible base addresses A0-A8. Page addressing: Page 1 base address, Page 2 base address + 2, Page 3 base address + 4, Page 4 base address + 8.

**X24C16:** Capacity 2,048 bytes arranged as eight pages x 256 bytes. Possible base addresses only A0. Page addressing: Page 1 base address, Page 2 base address + 02, Page 3 base address + 04, Page 4 base address + 06, Page 5 base address + 08, Page 6 base address + 0A, Page 7 base address + 0C, Page 8 base address + 0E.

**X24C32:** Capacity 4,096 bytes arranged as 16 pages x 256 bytes. Possible base addresses A0-A2-A4-A6-A8-AA-AC-AE. Page addressing: Page 1 sub-address 00, Page 2 sub-address 01 through to Page 16 sub-address 0F.

**X24C64:** Capacity 8,192 bytes arranged as 32 pages x 256 bytes. Possible base addresses A0-A2-A4-A6-A8-AA-AC-AE. Page addressing: Page 1 sub-address 00, Page 2 sub-address 01 through to Page 32 sub-address 1F.

**X24C128:** Capacity 16,384 bytes arranged as 64 pages x 256 bytes. Possible base addresses A0-A2-A4-A6-A8-AA-AC-AE. Page addressing: Page 1 sub-address 00, Page 2 sub-address 01 through to Page 64 sub-address 3F.

**X24C256:** Capacity 32,768 bytes arranged as 128 pages x 256 bytes. Possible base addresses A0-A2-A4-A6-A8-AA-AC-AE. Page addressing: Page 1 sub-address 00, Page 2 sub-address 01 through to Page 128 sub-address 7F.

Chips as large as the X24C128 and X24C256 are generally used only on PCBs for DVB or MPEG control/processing.

## Typical EEPROM address layout

Most EEPROMs are laid out in pages that are F by F hex, so a

	-0	-1	-2	-3	-4	-5	-6	-7	-8	-9	-A	-B	-C	-D	-E	-F
0-	24	3F	3C	1F	FF	FF	FF	1D	15	22	25	1F	FF	FF	FF	FF
1-	00	00	00	01	00	00	00	FF	11	FF	FF	0C	09	07	08	09
2-	28	13	12	17	28	23	1F	0A	24	09	05	00	00	00	00	00
3-	00	09	01	C2	00	09	1E	1D	27	1F	00	00	05	14	00	1A
4-	00	00	00	00	00	00	01	00	FF	FF	FF	FF	FF	FF	FF	FF
5-	1D	74	42	00	2F	F4	C4	00	32	F3	C4	00	31	73	C4	00
6-	2D	F4	C4	00	34	F7	84	00	25	F4	C1	00	23	F4	42	00
7-	24	F3	C4	00	2D	30	44	00	1D	74	41	00	1D	50	01	00
8-	1D	74	41	00	1D	74	41	00	1D	74	41	00	1D	50	01	00
9-	1D	50	01	00	1D	50	01	00	1D	50	01	00	1D	50	01	00
A-	1D	50	01	00	1D	50	01	00	1D	50	01	00	1D	74	41	00
B-	1D	50	01	00	1D	50	01	00	1D	50	01	00	1D	50	01	00
C-	1D	50	01	00	1D	50	01	00	1D	50	01	00	1D	74	44	00
D-	1D	50	01	00	1D	50	01	00	1D	50	01	00	1D	50	01	00
E-	1D	50	01	00	1D	50	01	00	1D	50	01	00	1D	50	01	00
F-	1D	50	01	00	1D	75	41	00	1D	50	01	00	1D	50	01	00

- NVM Type
- X24C02 (2k bit)
  - X24C04 (4k bit)
  - X24C08 (8k bit)
  - X24C16 (16k bit)
  - X24C32 (32k bit)
  - X24C64 (64k bit)

Fig. 1: Page A0 of a typical 16k TV EEPROM, with location 00 highlighted. Much of the data could be for tuning.

typical address is page number A02, address 8B and data F7, all in hex.

Fig. 1 shows page A0 of a typical 16k EEPROM. Location 00 is highlighted. A great deal of the data could be for tuning, as most sets have about 100 channel presets nowadays and have memory reserved in the EEPROM for this data.

## EEPROM faults

In the hostile environment of a TV set, with heat, static, flashovers etc., EEPROM data corruption is a common cause of faults. Here are some likely symptoms:

- No tuning, just snow (incorrect tuner selection).
- No sound, AV inputs OK (incorrect sound system selection).
- One AV input not working (incorrect model option selection).
- Blank raster, sound OK (incorrect video system selection).
- Geometry distortion (incorrect geometry option selection).
- No aspect-ratio control (incorrect model option selection).
- Missing user function (incorrect model option selection).
- Incorrect Pro-Logic operation (incorrect model option selection).
- Dead set (incorrect CRT beam-current data).
- Dead set (no height data).
- Dead set, blowing the line output transistor (incorrect line frequency selected).
- No colour (incorrect colour system selected).
- No colour and no sound (incorrect system data).

I've experienced all these faults from time to time and, as a result, I tend to suspect the memory chip for anything other than a blown up power supply. All too often the fault symptom may suggest as the cause a chip with more legs than a millipede (and sometimes smaller). So it makes sense to check EEPROM data integrity first.

## Chip programmer

An EEPROM programmer is a useful tool to have these days. Not to reprogram a suspect EEPROM inside a set, as it could well have been damaged, but to write the correct software to a cheap, blank memory chip and try this by substitution. There is often an enormous price difference between a blank chip and a spares-sourced preprogrammed one.

Most setmakers nowadays can supply an EEPROM programmer of sorts, although not cheaply, with appropriate default memory chip data, or you can build your own. Various designs are available on the internet.

# JVC's Progressive World

A presentation of JVC's latest AV technology was held recently, the main theme being progressive video scanning. **George Cole** reports on the new product line-up



The centrepiece of JVC's latest product range is progressive-scan technology, which the company is including in a range of TV sets (CRT and flat-screen), DVD players, a camcorder and a DVD recorder. JVC says it is focusing on progressive-scan technology because this gives higher-quality pictures with finer resolution, better colour reproduction and avoidance of the artefacts caused by interlacing. In many of its TV models JVC is combining progressive scanning with its Digital Image Scaling Technology (DIST), a digital video processing system that uses interpolation to enhance picture quality.

The company intends to extend its range of progressive-scan products during 2004, including an IDTV model. Table 1 shows the initial line up.

## Interlaced vs progressive scanning

TV broadcasting systems like PAL and NTSC use interlaced scanning to make optimum use of the available transmission bandwidth and reduce flicker. It is, JVC points out, a form of analogue compression. With PAL a complete TV picture (frame) consists of 625 lines, 576 of which are active (the rest occur during the field sync/flyback period). But instead of transmitting complete frames in sequence, each frame is split into two half frames (fields). These consist of 312.5 lines and are interlaced, that is the field with odd-numbered lines is transmitted first followed by the field with even-numbered lines. The receiver displays the two fields as a complete frame. For historical reasons to do with the electricity supply frequency, the

US NTSC system and the European PAL system have different field rates, 60Hz and 50Hz respectively. It's obvious that the bandwidth required to transmit 50 fields a second is far less than what would be required to transmit 50 complete frames per second: interlacing means that this bandwidth reduction can be done without loss of vertical definition. The 50Hz field rate does a good job of minimising the flicker associated with picture repetition – it's noticeable only when there are large, bright areas in a picture or we view the screen from the side of the head. The NTSC 60Hz field rate is better.

But interlaced displays can suffer from a number of artefacts, especially when an object is moving and there's a mismatch between one field and the next. Common defects include reduced vertical resolution and aliasing, a visible line structure, combing (jaggies) which shows up as

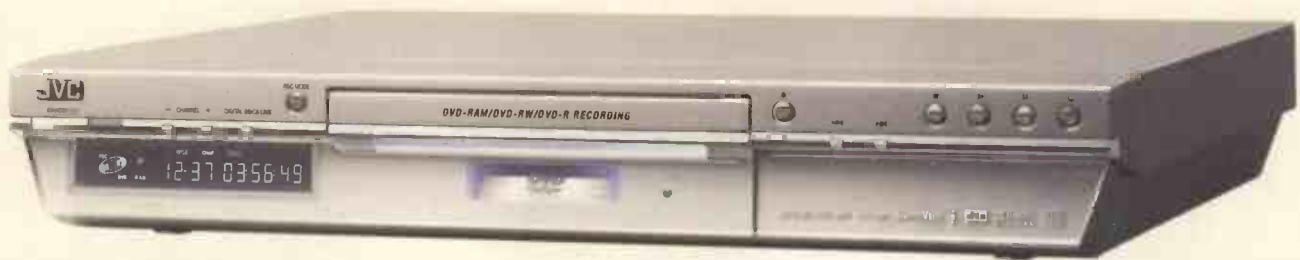
jagged vertical edges, and line flicker. A TV set that uses 100Hz field scanning can remove flicker but cannot eliminate the artefacts caused by interlacing. For that we need a progressive-scan display. Progressive scanning, also known as sequential or non-interlaced scanning, is now used by a number of video devices, including LCD and DLP projectors, plasma displays and PC monitors. Progressive scanning works by displaying complete frames rather than separate fields, thus removing the artefacts introduced by interlacing.

## Progressive-scan from DVD

One of the few sources of progressive-scan video material is DVD-Video. This feature has been available with NTSC DVD players for some time now, but until recently was not available with PAL DVD players because of copyright issues. Some

Table 1: JVC's Progressive World product line-up for 2003

Product	Launch date
XV-NA77 DVD player	Available now
DR-M1 DVD recorder	September
HV-32D25 CRT TV	Available now
28, 32 and 36in. CRT TVs with DIST	October
17in. LCD TV	Autumn
23in. LCD TV	Winter
26in. LCD TV with DIST	Autumn
32in. LCD TV with DIST	Winter
PD-35D30 W-VGA plasma TV with DIST	Available now
PD-42D30 XGA plasma TV with DIST	Available now
42in. W-VGA plasma TV with DIST	October
GR-PD1 camcorder	Autumn



The DR-M1 progressive-scan DVD recorder which include a timebase corrector, a frame synchroniser and Motion Active Noise Reduction.

PAL DVD players have offered an NTSC progressive-scan output option, which can be fed to the component-video input socket of a display device, but this feature is of little use unless the player is a multi-region one that's able to play Region 1 NTSC discs. Now, however, some PAL DVD players are beginning to offer a PAL progressive-scan output. DVD was designed to provide high picture quality, and the MPEG-2 video-compression system it uses can handle both interlaced and progressive-scan material, but DVD is basically an interlaced format, even where films are involved.

### Films

Film has always been a 'progressive-scan' medium, in that full frames are displayed. The frame rate is 24f/sec – to reduce flicker, this is doubled by the shutter in the film projector. DVD titles store each film frame as a series of video fields, using telecine equipment to provide the conversion. With PAL DVD this is fairly straightforward, as the 24f/sec used by the film industry is very close to the 25Hz PAL frame rate. For DVD titles the film speed is increased by four per cent (with some adjustment to the audio pitch to compensate for the alteration) to give a 25Hz frame rate, then each film frame is simply split into two fields, a process known as 2-2 pulldown.

This option is not available with NTSC because of its 30Hz frame rate. So a system known as 3-2 pulldown is used instead. Each successive film frame is split into either three or two fields, so that four film frames produce ten video fields. Although there's a slight overlap between fields, the system generally works well.

NTSC progressive-scan DVD players carry out what is called inverse 3-2 pulldown, or de-interlacing, by combining two fields to produce a frame and dropping two fields in every ten. PAL progressive-scan DVD players use inverse 2-2 pulldown.

### GR-PDS1 progressive-scan digital camcorder

Camcorders normally record and playback interlaced video, but the GR-PDS1 provides progressive-scan recording in the 16:9 format. The video signal is stored on a MiniDV cassette, using MPEG-2 compression. A 1.8 Megapixel,

progressive-scan CCD image sensor is used, with a pixel array of 1,280 x 659 for moving images and 1,280 x 960 for stills.

You might expect a top-end camcorder like the GR-PDS1 to use a three-CCD image-sensing system, but JVC claims that its single-CCD sensor provides superior image sampling. The CCD's pixel elements are covered with a hybrid complementary progressive colour filter system. This consists of yellow (Ye), Cyan (Cy), Green (Gr) and clear pixel filters. Blocks of two pixels are used to create the luminance (Y) signal, and blocks of four are combined to create RGB chroma information. The MPEG-2 compression enables up to an hour of video to be stored on a MiniDV cassette.

Other features of the GR-PDS1 include a downconverter for converting the images to conventional 625-line interlaced form, a 10x optical zoom, a 20x digital zoom, JPEG still picture compression, and an SD Memory card/MultiMedia Card slot. Dimensions are 114.5 x 99 x 271.1mm, and weight approximately 1.5kg with battery pack and cassette. No price details have been made available.

### DR-M1 progressive-scan DVD recorder

JVC is one of the last major consumer electronics companies to launch a DVD recorder. The company has decided to use the official DVD-RAM/DVD-RW/DVD-R formats. In addition the DR-M1 can read DVD-Video, Video CD, CD and CD-R/RW discs.

As with all DVD recorders, users can record at different picture resolutions, from VHS to DVD quality (in this case 250/340/400/500 lines). Naturally the higher the picture quality the shorter the recording time. The recording modes are XP (one hour), SP (two hours), LP (four hours) and EP (six hours). Other features include a timebase corrector, a frame synchroniser and Motion Active Noise Reduction. The latter, developed by JVC,

detects pixel changes and uses algorithms to eliminate edge smear and image lag.

The DR-M1 also uses an on-disc timer programming system. It writes timer data on the disc so that the user can set the timer by inserting a programmed disc. JVC says that the system could for example be used to ensure that a particular programme is always recorded on the same disc – useful for anyone recording a series.

Live Memory is JVC's name for what Panasonic calls Timeslip. It makes use of the fact that a DVD-RAM works more like a hard drive, enabling the user to record and play back simultaneously. DVD Navi is a library database that can store information on up to 1,300 programmes. Provided the user has been careful about numbering his discs, it's a simple job to find a disc that contains a specific programme. Another feature that's useful for finding a particular programme is the inclusion of animated thumbnails. When a user inserts a disc in the DR-M1, thumbnail pictures are displayed on the screen. Run a cursor over an image and it becomes animated. The forward-skip feature enables the user to skip the next thirty seconds – useful for advertisement breaks. Reverse-skip moves back seven seconds.

### Progressive-scan DVD player

JVC supports the DVD-Audio format. So the progressive-scan DVD player Model XV-NA77 plays both DVD-Video and DVD-Audio discs, also DVD-R, DVD-RW and DVD-RAM (without a caddy) discs. It can also read MP3 files and JPEG files on CD-R/RW discs. The XV-NA77 uses a 12-bit, 108MHz video DAC and an 'ultra high performance' one-chip AV decoder, type NDV8611, that incorporates an MPEG AV decoder, a fine video processor, an audio digital-signal processor and a RISC CPU that runs at 125MHz. An Express Play Start feature enables the first scene of a film to be viewed in less than four seconds (with a single-layer disc) instead of about ten seconds. A 1.5x playback system enables



The DVD player Model XV-NA77 plays both DVD-Video and DVD-Audio discs, also DVD-R, DVD-RW and DVD-RAM.

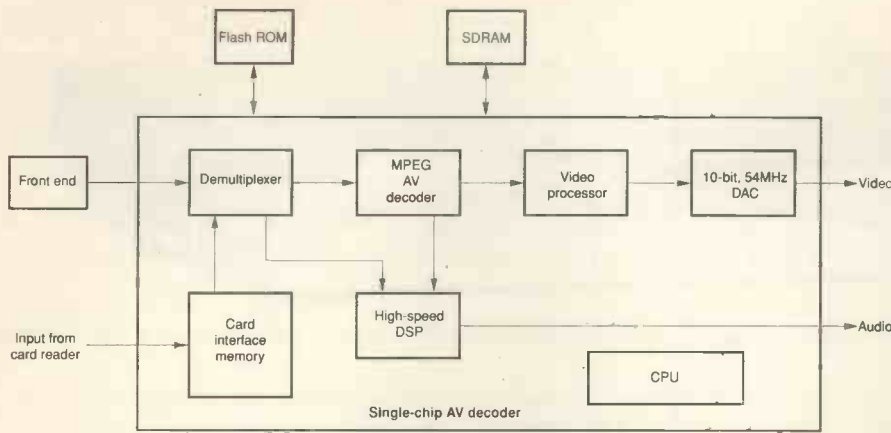


Fig. 1: Block diagram of the decoding system in Model XV-NP1.

discs to be viewed quickly, with audio and subtitles. Dimensions are 435 x 45 x 270mm, weight 2.1kg.

### DVD/memory-card player

More and more products use flash-memory cards nowadays, including digital cameras and digital camcorders that use them to store JPEG still images or MPEG-4 video clips, and digital music players that store music files such as MP3 and WMA (Windows Media Audio). A wide range of memory cards has been marketed

in recent years, and compatibility can be a problem when trying to read the data. Model XV-NP1 is designed to be able to read many types of memory card, such as SD, MultiMedia Card, Memory Stick, SmartMedia and CompactFlash, without the need for an adaptor. Fig. 1 shows a block diagram of the decoding system.

The player uses two video frame buffers to improve the processing speed. While one buffer is providing the display, the other is being used to decode the next image, providing a fast transition between

images. The dual video-buffer system is also used to provide up to eleven different video effects, such as image rotation and a variety of wipes.

### Optical wireless high-definition system

JVC took the opportunity to demonstrate a prototype optical wireless high-definition system that enables uncompressed HD data to be transmitted from a video source to a display device. The system has a top data transmission rate of 1.4Gb/sec and is designed for use as a domestic wireless LAN (local area network).

The main components are a transmitter unit and a receiver unit that sits next to the display system. The transmitter uses a laser diode with a maximum range of 10m. It includes a system that automatically aligns the axis between the transmitter and the receiver, and an auto-correcting feature in case the transmitter is accidentally knocked. An eye-safe optical system converts the laser output to light that's harmless even when, according to JVC, it shines directly into someone's eyes.

The demonstration worked well, though there was no audio with the prototype system. No launch date for the system was suggested. ■



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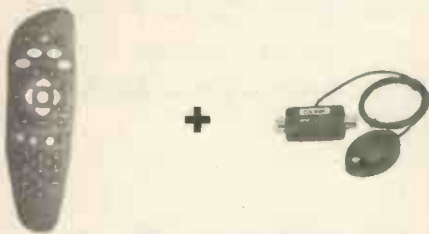
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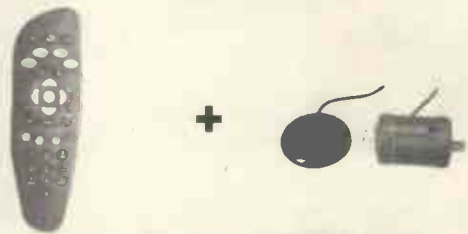
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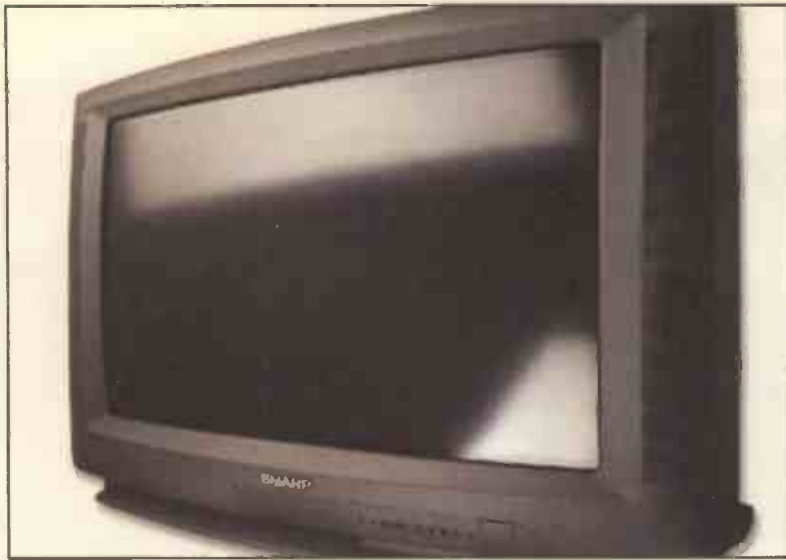
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Jim

Part 2 of this series, by Alex Towers, deals with power supply fault-finding and the operation of the line driver and output stages

# Servicing the Sharp DA100 chassis

In Part 1 last month the basic features of the chassis were listed, with details of the IC complement, and a description of the basic power supply operation, standby and main chopper, was provided. Our apologies for misquoting the chassis type (DA100 not D100).

## Overriding the PS control

As we saw last month, Q702 is switched on or off for on/standby control of the main chopper power supply. So it's possible to check whether the latter is working by removing the control voltage at the base of Q702. The simplest way to do this is to disconnect R792, see Fig. 10. If there are no problems with the power supply or the supply lines it should start up. It's good practice to disconnect R623 when carrying out this check, to ensure that the line output stage doesn't become active. See Fig. 11. If R623 is not disconnected and there's a fault in the line output stage the power supply may not start.

When the power supply starts with R792 disconnected it should regulate correctly. The power supply outputs can be disconnected in this condition but the integrity of the regulation feedback loop must be maintained, otherwise the HT will rise to a high level and component failures will occur.

## Power-factor correction

Later versions of the chassis incorporate a power-factor

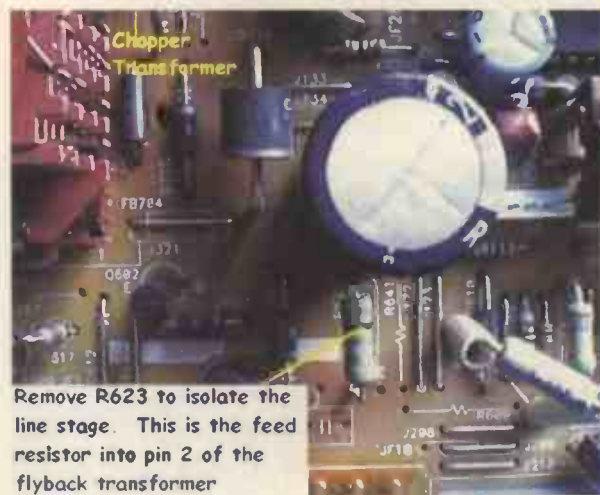


Location of R792. Remove R792 to override the standby operation of the power supply.

Fig. 10: Location of R792.

correction module between the output from the mains bridge rectifier D701-4 and the reservoir capacitor C705. Its function is to ensure that current is drawn from the start of the mains voltage cycle, i.e. zero-voltage switching, so that good mains supply voltage waveform linearity is maintained. The module is a sub-board which is mounted on the left-hand side of the main chassis (when viewed from the rear of the set). The board also has the focus modulator circuit (76cm and some 66cm models only) on it.

The power-factor correction circuit (Model 56FW53H) is shown in Fig. 12. It's basically a DC-to-DC converter that increases the input voltage to the main chopper circuit to about 400V DC. About 325V arrives from the mains bridge rectifier at L6. Q1701 acts as a chopper transistor, controlled by IC1701,



Remove R623 to isolate the line stage. This is the feed resistor into pin 2 of the flyback transformer

the output being rectified by D1703 which has C705 as its reservoir capacitor. Note that when the module is incorporated the value of C705 is reduced to

Fig. 11: Location of R623 in the feed to the line output (flyback) transformer.

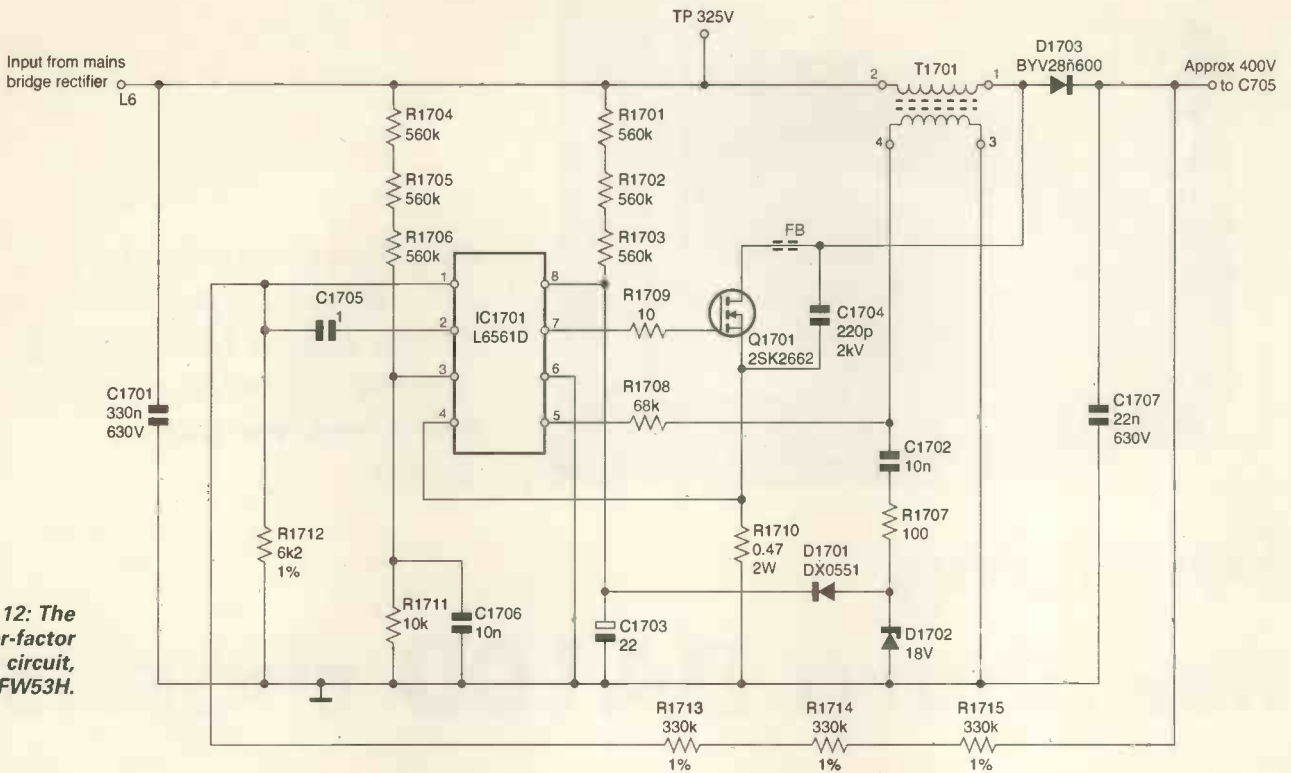


Fig. 12: The power-factor correction circuit, Model 56FW53H.

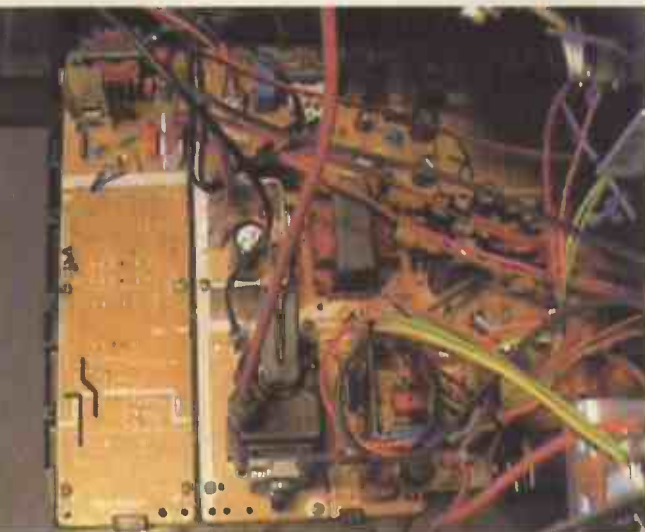
68 $\mu$ F while its voltage rating is increased to 450V (instead of 220 $\mu$ F, 385V as shown in Fig. 6).

Fig. 13 shows the power-factor correction PCB in 66 and 76cm models – it's on the left. Fig. 14 shows the power-factor correction PCB used in Model 56FW53H: as shown in Fig. 15, it's mounted at the front of the set, underneath the CRT.

### High HT

In some fault conditions the HT can rise to over 200V, which can cause damage in other parts of the chassis, see list below. The usual cause of high HT is failure of the power supply voltage-regulation feedback optocoupler IC705. This device is easily damaged by excessive heat while being soldered. So keep your soldering

Fig. 13: The position of the power-factor correction PCB in 66 and 76cm models – it's on the left.



iron turned down to below 250°C, and don't solder any leg for more than ten seconds. If these conditions are not adhered to the transparent barrier between the LED and optotransistor sections will be damaged. Note that sometimes, when the optocoupler has been damaged whilst being fitted, the set will work for several weeks or months.

To prevent damage to other parts of the circuitry should the HT rise an avalanche diode (D735, see Fig. 5) was added in parallel with the HT reservoir capacitor C720 from late 1999 production. It has a rated maximum voltage of 170V and will go short-circuit when this voltage is reached. The diode, part no. RH-EX0875BMZZ, should be included in all sets. Fig. 16 shows the position of D735, on the print side of the PCB. Note the use of hot-melt glue to prevent the diode from shorting to adjacent tracks.

When the avalanche diode is incorporated only four items generally need to be replaced in the event of a high-HT fault. These are D735, Q601, IC705 and C720. This is because D735 prevents further damage. A Sharp kit, part no. FWSERVKIT01//, contains these four items.

If the diode is not fitted the following components should be checked for damage before switching the set on:

Q601, the line output transistor, part no. RH-TX0192BMZZ. It becomes leaky or goes short-circuit.

IC301/2, the audio output ICs, part no. VHITDA7480/-1. These can go short-circuit. Also check the supply feed chokes L315, L316, L350 and L351 (part no. VP-CF3R3K0000). Fig. 17 shows the location of these components.

IC1801, the RGB output chip on the CRT base PCB. See Part 1 for the part no. It goes short-circuit. Check that the resistance at pin 5 is greater than 500 $\Omega$  with respect to chassis.

C720, the HT reservoir capacitor, which can be physically damaged. Part no. depends on value, see previous note.

IC1301, the centre-channel amplifier, part no. VHITDA7480/-1. This goes short-circuit. It's located on the centre-speaker PCB, see Fig. 18.

Q5407, part no. VS2SA1837// -1, and Q5408, part no. VS2SC4793// -1. These are the scan velocity-modulator transistors, which are mounted on the CRT base PCB. They can go short- or open-circuit. See Fig. 19 for the location of these items (and IC1801).

The CRT base PCB suffers under the high-HT condition. In this case all the electrolytic capacitors usually have to be replaced.

The moral is, don't run the set under the high-HT condition.

### No power-supply operation

No power-supply operation can be caused by a number of



components, the most common failures being around the primary-side control chip, IC702. If the supply to pin 1 of this IC falls below 5V, the operation of the power supply becomes unreliable. Though the power supply is quite complex, only a few components cause problems.

For low supply to IC702 check R770 (220Ω or 270Ω safety), R771 (470kΩ, 1W), R721 and R703 (both 150kΩ). R771 is connected to the gate of Q715.

The 5V regulator IC707 on the secondary side of the circuit can fail, the result being a set that doesn't turn on even though the power supply starts up.

No power-supply operation or low HT (about 30-40V) can be caused by R713 and R714 (560kΩ, 0.5W) going high in value or breaking down under load. It's important to check these two resistors by substitution, as they can read OK with a meter though they are faulty. They must be of the metal-film, not carbon-composition, type.

### Other power-supply problems

The cause of erratic remote-control operation has been traced to several components in the power supply. The symptoms normally encountered are no remote-control operation or intermittent control of volume, either increasing dramatically or rising slowly with the OSD visible. D729 (see Fig. 6) can be the cause but it's more common for noise to enter IC702 which then produces spurious remote-control commands that reach the main microcontroller chip IC1001. To prevent this happening, fit a 470nF, 16V surface-mounted capacitor (part no. VCKYTV1CF474Z) across the input (pins 1 and 3) to the

optical diac IC708, see Fig. 20. This capacitor was fitted during production of all GF and HW models.

Intermittent failure of the chopper transistor Q701 can be caused by dry-joints at the

components in the snubber network (D711, C710, R715) or poor connections to the mains rectifier's reservoir capacitor C705. Q701 must be the correct type, S5F10N80A (part no. RH-TX0198BMZZ). Use of an

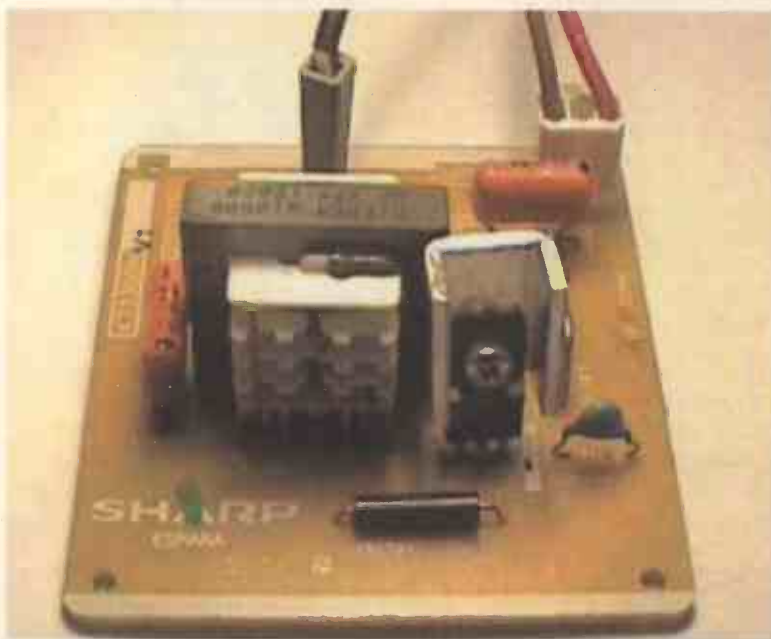


Fig. 14: The power-factor correction PCB used in Model 56FW53H.



Fig. 15: Location of the power-factor correction PCB in Model 56FW53H.

### Location of Power Factor PWB

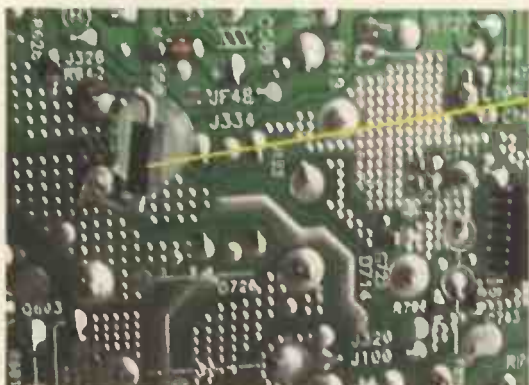


Fig. 16: The location of avalanche diode D735. Note hot-melt glue (see text).

Location of D735 on the print side of the PWB



Fig. 17: Location of the audio output stage components on the main PCB.

incorrect transistor can result in a power supply that doesn't work, causes excessive RF interference or is unreliable.

If there's a mains surge or lightning strike Q701 will invariably fail. D712, Q702, Q703 and R716 will also have suffered damage, as will the bridge rectifier diodes D701-4. To prevent further failure it's advisable to replace all these components, even if they do not appear to be faulty.

The programmable zener diode IC706, which drives the feedback optocoupler IC705, can cause high or low HT. Its part no. is RH-IX1704BMZZ.

Erratic operation of the main microcontroller chip IC1001 can be caused by the 3.3V supply rising to 5V because of failure of Q710, Q711 or Q712 in the 3.3V regulator circuit. Check for 3.3V at the emitter of Q712.

### The line output stage

As in previous Sharp chassis a transformerless line driver stage is used, with its running voltages obtained from the line output transformer T601. Fig. 22 shows the basic line driver and output stage circuitry.

At switch on 8V from the power supply is fed to the collector of Q603 via R605 and to the collector of Q602 via R628 and R608, while -16V is applied to the emitter of Q602 via R619. Line drive pulses from pin 50 of IC801 are fed via inverter Q802 to the base of Q603. As a result Q603/2 and the line output transistor Q601 are brought into operation. The waveforms that appear at pins 6 and 10 of T601 are rectified by D610 and D611 respectively to produce the running voltages for the driver stage.

When the drive signal is high,

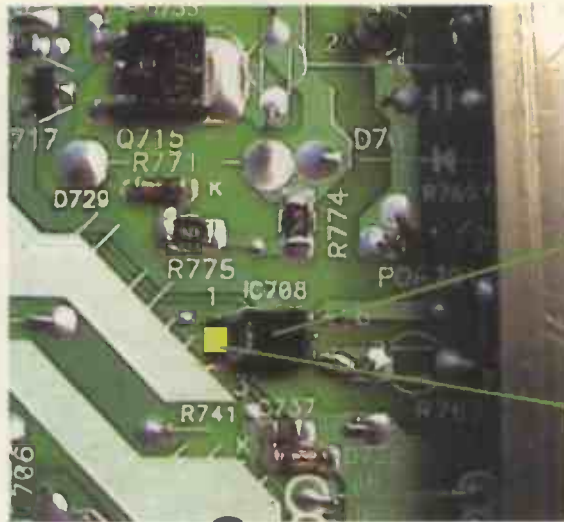
the emitter of Q603 goes high, switching Q602 on. The voltage at the collector of Q602 falls, and Q601 switches off. Conversely when the drive signal goes low Q603/2 switch off and Q601 switches on. As the current drawn from the 8V supply via R608 and R628 (both 1k $\Omega$ ) is minimal, Q601 doesn't turn on fully. But it does energise T601 sufficiently for secondary-winding voltages to be produced. When D611 conducts Q601 switches on harder, until the drive signal goes high to start the next cycle.

Once the line output stage is running, D611 provides a low-impedance, high-current path to turn Q601 on. D610 does the same to switch Q601 off. These low-impedance supplies are required to ensure that the output transistor spends a minimal amount of time on the linear portion of its characteristic. When Q601 is



Centre speaker PWB IC1302 - IC1300 is an SMD device mounted on the print side of the PWB

Fig. 18: Location of the centre-speaker PCB.



IC708  
Location of SMD capacitor

Fig. 20: Location of the SMD capacitor at IC708.



Fig. 19: Position of CRT base PCB components that can fail under high-HT conditions.

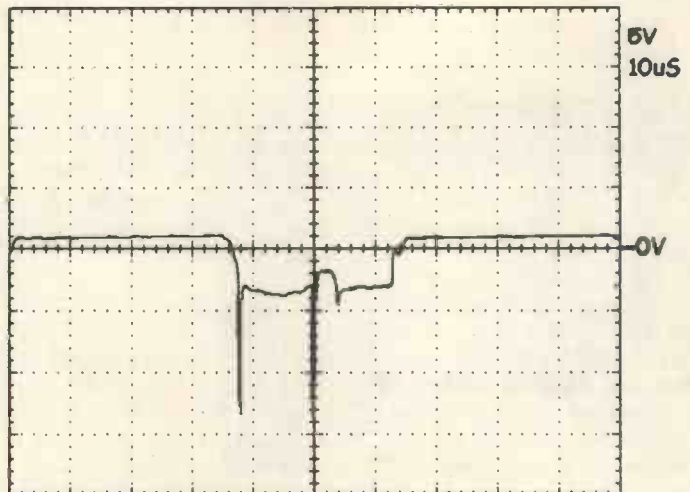


Fig. 21 Drive waveform at the base of the line output transistor Q601.

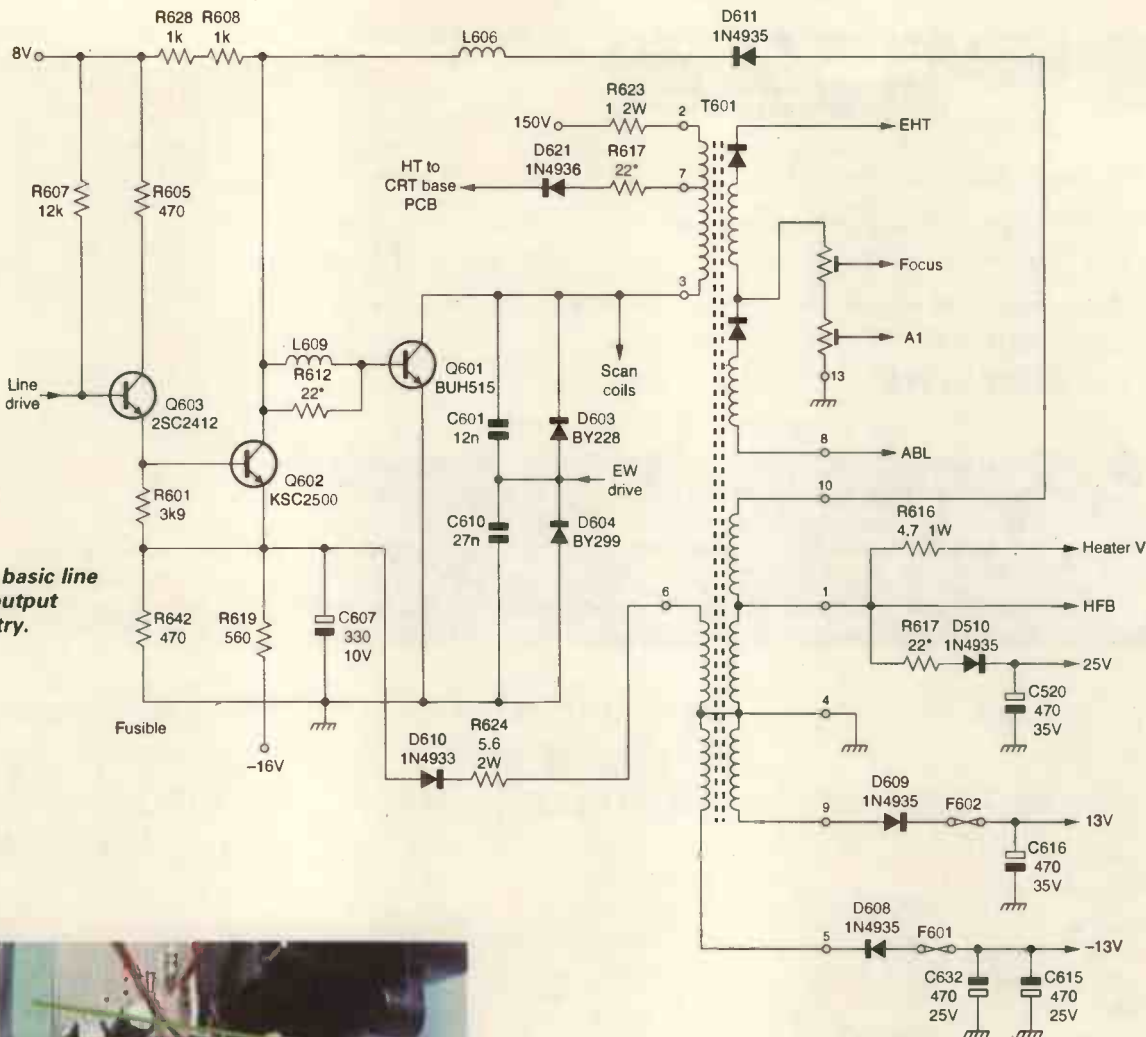


Fig. 22: The basic line driver and output stage circuitry.



C613  
R623  
C632

C604 Q601

Fig. 23: The location of various components in the line output stage. C613 is the scan-correction capacitor.

switching between on and off or off and on power is generated and is dissipated as heat. Thus Q601 can fail if it takes too long to switch on or off.

With this driver arrangement it's essential that the circuit is started softly. For this reason the line drive frequency is doubled initially, effectively reducing Q601's on time, until the run

voltages have been established.

In addition to producing the EHT, focus and first-anode voltages for the CRT, T601 produces  $\pm 13V$  supplies for the field output stage - D609 rectifies the pulses at pin 9 while D608 rectifies the pulses at pin 5. Line flyback pulses (HFB) from pin 1 are fed to IC801 for timing and safety (to prevent excessive EHT)

purposes. These pulses are also rectified by D510 to produce a 25V supply for the field flyback. The pulses at pin 7, sitting on the HT supply, are rectified by D621 to produce the voltage required for the RGB output stages.

Finally a negative-going voltage obtained from pin 8 is used for the protection circuit. This voltage is proportional to the beam current. The greater the beam current the greater this negative voltage, which is linked to pin 95 of IC1001 via zener diode D622 and Q606. Should this voltage exceed the safe working level, pin 95 of IC1001 will go low and the set will be switched to standby (no power supply operation).

Fig. 23 shows the location of various components in the line output stage. Fig. 21 shows the drive waveform at the base of Q601.

### Next month

We'll continue next month with the focus modulation (66 and 76cm models) and EW drive circuits, and provide fault-finding guidance on the line driver/output stages. ■

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Your address and telephone number will not be published but your e-mail address will unless you state otherwise.

Please send ONLY text intended for the letters page. Correspondence relating to subscriptions and other matters must be sent to the office address given above.



## Timer/VideoPlus problem

Over the past two weeks we've had five Panasonic VCRs with the same reported fault, no timer of VideoPlus operation. The machines were all different models, between four and eight years old, and on checking the clock/calendar settings we found that they were all stuck at 10 July 2003. There's an option of auto or manual clock setting, and all were set to auto. Resetting the date on manual cured the problem.

Panasonic says this fault has been reported only in Devon and Cornwall. It's to do with alterations to the BBC1 teletext signal, which this range of VCRs uses to set the time and date automatically.

*Steve Hague,  
Redruth, Cornwall.*

## Hints and tips

I was interested to read Geoff Darby's letter (September, page 692) in which he described the use of Brasso wadding to remove scratches on CDs. When I was at Liverpool University in 1970 I used to supplement my grant by making pendants that consisted of two pieces of Perspex glued together, shaped with a file and sandpaper, then finished off with Duraglit wadding. As a sideline I polished out scratches in watch glasses. I have used Brasso wadding to fix scratches in CDs since they first appeared on the market. It helps if you finish off with radial rather than circular strokes. For deep scratches in Perspex I start by 'frosting' with 400 grade sandpaper and finish off with wadding, but I wouldn't recommend this for CDs.

While on the subject of handy tips, it's a good idea to visit your local photographic shop and ask for a bag of empty (used) film canisters. These plastic containers have a multitude of uses. I wrap ICs in antistatic polythene, pop them

inside a film canister and post or store them in this way. The canister prevents the pins from being crushed. You can also use them for storing small amounts of grease, nuts, bolts and various small components. My wife uses them for transporting small amounts of talcum powder etc. when we go on holiday.

*Martin Pickering,  
Sandbach, Cheshire.*

## Battery polarity protection

I recently had in for repair a Tait 2000 two-way radio that's used by car-rally marshalls. These units tend to be passed around and used in inauspicious conditions. The radio had a pair of crocodile clips and had been connected to a 12V car battery the wrong way round. The protection features did their job, but there was damaged print. So repair was necessary, and I gave some thought to what could be done to prevent a repeat. The result was the circuit shown in Fig. 1.

Relay RLA has normally-open contacts. If the radio is connected to the battery the wrong way round, the relay provides protection while the red LED and buzzer provide a warning. When the radio is connected the right way round, D2 energises the relay whose contacts close to provide power. The green LED indicates this.

The circuit could be used to protect anything that might be powered from a 12V car/truck battery, for example a 12V portable TV set. I built the initial prototype in a small box in the lead, and have since built several more. With some older 12V portable TV sets the circuit could be built into the set. The relay is a 12V DC type with 10A normally-open contacts. Obviously the design could be adapted to meet various needs.

*Jim Littler,  
Wigan, Lancs.*

## Those were the days

Most elderly TV enthusiasts will recall the famous EF50 valve with its inherent contact problems. I once sold an elderly Pye Model D18T, which had a

complement of red EF50 valves. Why were they favoured in comparison with the silver types? Was it just the appearance? Anyway the set had a problem that we couldn't cure – intermittent sound. The lady who bought it got used to giving the cabinet a smart tap, which usually provided a temporary cure. A sore hand made this painful however, so she got a hammer and wound a duster around its head to protect the cabinet from damage. I seem to recall that this was quite effective, but the odd thing was that she wouldn't move the set to dust it in case she damaged it!

*Philip Bearman,  
New Barnet, Herts.*

I wonder how many people recall aerial erection in the early days of TV? Prior to the start of transmissions from Sutton Coldfield it was a two-man job that took four-six hours to complete. The old-established family firm I worked for believed in first-class workmanship. For example each aerial was earthed, to assure customers that the huge metal object was safe from lightning strikes! So an earth cable was run down with the coaxial cable, taped every foot then wrapped with a strand of lashing wire and eased under the roofing tiles to hold the cable firm. The earth rod was driven into the ground as a short run was required. This was difficult when the ground was covered with concrete! Lashing cable had to be properly spliced to the cable eyes – no U-bolts were allowed.

As there were few aerials in the district to line up with, aerial orientation was based on a bearing on an OS map and use of an ex-services fluid-mounting compass. You couldn't rely on the availability of test transmissions. Even later they were on for only two hours in the morning.

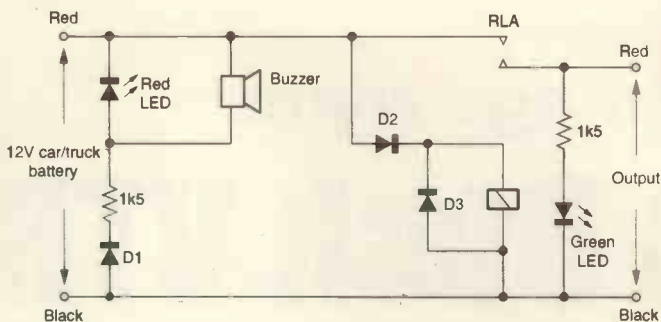
The only lightning strike we had was a direct hit – tiles off the roof and the coaxial cable and earth wire vaporised in short sections. The set was a 9in. Ferguson TRF table model that had cost about 39 guineas. It was amazing that the strike only smashed the first RF amplifier

valve (EF91). It then went to the volume/on-off switch, which was destroyed, and after that round the room, piercing the twin plastic mains cable in several places. On reaching the only power socket in the room, a cooker outlet, it blew the entire cast-iron cooker unit off the wall!

Unusual TV faults dealt with in the field could be very time consuming. For example a local farmer complained that ITV went off at tea time, BBC remaining OK. The set was a Bush Model TV125. We eventually established that the PCF86 mixer/oscillator valve failed to oscillate at the higher frequency, but the actual cause was mains supply loading (voltage drop) when the milking machines were brought into use! The width and height were unaffected, which masked the cause of the trouble.

On another occasion the problem was colour drop-out on ITV only with a Körting hybrid set. Suspecting a gate-pulse timing problem, we fitted an exchange colour decoder module. This made no difference, so the set was taken back to the workshop for a prolonged soak test. No fault was found, and the set was subsequently taken back to the customer – where it failed at teatime!

**Fig. 1: Jim Littler's battery-polarity protection circuit. All diodes are type 1N4001. See text for relay details.**



We began to suspect some rogue radiation, and eventually traced the cause to an old Defiant set in the adjacent semi-detached house – the sets were back-to-back. This Defiant set radiated a harmonic signal through the wall when on BBC. Some diplomacy was required to sort this one out!

Ron Bourne,  
Cheddleton, Staffs.

### Nokia monitors

With reference to the excellent feature on servicing Nokia monitors (July and August issues), a fault I have had with the Dell D1025HE 1000HS series (Nokia 447S061) is a blackened, blown mains

fuse caused by an internal short-circuit in the mains bridge rectifier's reservoir capacitor. When I examined the capacitor, which was made by Siemens, I found that it had a hole in its side. It is easy to overlook this and waste time checking the degaussing posistor etc.

I have also had the line output transformer (Eldor FJ3000) in the 447S061 catch fire, with flames that had to be blown out when the monitor had been disconnected. This could be dangerous.

I have come across Nokia monitors with Zenith shown on the front.  
Mark Garton,  
Bromsgrove, Worcestershire.a

# HELP WANTED

The help wanted column is intended to assist readers who require a part, circuit etc. that's not generally available. Requests are published at the discretion of the editor. Send them to the editorial department or email to [t.winford@highburybiz.com](mailto:t.winford@highburybiz.com)

**Wanted:** Spares for the Thom 3000 CTV chassis, including EHT/scan transformers and A1 switches. N. Dobson, 19 Romney Drive, Carrville, Durham, DH1 1LS. Phone 01913 865 387.

**Wanted:** Circuit diagram (photocopy OK) for the Panasonic Model DVD-A160, as IC1021 is missing. Alternatively I might be interested in a working power panel. Phone Jeff Buck on 01206 791 128 (Colchester) or email [jefbuck@yahoo.co.uk](mailto:jefbuck@yahoo.co.uk)

**Wanted:** Information to identify the control chip U801, an 8-pin DIL device, used in the Proline DVD player Model DVD2500. The chip has blown its top off, destroying the identification. Derek Castle, 16 Cleveleys Court, Cleveleys Avenue, Holbeck, Leeds, LS11 0AX. Phone 01132 774 047.

**Wanted:** Service manual (photocopy OK) for the Pioneer CD player Model PD-M50 to help with laser replacement. Hannas Electrical, 10 Cross Street, Enniskillen, BT74 7DX. Phone 02866 342 822.

**Wanted:** For spares, Quad 303 and 405 power amplifiers, 33 and 44 preamplifiers and FM2 and FM3 tuners. Working or non-working. Phone Mike on 01758 613 790.

**For disposal:** Copies of *Television* from 1975 to date, U-View circuit books, manuals, parts, test equipment, etc. Phone David on 01519 321 419 (Merseyside).

**Wanted:** User manual for the HP digitising oscilloscope type 54501A. Photocopy OK. Will cover costs. Phone Charles Coultas on 01189 785 713 or email [charles@dataskil.com](mailto:charles@dataskil.com)

**Wanted:** Service manual or circuit diagram (photocopy OK) for the Sharp SM-32 amplifier. Also information on the drive used in the Sharp CP-32E speaker system, such as manufacturer, part numbers or part availability. Whole units of either product would be of interest to me. Phone Andrew Fell on 01444 248 389 or email [andrew@fell.goiinternet.co.uk](mailto:andrew@fell.goiinternet.co.uk)

**Wanted:** Old half-inch diameter ferrite rods. Must be six inches or more long. Willing to pay very good money for them. Peter Tankard, 16A Birkendale Road, Sheffield, S6 3NL. Phone 07931 463 823 (mobile) 9 a.m. to 10.30 p.m.

**Wanted:** IC type TDA4429T. It's an IF amplifier used in an old Sony tuner. If anyone can help, please contact Rod Tyler, Tyler TV, Petworth, West Sussex. Phone/fax 01798 342 210 or email [r@rtyler60.fsnet.co.uk](mailto:r@rtyler60.fsnet.co.uk)

**Wanted:** The four push-button controls (volume, prog. etc.) on the front panel of an Alba Model CTV4809 no longer work though the set is

otherwise OK. Please phone or write if you can help with this fault. I don't have a manual. Ron White, 29 Nunnery Street, Castle Hedingham, Essex, CO9 3ND. Phone 07751 674 650 after 6 p.m.

**For disposal:** I have free for collection *Television* magazines from 1977 to 1989. John Clarke, 27 Northumbria Close, Prospect Hill, Worksop, Notts, S81 0SU. Phone 01909 486 438.

**Wanted:** Front cabinet for the 29in. Sony Model KVE2925. The part no. is X42000793. It's probably used in other models. Please phone Stephen on 01932 341 854 or email [sachpman@fsmail.net](mailto:sachpman@fsmail.net)

**Wanted:** A service manual or any servicing information on the Philips LaserVision Models 22VP600 and 22VP700. M. Stephens, 283 Blackburn Road, Haslingden, Rossendale, Lancs, BB4 5JG.

**Wanted:** Working text board for the Philips Anubis A AC chassis, using SAA5246AP/E, M5156AL-12 and PCF84C81AP/098 chips. All costs paid. Please phone 01483 720 022 (Woking, Surrey) or email [tvaudio@waitrose.com](mailto:tvaudio@waitrose.com)

**Wanted/for disposal:** Does anyone know of a source of plastic push-buttons suitable for the Quad 22 control unit? I have for disposal 130 vintage radio valves (1920s-1950s) plus other interesting components. Offers for the lot – phone or email for a list. I also have a 1950s Ekco VHF radio, working but needs attention, and a 1977 Thorn 9000 series colour TV set in excellent condition, with manual, stand, two remote-control units and lots of spares. These are both free for collection. Phone Steve Sheppard on 01588 660 519 or email [steve@jnb384.free-online.co.uk](mailto:steve@jnb384.free-online.co.uk)

## Vintage repair:

# A Bush VTR103 radio

Pete Roberts tackles an AM/FM radio that failed to provide reception in any of the bands. The use of germanium transistors had some advantages in terms of performance quality



Photo 1: Appearance of the Bush Model VTR103, an AM/FM receiver that dates from 1962.

How's this for a classic? A three-band Bush radio Model VTR103 dating from 1962, with VHF coverage 88-100Mc/s (we'll drop Hz this time to keep in the spirit of things). Photo 1 shows the receiver, and Photo 2 the internal layout. The fault report was no reception, just crackling. I connected the receiver to my bench power supply, set for 9V output, and found that the current consumption was 20mA (spot on for MW/LW reception). So there was obviously nothing seriously wrong.

### Circuitry

The set is fairly complex compared to most radios of

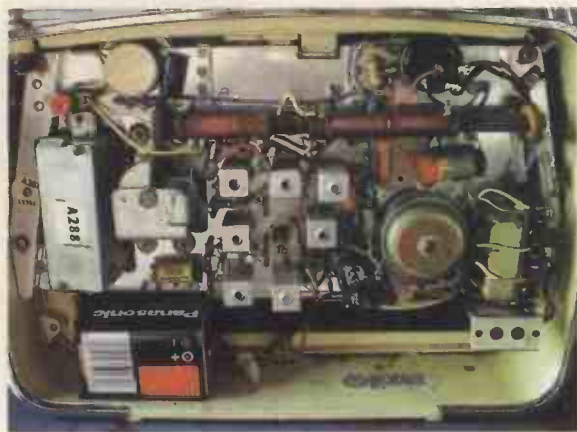


Photo 2: Internal layout of the VTR103.

the time. Unlike the two-band TR82, the RF/IF stages use the then new Mullard alloy-diffused junction transistors. Starting from the front end, the VHF tuner has an AF114 RF amplifier followed by an AF115 self-oscillating mixer, both operated in the common-base mode. The MW/LW mixer/oscillator, which acts as the first IF amplifier for VHF reception, and the two following IF stages all use AF116 transistors. The VHF IF is 10Mc/s, the AM IF 470kc/s. An OA90 diode is used for AM detection while a pair of OA79 diodes is used in the FM ratio-detector circuit.

The audio section starts with an OC71 preamplifier transistor which is followed by an OC81D driver transistor. This is transformer-coupled to the OC81 output transistors, the secondary winding on the driver transformer having a centre-tap that's connected to chassis. The output stage is very nice: it's a balanced push-pull type with a meaty valve-radio sized output transformer. The transistors are pnp types throughout, with their emitters fed from the 9V rail.

### Fault finding

I decided to tackle the loss of AM signals first. Touching the wiper of the volume-control potentiometer produced a healthy mains hum, so the audio stages were working – it never ceases to amaze me how quiet germanium amplifiers can be compared with modern silicon circuitry. Measurements around the three AF116 transistors produced voltage readings close to those shown on the circuit diagram.

The AF11X range of transistors are housed in large TO7 cans. They all suffer from a peculiar problem: the collector develops a short-circuit to the case. This is caused by a conductive whisker forming in the silicone compound that's used to protect the transistor wafer. The transistors in the VTR103 were all OK in this respect however.

Further experimental signal injection (touching various points with a screwdriver in contact with my finger) produced hash when the base of the final IF amplifier transistor was contacted but nothing when the base of the transistor in the previous stage was contacted. So I replaced the first IF transistor, using an AF126. This is the later version of the AF116, in the much larger TO74 can. Voila – up came medium- and long-wave reception. But there was still no VHF reception.

When the set is switched to VHF, signal injection of the type just described should result in short-wave noise (10.7Mc/s is about 30 metres). But I couldn't raise a cheep anywhere while poking about in the RF/IF stages. So I decided to adopt the 'official' approach and



brought out my trusty Advance E2 valve signal generator, allowing it to warm up for the recommended twenty minutes! While waiting, I checked the two OA79 diodes in the ratio-detector circuit: they were both OK.

When I injected a high-level amplitude-modulated 10.7Mc/s signal at the collector of the final IF amplifier transistor there was the expected distorted 400c/s tone, but silence when the probe was transferred to the transistor's base. What sort of transistor fault can give correct DC conditions and satisfactory operation at 470kc/s but no results at 10.7Mc/s? I've long given up applying what some call "logical deduction of fault conditions". In went another AF126, and the result was short-wave noise when I touched the VHF tuner's IF output. But still no VHF reception.

The VHF tuner is in a separate screening can and uses permeability tuning, with an RF amplifier stage and a self-oscillating mixer. Access is easy: undo two 6BA nuts and the tuner housing can be slid off, revealing both sides of the PCB and the permeability tuner with its cord-tensioning spring, see Photo 3. Once again voltage checks around the two transistors produced readings close to those shown on the circuit diagram.

Now where I live, at Runcorn, I am not only at the top of a multi-story building which is itself sited on top of a hill, but I'm also in the primary service area of the Holme Moss transmitter and surrounded by strong local-radio transmitters. So I have to be very careful when servicing VHF/FM receivers as the signals here are so strong across the band that a set with a dead RF amplifier can still hit the limiting level. Thus in my workshop a VHF radio with working IF stages means just one thing: a dead mixer/oscillator.

After replacing the AF115 mixer/oscillator transistor with an AF125 I was rewarded with excellent VHF reception and, surprisingly, no realignment was required despite fitting the physically much smaller AF125 – all stations appeared at the correct points on the alignment check dial (see Photo 4).

Something else that surprises me is how low the inter-station noise is with these old receivers. I've noticed this with most of the early Sixties gear I've serviced: there's nothing like the raucous hash you get with modern equipment. One thing I did notice, with our crowded VHF band, was 'birdying' because of poor image rejection, though this was significantly reduced when the tuner's screening can had been refitted. Of course this forty-year old radio receiver was originally designed to receive just three widely-separated stations at nothing like the field strengths we have today.

### Capacitors

The electrolytic capacitors in this Bush receiver are all those attractive two-tone Plessey ones I liked as a boy and still like now. Even the labels were in good nick. Experience has shown that these capacitors continue to be pretty reliable even after all these years. The low quiescent current proved that none of the decouplers were leaky, so I left them all in place.

Likewise the Hunts moulded capacitors. Now I know that these had a very bad reputation when used in valve radios and TV sets: the cases crack and the paper dielectric becomes leaky. I remember, when I were but a lad, watching Hunts Supamolds going up in a puff of smoke when a particularly ratty old radio was first plugged in after years of disuse. In a transistor set however the capacitors aren't subjected to the high temperatures that damage the moulded casing, nor are they run at anything near their rated voltage. I've never had reason to replace a Hunts moulded capacitor in a transistor radio.



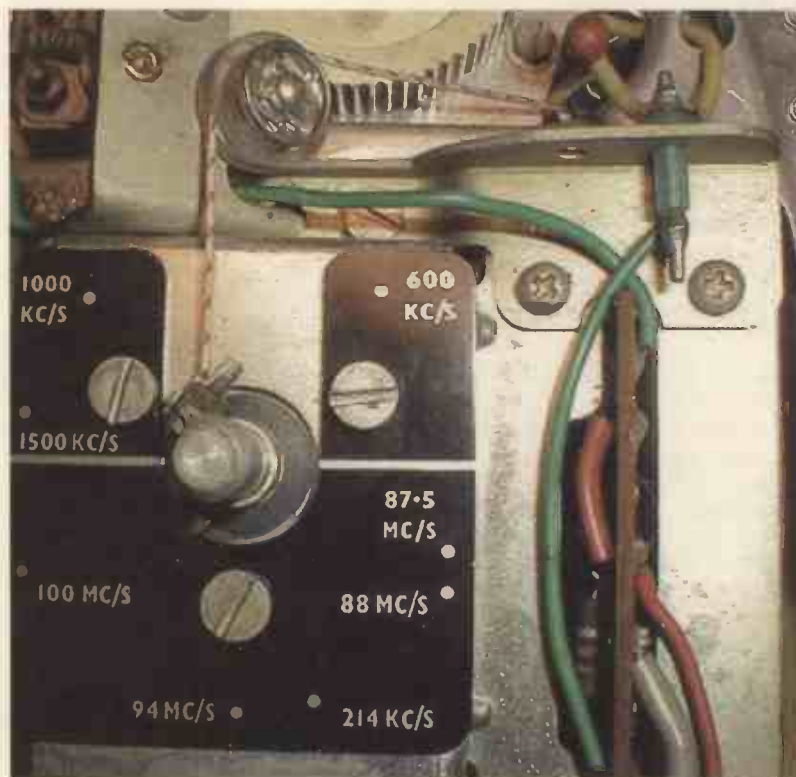
Photo 3: The VHF tuner, after removal of its screening can.

### Chassis removal

I really dreaded one part of the job: removing the chassis. This is held in place by four screws that are easy to remove, but you also have to pull off that tuning knob! And after forty years it was tight. The recommended method of removal is to pull it off with a sink plunger but, having run out of these, I had to resort to other methods.

One thing you must never do is to try to prise the knob off with a screwdriver – that approach is guaranteed to crack it. I had to ease my not particularly dainty fingers under the knob, helped a bit by longish nails, then slowly and carefully rock it back and forth while pulling it gently. After about five minutes the knob relinquished its grip on the tuning gang's shaft. This particular radio is of great sentimental value to its owner, so I had to take the greatest care. There's a moral here: avoid trimming your nails before dismantling a Bush radio!

Photo 4: The alignment check dial.





# DVD

**Fault reports from  
Geoff Darby  
Chris Bowers  
and  
J.S. Ogilvie**

We welcome fault reports from readers – payment for each fault is made after publication. See page 745 for details of where and how to send reports.

## **Samsung DVD-S224**

The symptoms produced by a defective laser can be many and varied. A fairly common one is failure to play one type of disc, usually either CD or DVD. It's often not appreciated that there are usually two laser diodes in the optical block, and of course either can fail.

As a general rule if one type of disc plays and the other doesn't the optical block is the first suspect. There can be other causes however, including servo trouble, because different servo processing systems may be used for playing different disc types, and spindle motor trouble,

because the rotational speed for playing a DVD is much higher than for playing a CD. I've also known corrupt software to cause problems between media types.

This particular unit would play CDs but wouldn't spin a DVD up to full speed and play it. This could have meant a suspect spindle motor. But in this machine the motor is an electronically-commutated direct-drive type rather than a conventional DC type with brushgear, and these are in general reliable in this application.

So I fitted a replacement laser from stock. This restored normal playing of all types of disc. **G.D.**

## **Sony HCD-S300**

This home-cinema unit produced crackles, pops and hisses in varying degrees from all channels, more predominantly from the surround channels. There didn't appear to be any disturbance at the inputs to the power amplifier ICs, nor on their supply rails. So, reluctantly, I replaced them all.

This cured the problem, but these TA2020-020 digital amplifier ICs are not cheap. At over £30 each it was a very expensive repair. I wonder whether all three were from a faulty batch? **G.D.**

## **Panasonic DVD-LA65**

This nice little personal DVD player, with widescreen LC display, wouldn't read discs. From the top, it didn't look as if the laser was fully home. So the unit was

dismantled and the deck was removed. This whole operation is very simple, involving simply removal of all the obvious-looking screws in the bottom, separating the case top half from the bottom, unplugging the deck, and lifting it off the locating spigots – it's not screwed in.

When the deck was out I found that the laser worm drive felt stiff. The laser and drive were easily removed from the deck, by undoing the two screws that secure the sled-motor cover plate. Once the laser and its worm drive were out, the worm was indeed found to be stiff in the laser. I screwed it out carefully, cleaned its grooves, relubricated the bearing and interface pawl surfaces, then screwed the worm back in. After that it rotated freely and smoothly.

The laser and drive were then refitted to the deck and the whole unit was reassembled. When tested, it played discs faultlessly and performed chapter jumps quickly, quietly and correctly as requested. **G.D.**

## **Sony DVP-NS305**

There was no audio from the scart connector at the rear of this unit. A quick call to Sony technical provided a possible cause, bad or poor contacts at connector CN203 on board AV61. Resoldering the contacts restored correct operation. **C.B.**

## **Sony HCD-S800**

There was no DVD operation. Checks at connector CN008 on the DVD board showed that the 12V supply was missing. The cause was traced to a faulty 10µH inductor, L904, on the power board. The part no. is 1-414-398-11. **C.B.**

## **Sony DVP-NS300**

This unit had no power. I soon found the cause when I checked the supply lines on board IF80 with a meter. The 1A chip link PS401, part no. 1-576-509-21, was open-circuit. A replacement restored power. **C.B.**

## **Oritron DVD600**

I'd never heard of this one before. It came in dead. On checking I found that the main reservoir capacitor C802 (33µF, 400V) had leaked and as a result U801 (TOP223P) had failed. I couldn't find this device listed anywhere. It looks like an 8-pin IC, but six pins are shorted together. So I obtained a TOP233Y with a slight modification, fitted it and found that the player came back to life. I let it run for a day to make sure. **J.S.O.**

## **Pioneer DV515**

If there's no drawer operation, check whether circuit protector P103 (800mA) is open-circuit. **J.S.O.** ■

**D-GEN** A breakthrough in low cost pattern generators this new design has 14 display outputs at 512\*288 resolution, including three full testcards of 4:3 and 16:9 ratios. Composite, S Video, SCART - RGB and Audio outputs, runs on batteries or 8-12V DC adapter.

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Note: Unit is software upgradable

**Full parts kit to build the D-GEN, £75.**



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# DX and Satellite Reception

Terrestrial DX and satellite TV reception reports – July was another remarkable month for SpE activity. Broadcast and satellite TV news. The HS Publications D500 DX-TV converter for low-band VHF reception reviewed. Roger Bunney reports



Young Germans at a live Brandenburg Gate pop concert, seen via Eutelsat W1 (10°E).

July 2003 was another remarkable month for Sporadic E reception. It was as good as anything since I first started DXing in the mid Sixties, when SpE signals in Band I were intense, very strong and of long duration. This time round, records have been broken. See later for a report on Band II FM radio reception from across the Atlantic – both the US and Canada!

The advent of PC radio scanners such as the Icom IC-PCR1000 has made it possible to measure carrier offsets to a few Hz. This has led to confirmation of reception at distances previously thought to be impossible. Often such below-threshold signals do not register with a conventional scanner, and certainly won't produce an image on a TV screen. Unless such reception is unique, it won't be mentioned here.

The July SpE log is as follows:

- 1/7/03 RAI (Italy) chs. IA and B; TVE (Spain) chs. E2-4.
- 3/7/03 TVE E2; IZ (TVE Izana, Canary Is) E3.
- 4/7/03 RAI IA; TVE E2.
- 6/7/07 MTV (Hungary) R1; SVT (Sweden) E3; RAI IA, B.
- 7/7/03 RAI IA, B; ch. A2, 3 (see later).
- 8/7/03 RAI IA, B; TVE E2-4; C+ (Canal Plus, France) L3; IZ E3; SVT E2, 3; YLE (Finland) E3; ORT (Russia) R2; RTL (RTL Klub, Hungary) R2.
- 9/7/03 RAI IA, B; RTL R2; RTP (Portugal) E3; ch. A2 video, see later; TVE E2-4; SVT E2, 3; YLE E3; NRK (Norway) E2.
- 13/7/03 YT (Ukraine) R2; RAI IA.
- 15/7/03 TVP (Poland) R2.
- 16/7/03 RAI IA.
- 17/7/03 TVE E2, 3; RAI IA, B; ETV (Estonia) R2.
- 18/7/03 RAI IA, B; TVA (Italy) E2; CRO (Croatia) E3; TVE E2; RTP E3.
- 19/7/03 RAI IA, B; TVA E2; LTV (Lithuania) R2; C+ L4; TVE E2, 3; RTP E3; IZ E3; YT R1, 2; MTV R1; RTL R2; JTV (Jordan) E3.
- 20/7/03 TVE E2-4; IZ E3; RAI IA, B; NRK E2, 3; ARD (Germany) E3; MTV R1.
- 21/7/03 NRK E2-4; SVT E2-3; RUV (Iceland) E4; ORT R2; RAI IA, B; TVE E2-4; MTV R1.
- 22/7/03 RAI IA, B; TVE E2-4; SVT E2-4; NRK E2-4; RTL R2; RAI IA, B.
- 23/7/03 TVE E2; CRO E4; RTL R2; RAI IA, B.
- 25/7/03 RAI IB.
- 26/7/03 NRK E2, 3.
- 27/7/03 RAI IA; TVE E2-4.
- 28/7/03 RAI IA, B; C+ L3; TVE E2.

The heatwave over the 12-14th produced enhanced tropospheric reception, with Band III/UHF signals from Germany, Norway and the Benelux countries.

The 7th was a remarkable day. Cyril Willis (King's Lynn) received ch. A2, A3 and A4 signals from the US and Canada using his Icom PC scanner. Ch. A3 included a Mary Tyler Moore interview, ads. etc. One of several ch. A2 signals received was identified as WPBT-TV ch. 2 Miami, at 2145 GMT. Unidentified ch. A2 video/audio was received on the 9th. On the 21st at 1455 GMT there were traces of ch. A4 Venezuela.

Hugh Cocks in the Algarve has confirmed reception of Telemundo-TV ch. A2 from Puerto Rico at 2200 GMT on the 3rd. Transatlantic TV had been received on five consecutive nights at that time!

Evidence of high transatlantic activity has come from an amateur radio DXpedition to St. Pierre Island (Nova Scotia) from June 12 onwards. It seems that European ch. E2 video was present most of the time every day!

An outstanding month.

## Backtracking to June

Further reports of the excellent June SpE conditions have been received. On the morning of Saturday June 7 John Faulkner

(Notts) received signals in chs. A2-5 from North America. After maybe a quarter of a century CKCW Moncton, New Brunswick ch. A2 was received again. This has been confirmed by Carson McDavid, CKCW's Engineering Director. Reception lasted for almost two hours. An audio file of parts of his reception can be heard at

[http://www.skywaves.info/audio/A2\\_audio.mp3](http://www.skywaves.info/audio/A2_audio.mp3)

Tim Bucknall (Congelton) and David Hamilton (Ayr) also received low-band signals on the 7th.

As reported last month, Cyril Willis received Venezuela ch. A3 on the 16th. It seems that the station was RCTV Barcelona (Anzoategui). Izana ch. E3 was strong at the time. Hugh Cocks (Algarve) has more recently received Puerto Rico ch. A3.

Following a day of intense European SpE reception on the 26th John Faulkner turned his aerials to the west and, at 1900 hours GMT, found that chs. A2-5 were full of carriers. A ch. A3 CTV identification could have been from four possible transmitters: being the highest powered, the most likely candidate is CFRN Edmonton, Alberta. At the time 50MHz radio amateurs were reaching almost the Canadian Pacific coast, so Edmonton is quite possible.

Meanwhile David Hamilton and Paul Logan (Lisnaskea, NI) found that SpE had reached Band II FM at up to 99.30MHz, with reception from a whole raft of North American FM radio stations in New Brunswick, Newfoundland, Maine, New Hampshire and New York state. The distance from Lisnaskea to WFRY Watertown NY is 3,049 miles, and to WHCF-FM Bangor 2,756 miles! A station co-channel with WFRY mentioned "the Hamptons", which is a favoured spot on Long Island, though WALK-FM has not confirmed that this was their transmission. Eleven North American FM stations were heard during this dramatic opening. The 99.30MHz FM station was an unidentified Canadian one. David and Paul were using a Sony ST-SB920 with a double-six Yagi aerial and a Denon tuner with a four-element Yagi aerial. Late news - Paul Logan reports further transatlantic SpE FM reception during the evening of July 20.

Our congratulations to these DXers for their achievements. DXing records have been broken!

A sound clip of 88.5MHz reception from WHCF Bangor can be heard at

<http://www.skywaves.info/audio/whcf.mp3>

Two clips of 97.1MHz reception from CBTB Baie Verte, Newfoundland can be heard at

[http://www.skywaves.info/audio/cntb\\_1.mp3](http://www.skywaves.info/audio/cntb_1.mp3) and

[http://www.skywaves.info/audio/cntb\\_2.mp3](http://www.skywaves.info/audio/cntb_2.mp3)

Note that *Skywaves* is the monthly journal of the British FM and TV Circle. The above information is from issue no. 79, July 2003.

## Satellite sightings

Midsummer brings extended coverage of sports and other outdoor activities. Granada regionals via Telecom 2D (8°W) have been featuring local sports, e.g. cricket and horse jumping from the summer shows. For example the Royal Welsh Show was carried by the usual BT TES-41 truck at 12.574GHz H (SR 5,632, FEC 3/4) for Harlech Wales over July 21/22. Anglia and Meridian South and East have carried local cricket, boating and similar activities for use in their evening news programmes. The deaths of two divers exploring a shipwreck off the West Sussex coast was reported by Meridian's BT TES-43 truck from the Littlehampton quayside on the 22nd. This was again via 8°W, at 12.580GHz H (5,632, 3/4).

Meridian leased a second truck on July 19 (Meridian 8MBIT TES-9) to cover reaction to the Dr Kelly/Iraqi weapons dispute from outside the Thames Valley Police HQ, feeding the report to US TV networks. As the news presenter rehearsed his report, the truck engineer advised him, via his earpiece, "fall out on the truck, putting the carrier down". The signal then dropped out. Curious! This was via Eutelsat W1 (10°E) at 10.090GHz V (5,632, 3/4).

Two days later there was an early-morning start for the Sky



A Philips PM5544 test pattern seen via Eutelsat W1.

News crew when Jeffrey Archer left Hollesley Bay open prison. The UKI-784 C1 4.2 truck uplinked this 8 a.m. occasion via Eutelsat W2 (16°E), with downlink at 12.525GHz H (5,632, 3/4).

The French pay great attention to OB coverage of the Tour de France cycle race each year. On the evening of the 26th however a Dutch SNG unit, Stolkvideo Hol-47, appeared in France with live reports, VTR playbacks etc. for channel N.TV. This was via W2 at 12.555GHz H (5,632, 3/4). On the same evening Sislink France UKI-028 covered a local French football kickabout match via W1 at 10.962GHz H (5,632, 3/4) - I assume that SIS maintains a



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News report via Eutelsat W1 during the Dr Kelly controversy.

presence in France and other European countries while retaining UK truck identification numbers.

There was dramatic and technically-impressive live coverage of the Michigan Indy 400 car race from the Michigan International Speedway, Brooklyn during the evening of the 27th. Cameras on several of the cars produced amazing, flawless pictures, cutting between the lead car with a reverse-facing camera and the lead challenger car with its camera facing forwards. Pit stops were also featured, using the on-board cameras. All four tyres changed and a tank full of gas within eleven seconds – beats my local Shell garage! This was carried via Atlantic Bird 1 (13°E) at 11.014GHz H (20,145, 3/4), the GlobeCast multiplex. The other two channels in the multiplex were busy with a White House report and the usual Sunday PGA from Georgia.

Alan Richards (Nottingham) saw footage of the shootout between US troops and Uday/Qusay Hussein. He describes it as harrowing. The event was seen, as it unfolded, via Eutelsat W1 at 10.971GHz V (4,167, 5/6), the APTN/UP4 feeder. An updating report from Baghdad on the US Army hunt for Saddam Hussein was seen via Eutelsat 2F1 (21.5°E) at 12.526GHz H (5,632, 3/4). Alan also mentions that the Brazilian TV channel Record International is still being transmitted during the evenings via Hispasat (30°W) at 11.931GHz V, while Galicia TV is present at 11.811GHz V (both 27,500, 3/4).

Dave Dyson (Accrington) comments that Iraqi TV hasn't returned to the screen as yet though he has found 'Iraqi Media Network' via Eutelsat W1 at 11.100GHz H (SR 2,793, FEC unknown).

Earlier in the month Europe\*Star-1 (45°E) carried NTSC (525-line) feeds to the US from Johannesburg. The transmission, with the identification 'GlobeCast Africa Enc', consisted of an African version of *Big Brother* with eleven countries participating in the action. This CNN feed was downlinked at 11.515GHz V (5,632, 3/4).

A rare sighting via Intelsat 901 (18°W) on the 25th covered desert fires near Denver. This was at 11.661GHz V (6,111, 3/4). The test card identification was 'Denver abc7 working for you, KMGH-TV Denver'. 'KMGH-DT 17' provided the newscopter pictures.

In answer to a reader's query, all the reports in this section are of reception using conventional receivers and dishes no larger than 1.2m.

## Broadcast news

**Netherlands:** DTT transmissions have now started but there's a lack of consumer equipment. It's initially a subscription service with a smart card and channel availability similar to that via

cable. One comment is that it's cheaper to buy a satellite dish, though I understand that this also requires an annual licence payment. Radio broadcasting has been through a franchise change recently. Some well-known broadcasters such as Radio 10 Gold (675kHz) have disappeared.

**Czech Republic:** At present three Band I transmitters carry the Nova TV service, Praha ch. R1 at 150kW ERP with horizontal polarisation, and the two ch. R2 transmitters Ostrava and Ceske Budejovice which both operate at 100kW ERP with horizontal polarisation. There are two UHF Nova transmitters and several that operate in Band III. The national services CT-1 and CT-2 transmit solely at UHF.

**RSL-TV:** A statement from My TV Network, operator of Portsmouth Television and Southampton Television, reported in the *Daily Echo* on July 29 says that "the business is on a precarious footing, totally reliant on sales. Unless further funds can be found from new investors, the future looks bleak". The statement was made at a tribunal hearing into claims of unfair dismissal by seven former employees.

## Terminology

There seem to be some new telecom-world buzz words. 'In-band m-commerce' relates to 'content' downloaded to a mobile phone. This can be music, news, information from other services, ring-tones etc. 'Out-of-band m-commerce' relates to buying/ordering via the phone goods and services that are delivered other than via the phone, e.g. by post, collection from a shop etc., or the purchase of insurance and financial products. The range is vast, the mobile phone being used as the payment tool.

## Satellite news

Israeli RR Sat is occasionally seen via satellite downlinks. A recently received press release provides more information on the operations of RR Satellite Communications Ltd. The company has five SNG trucks, each with a characteristic diamond-shaped dish, uplinking in Ku band with either analogue or digital (MPEG 4:2:0 or 4:2:2) video. The satellites mostly used are Hot Bird 3, Eurasiasat-1 and Eutelsat W1. The teleports at Tel Aviv and Reem use the C and Ku bands.

As mentioned last month, BBC-TV from 28.2°E dropped the use of Videoguard encryption on July 10. The BBC Ceefax page 698 should carry the latest information – via analogue terrestrial TV!

The hot-spot for Latin American cable TV feeders is Intelsat 805, which is low in our SW skies at 55.5°W. Over twenty main broadcasters now use this slot. The Argentine company TIBA leases thirteen transponders on four Intelsat craft to provide C- and Ku-band coverage across the Americas, Africa and Europe. Check for eastbound transatlantic TIBA feeds, which are uplinked from the Buenos Aires teleport.

## C band

A few readers may use larger dishes (1.5m+) for C-band (3.4-4.2GHz) reception. The July 2003 issue of Bob Cooper's NZ trade magazine *SatFACTS* contains a warning for those interested in such reception. C-band satellite transmission thrived in North America in the Eighties, then decreased as progress was made with Ku-band equipment. Likewise C-band use opened up in the Nineties in Asia, covering vast land tracts. Again the move is now to Ku band. Low-noise, high-gain Ku-band LNBs are being mass-produced and are cheap. Conversely fewer C-band LNBs and feeds are being produced, so prices are rising. The C-band market could eventually dry up, leaving only telecoms users. This would mean professional gear at corresponding prices. So if you are considering C-band reception, buy an LNB + feed now, while prices are still reasonable. ■

## Review:

# The D500 DX-TV converter

The use of an outboard tuner system for DX-TV reception in Bands I/III has been common for some thirty years. The tuner converts the Band I/III signals to UHF for feeding to a standard TV set. One great advantage is that the IF bandwidth can be reduced, increasing the signal-to-noise ratio with weak signals. Another advantage of this, when strong SpE signals are present, is that adjacent-channel interference can be reduced. European Band I/III channel allocations differ from country to country. You might find that a ch. E2 signal (vision carrier frequency 48.25MHz) is present at the same time as one in ch. R1 (vision carrier frequency 49.75MHz). With a standard 5.5MHz IF bandwidth there will be considerable interference between the two. Narrowing the IF bandwidth will reduce and possibly eliminate such interference. In effect, an outboard tuner system enables any domestic TV set to be used for DXing – the set becomes an RF VDU!

HS Publications of Derby has been selling TV and FM DXing equipment for many years, and is perhaps best known for its D100 converter. This covers 45-110, 160-230 and 430-890MHz, with switchable IF bandwidth (wide, medium or narrow) and separate audio subcarrier tuning. The DX signal is then remodulated on to a standard UHF channel for connection to the TV set. The D100 costs £160 or £175, the latter with a 'DX alarm'.

The latest product from HS Publications is a 'scaled-down' converter, Model D500, which is intended primarily for SpE and F2-layer reception of low-band VHF TV signals. Coverage is therefore single band, from 45MHz to approximately 86MHz. While the D100 has

nine front-panel controls the D500 has three, for gain, bandwidth (BW) and tuning. There is also a power-on LED.

The D500 is housed in a comparatively large plastic box that measures some 157 x 160 x 88mm (including the feet). Its front panel is dominated by the tuning knob, which is calibrated in the various Band I channels through to R3. The rear panel has two Belling-Lee coaxial sockets for VHF input and UHF output, and a 3.5mm socket for the DC input from a 13A plug-top 13.5V power supply that comes with the converter. A small oscillator-adjustment hole enables the UHF output to be varied within  $\pm 5$  channels of ch. 65 nominal.

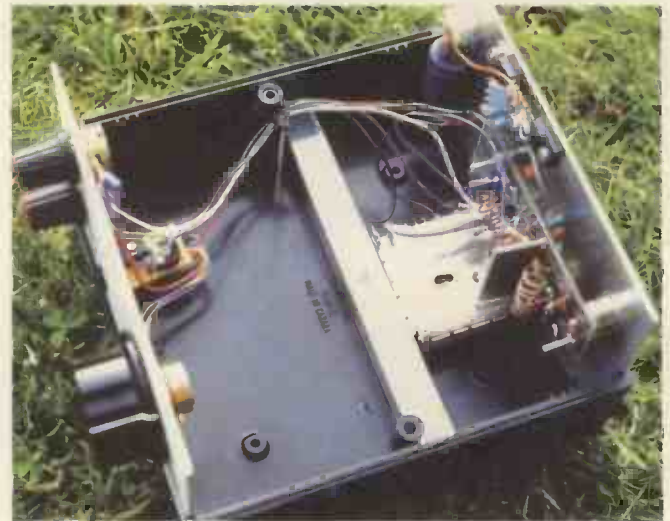
A look inside reveals a tuner and adjacent UHF modulator, some voltage-regulation components and a small tuning range adjustment PCB that's 'tacked' on to the front panel. There's a lot of open space inside – you could fit batteries for portable operation.

Operation is simple, and a clear instruction leaflet is provided. This explains how to find the best output channel.

I found the D500's tuning action during an SpE opening a bit odd initially, as I am used to the D100. The D500's tuning range for channels E2-4 is almost 180°. With the D100 this range is cramped into a 60° segment. Minimum IF bandwidth, with the control fully clockwise, seems to be about 2.5MHz. Depending on the settings of the bandwidth and tuning controls it's possible to lose the signal. If, for example, the BW control is set half way and a weak signal appears, reducing the bandwidth by rotating the control clockwise may eliminate the DX signal as its tuning peak falls outside the



Front view of the HS Publications D500 DX-TV converter.



Internal view of the D500 DX-TV converter.

bandpass. This problem is overcome once you have experience in using the converter. During the strong SpE openings in recent weeks (June/July 2003) I found that it's best to set the gain control at 50 per cent of maximum. Running flat out could cause overloading – I use a preamplifier with a gain of 20dB. If you don't use a preamplifier, a higher gain setting may be better.

I found the D500 an effective and simple-to-use tuning system for low-band TV-DXing. It worked well on test with SpE signals, and I feel that it will be equally effective when F2 signals become available during the

next solar cycle – hopefully there will still be some analogue VHF activity. The only minus points are the bandwidth/tuning problem mentioned above – and the rather large size of the box!

The D500 is available at £99.95 plus £2 UK carriage from HS Publications, 7 Epping Close, Derby, DE22 4HR. The phone number is 01332 381 699. A catalogue can be obtained from

GarrySmith@dx-tv.fsnet.co.uk or you can go to the website at

www.test-cards.fsnet.co.uk Alternatively a catalogue can be obtained for £1.25 from the Derby address.



# AUDIO FAULTS

Reports from  
**Eugene Trundle**  
**Roger Burchett**  
**Geoff Darby**  
**J.S Ogilvie**  
**Chris Bowers**  
and  
**David I. Scott**

We welcome fault reports from readers – payment for each fault is made after publication. See page 745 for details of where and how to send reports.

## Sony LBT-D359

The complaint was very intermittent sound-track 'jumping', usually backwards and generally near the beginning of a disc's playback. It happened only when the moon was blue and Manchester United were playing at home to Wimbourne Wanderers. The cure was to replace the sled-drive motor and the optical unit's ribbon cable – I think! **E.T.**

## Technics RS-TR373/374 tape decks

I had for repair a later version of the TR373, which is similar to the TR374 and quite different from the earlier TR373 covered in the main service manual. For the later version you need supplement AD9512273SO. My thanks to SEME for sorting that out for me.

The fault itself was quite simple. There was no audio output and no bar-graph movement. The deck functions were OK. There are two 0.25W fusible resistors on the mechanism control board, which is mounted on the back of deck 2. They are in series with the  $\pm 7.7V$  supplies (marked +B1 and -B). R406 ( $27\Omega$ ) is in the +B1 feed and R407 ( $18\Omega$ ) in the -B feed. Both were burnt and open-circuit. Amongst other things these lines supply the AN7356SC-E2 playback/record amplifier chip IC2 and the AN7357FB-V Dolby chip IC401.

It was easy enough to measure the current flowing via each supply. I found that the -B line was supplying excessive current, and a near short-circuit could be measured to chassis. But where was the short? Close examination under a strong light with an even stronger magnifying glass led me to link J66 which, when cut, isolated both ICs. Glory be, the fault was at the input side! The culprit was the  $470\mu F$ , 10V decoupling capacitor C424. Presumably C423 (same value) in the +B1 supply could cause the same fault.

This was a simple fault theoretically, but dismantling the unit was not so simple (a Mole grip was required to move one screw holding the board). The print is spidery. Who designed the print on the IC side of R407 without an adequate land? Shame on you! **R.B.**

## Goodmans System M500

I normally associate Goodmans with the lower end of the market where, often, the cost of a repair can exceed the value of the unit, resulting in just lost time and no profit. So I lifted this one, which was labelled 'dead', on to the bench with some trepidation. The first shock was that it was surprisingly heavy. The second shock, once it had been opened up, was the superior build quality. It was well put together, and looked as if it was going to

be very difficult to work on.

The only voltage I could see marked on the main PCB, at the right-hand side of the unit, was 5.6V. It was right next to a three-legged device that I guessed might be a 5V regulator, as its centre pin was returned to chassis via a forward conducting diode. It was impossible to see the device itself readily, being on the other side of the board. If it was a 7805, its input voltage was very low. There were however good 20V levels across the nearby smoothing capacitors. Following the print back from the regulator's input pin I came to another three-pin device, below, to the right and at 90° to the first one. Its middle leg went straight to chassis and its input pin went straight to a smoothing capacitor with 20V across it. This suggested that the second device was also a regulator and might well be faulty: the PCB beneath it was cold, indicating that the device was not in an overload shutdown condition.

I unsoldered its legs, pushed it in and then shook it out from the unit. It turned out to be one of the smaller D-line regulators, probably rated at 100mA or so. It was a 12V type, which made sense. Rather than try to fit a replacement into the board in the original position, I installed a 1A plastic flat-pack type on the back of the board, where it would probably run cooler anyway. This restored full normal operation, and a long soak test proved that there were no other problems.

In this case I can't provide component reference numbers, as the devices were so far down on the board that I simply couldn't see these and there was no printing on the track side. **G.D.**

## Sony HCD-RG30

There was a tape problem with this unit. The B deck (record/playback) produced very low, muffled and brassy left-channel playback. The right channel was OK, and both channels were OK with the A deck. When I tested the unit I found that the 'Groove' feature, a sort of dynamic bass enhancement, was switched on. When this was set to off there was no discernible sound from the left channel.

I found these symptoms confusing. The problem had a sort of 'heads' feel about it, so I set about swapping the left head's output to the right-channel amplifier, to check out the head. I did this by removing the solder from the four connector pins on the main boards, then patch-wiring the pair from the left head to the print going to the right amplifier. The result was nothing at all from the left head, even with the Groove feature applied.

At this point I decided to measure the resistance of the heads. The reading for the right-channel head was a couple of hundred ohms, but the left-channel head



read short-circuit. So there was clearly a head problem of some sort. I next stripped the front panel away from the unit to gain access to the tape decks, then removed these to take a good look at the head assembly on the bad deck. This deck uses a bi-directional 'flip-over' head, with the connections made via a flexiprint which is terminated at a small PCB that's screwed to the bottom edge of the deck. A connector on this PCB is used for the screened cable that plugs into the main PCB. I found a small whisker of solder here, across the pins for the left head. Once this whisker had been removed there was normal audio from the left head.

What I am uncertain about is how, with the left head short-circuit, it had been possible to get anything from this channel? I assume that the low, distorted sound was signal from the right channel being fed to the left channel by the Groove-effect system. This would account for why there was nothing at all, even with the effect turned on, when I connected the shorted left head's output to the right-channel amplifier. **G.D.**

### **Sony HCD-RXD5**

There were control problems with the CD changer in this unit. Intermittently the tray would eject on its own and the carousel would revolve endlessly. I was able to establish that there were no carousel-position detect pulses at pin 6 of CN392 on the main PCB when this happened. Checks on the supplies to the CD changer via this connector showed that the motor 7V supply was present at pin 1 but the 5V supply for the disc and carousel detectors, at pin 5, was missing.

The 5V supply comes from switch transistor Q905 on the main board. This transistor is driven by Q904, whose base input comes from pin 2 (power) of the microcontroller chip IC501. Inspection of this IC's pins under a powerful magnifier revealed that the amount of solder on them was meagre at best. A reflow of all the pins, with a little fresh solder added, restored the drive to Q904 and correct operation of the CD unit. **G.D.**

### **JVC VS-DT2000R**

"Loud buzzing on left channel" was the complaint with this elegant unit. I found that the level of the buzz was not affected by the setting of the volume control except when it was at zero. The noise then stopped. Audio reproduction from the channel affected was fine. The buzz was very 'raspy', quite unlike anything I had heard before.

Scope checks at the outputs from IC101, which is a dual op-amp buffer between the volume control/function select IC and the output IC, showed that a

very odd waveform was present at pin 7, the left output. A couple of capacitors near this IC were getting in the way of the scope probe. When they were moved the symptoms changed dramatically. Although an odd output waveform was still present, it was no longer large enough to be heard.

A little farther away there are a couple of electrolytics and some diodes. These are involved in generating the negative supply for the VFD. A scope check in this circuitry showed that the supply was not only ragged but was also 'hooting' at high frequency, in bursts. This was the waveform I had been seeing at IC101. The actual hoot was at too high a frequency to be heard but the burst rate was low enough: this was the raspy buzz that came from the left-channel speaker.

The cause of the fault was that C3802 (100 $\mu$ F, 63V) was unsoldered at its negative end. This is the last reservoir/smoothing capacitor at the end of the voltage multiplier that produces the VFD supply. Application of fresh solder to the joint restored a nice, clean supply and normal audio output. **G.D.**

### **JVC CA-MXJ75R**

If the problem with this music centre is no or intermittent no sound, remove the amplifier and heatsink assembly and check IC781/782 (both type TDA7295) for dry-joints. Also check IC701 (STK411-210E). Resoldering all pins is usually an effective cure. **J.S.O.**

### **Aiwa CSD-MD5K**

If the problem with this MD/CD/radio/cassette player is loss of tuner reception, remove the separate tuner PCB and check for bad joints, some of which may well be in the tuner itself. The repair is difficult but can be done with care. **J.S.O.**

### **Sony TA-FE230**

This amplifier unit appeared to be totally dead. I carried out some cold checks with the multimeter and found that the main power transformer T1 was open-circuit on the primary side. The part no. is 1-433-6211-1. All was well once a replacement had been fitted. **C.B.**

### **Sony CDP-H3750**

When a KSS-240A optical unit is used a whistling noise may be heard from the mechanical CD assembly with some discs. The cause is vibration of the disc, the optical lens and the BU base, resulting in resonance. This vibration can be reduced by adding a fixed weight, part no. 7-685-134-19, which is screwed on to the PCB, and optical block weight part no. 4-962-979-02. **C.B.**

### **Sony ZS-D50**

There was a cassette stuck in this portable unit's tape deck. A quick check inside revealed that the capstan belt had slipped off the motor pulley. We've had this before. There is now an improved belt, part no. 3-229-349-01, also a guide belt assembly, part no. X-3380-302-1. You are also advised to replace the collar, item 152, and gold screw, item 151. **C.B.**

### **Sony CDP-H3750**

There was no operation when the AB button, or power off, was pushed. A quick look inside revealed that connector CN213 hadn't been pushed in or correctly inserted. Normal operation was restored once this had been done. **C.B.**

### **Sony MZ-R900**

This MiniDisc player opened and closed poorly. A look inside revealed that the chassis had become bent and deformed. Normal open-close operation was restored once a replacement chassis assembly, reference 52, part no. X33793205, had been obtained and fitted. **C.B.**

### **Trio KR-4070-L**

This tuner/amplifier had given flawless results for over twenty years. The problem now was that stereo FM broadcasts were sometimes reproduced in mono form. The FM beacon LED had also become very sluggish in operation, occasionally lighting first time on reception of a stereo broadcast but more often coming on only after careful retuning. In addition stereo decoding seemed to be more difficult to achieve with stronger signals.

Fortunately I had the service manual. Stereo multiplex decoding is carried out within an IC, which might have been difficult to obtain. But the 'borderline' symptoms seemed to me to be typical of a decoder whose oscillator is running slightly off frequency. An external preset resistor, VRg1, is provided for frequency adjustment, and a procedure for accurate setting up is given in the manual. I decided however to note the original position of the wiper and try slight adjustment. My first attempt stopped the stereo decoder working altogether, suggesting that I had moved the preset in the wrong direction. This proved to be so. When I turned VGg1 to a position just the other side of the original one there was correct and reliable reception of stereo broadcasts.

Clearly an element of drift had occurred over the years. It would have been nice to have been able to measure this drift, but I was pleased to have been able to correct the fault. **D.I.S.** ■





# MONITORS

Fault reports from  
**Gerry Mumford**  
**Bob Bradley**  
and  
**Ian Field**

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

Reports can be sent by post to:

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BR8 8HU

or e-mailed to:  
t.winford@highburybiz.com

## Gateway 2000 EV900 (Model X19001)

The fault description read “smoke poured from slots in the back”. So, in the interests of safety, I decided to open and inspect the unit before powering it up for the initial test. A close inspection revealed three burnt-up resistors at the rear right corner of the chassis, along with the ABL preset which had melted severely. A scrap chassis was used to determine the values of the destroyed components. These were R538 (1k $\Omega$ , 1W), R773 (2.7k $\Omega$ , 0.5W), R573 (68k $\Omega$ , 0.5W) and VR501 (20k $\Omega$  mini vertical preset). Replacements were fitted, then the unit was cautiously powered up. After a delay of about a second there was a horrible screech from the line output transformer and R538 started to burn again.

Obviously the LOPT (type FEA658) was faulty. So one was transplanted from a scrap chassis. This finally resulted in a good display. **G.M.**

## Philips 17A8808Q

This monitor powered up with a green LED light and the rustle of EHT, but there was no display at all. Checks at the CRT base showed that the control grid voltage was -155V, so the tube was cut off. Further checks, in the deflection circuitry, revealed that there was no line output stage activity, as the BU2527AF line output transistor Tr7503 was short-circuit and the fusible feed resistor R3518 (1 $\Omega$ , 0.5W) was open-circuit. Replacements restored normal operation.

Note that this monitor has a separate output stage to drive the line output transformer, which was why there was normal EHT even with this fault condition. **G.M.**

## Viewsonic P810

This huge monitor was completely dead. The 5AT mains fuse FS801 was open-circuit and the power supply had blown up. This looked quite scary initially, as the power supply uses a double-sided PCB with many bespoke and surface-mounted components. As luck would have it however the repair turned out to be quite easy.

Replacement of the 2SK2148 chopper FET Q821, its surface-mounted gate resistor R832 (22 $\Omega$ ), D826 (unmarked, but use a 1N4148) and the 30V, 500mW zener diode D824 produced a first-class display.

The use of a DC blocking capacitor between the chopper FET and the control IC clearly prevented what could have been catastrophic damage to the chip. This would have been a problem as it's a non-standard device. **G.M.**

## IBM 6332-002

This 14in. monitor is also badged 14L10 on the front-control flap. It was dead, as

reported. When I removed the back cover and checked the mains fuse I found that it was OK. This was a surprise. When the usual components fail, i.e. the chopper FET, control IC, and the diodes etc. in this area, one finds it blackened. But all these devices read OK.

So, suspecting dry-joints, I removed the main PCB from the mounting tray to enable me to examine its underside. Although these monitors do suffer from dry-joints, in both the power supply and the line output stage, this one was OK.

After examining the mains input and bridge rectifier circuits I discovered that a resistor (0.68 $\Omega$ , 2.5W vitreous enamel) that connects the output from the bridge rectifier to the reservoir capacitor C120 was open-circuit. This component is not marked on the board as a resistor but instead as a wire link (93). A replacement cured the fault. **B.B.**

## Sony CPD-200EST

When this 17in. monitor was switched on from cold there was frame foldover at the bottom of the screen. Height adjustment via the front control panel made the fault worse. As the monitor warmed up its display improved slightly but not significantly.

After removing the back cover I set about disconnecting all the relevant wiring to enable the main board to be withdrawn from the cabinet, along with its tray assembly. It's then a simple matter to separate the two, giving access to both sides of the PCB.

My first step was to replace the TDA8172 frame output chip IC401. This made no difference so, working without a circuit diagram, I decided to carry out voltage and waveform checks, making comparisons with previously encountered circuits that use the same IC. I also had to hand a manufacturer's data sheet for the IC.

This information showed that pin 4 of the IC is usually connected to chassis. In this monitor however pin 4 receives a negative voltage from the power supply. Further investigation was required, after which I concluded that the negative voltage at pin 4 was incorrect at -8.6V and should have been nearer to -12V.

The power-supply reservoir capacitor for the -12V line is C653 (470 $\mu$ F, 25V). Once this capacitor had been replaced the voltage at pin 4 of the TDA8172 chip settled at -11V, curing the fault. **B.B.**

## Enact JD144H

The fault symptom with this 14in. monitor was excessive brightness. I checked the CRT's control grid voltage on the base panel and found that it was too positive for my liking. In addition it didn't vary much when the brightness control was adjusted. So it appeared that the negative supply to

the brightness control circuit was either missing or very low.

Working without a circuit diagram, I traced the circuitry back from the control grid on the CRT base panel to try to find the brightness control network. I discovered that the negative supply is derived from the line output transformer via rectifier diode D409, with R482 in series. This resistor, together with Q419 and Q422, form part of the brightness network. I struck lucky at this point, as R482 had gone high in value. The reading was 385k $\Omega$  instead of the correct 120k $\Omega$  (0.5W). A replacement resistor restored normal operation. **B.B.**

### LVI Magnilink X14

This is a Philips 14in. colour portable converted into a form of 'electronic microfiche' to help partially-sighted people by providing variable magnification via an accompanying camera base unit, and is also able to invert the whole picture or individual colours to assist with colour blindness. The original chassis type is A14A, but there's another type number that was partially obscured by a label that had been placed on top.

The problem was no field scanning. The field output stage is a discrete-component design with two transistors, Tr7401 (BD258) and Tr7402 (BD137). There was no supply to them because D6020 (BYD33G) was short-circuit and R3427 (1 $\Omega$  fusible) was open-circuit – the supply is derived from the line output stage. Neither of the output transistors was short-circuit, and the class AB bias network appeared to be OK. But the replacement fusible resistor went up in smoke as soon as power was applied. As no other circuit path associated with this supply seemed capable of passing that much current without visible damage, I tried again with another fusible resistor and both output transistors removed.

This time there was no smoke. A check on the supply voltage produced a reading of about 43V, which I thought was rather high. But it may have risen because the supply was off-load, and the CRT heater glow looked about right. So I was still looking for the cause of the fault.

Further inspection revealed a burn mark on the heatsink for the BD137 transistor, which is mounted on an amber heatsink washer that looks similar to the plastic substrate used for some membrane keypads and things like the internal ribbon cable to the R/W heads inside hard drives. The insulator had punched through and shorted. The other output transistor doesn't have an insulator – its collector is connected to chassis anyway. Neither transistor had any heatsink compound. As

the heatsink is a mild-steel stamping, the transistors' heat-transfer contact faces need all the help they can get. And in the case of the BD137 transistor, which requires insulation, compound helps to reduce the risks from burrs and lumps in the plating.

It's good to see that Philips had learnt from past experience and formed the leads of the output transistors so that they could flex with thermal expansion. Previously such devices had been clipped to the heatsink with dead-straight leads. As a result thermal expansion could fracture solder joints. **I.F.**

### Royal X1448

This dead mono VGA monitor had been converted for Atari operation. You tend to get power supply problems following the conversion. It seems that when the line frequency is adjusted to suit the Atari monochrome high-resolution mode the current consumption increases. As a result the BYT56M 35V supply rectifier D106 becomes unreliable.

I've come across the problem before and have tried various diodes in this position, most of which run alarmingly hot despite being amply rated. The BYT56M is rated at 3A, 1kV, but the data I have about its  $T_{rr}$  is vague, stating only that it is less than 100 $\mu$ sec. A BRY29-700 has been tried. Its ratings are 7A, 700V,  $T_{rr}$  75 $\mu$ sec. It runs quite hot but is OK with a clip-on heatsink. Unfortunately there was only one of these in stock, and I had a batch of monitors to do.

I decided to try an FMU16S rectifier, as I have a plentiful supply of them. This seems to be adequately rated (16A) but still runs pretty warm. Sliding a hollow ferrite core from a scrap VGA width coil on to one of the leads seemed to help.

The chopper and line output transistors in this chassis use the steel chassis frame as a heatsink. The line output side was getting very hot! Picture size is a well-known problem, even with Atari-manufactured monitors. It's much worse with a VGA conversion. Judging from the CRT's heater brightness the company that had carried out the conversion had cranked up the power supply instead of adjusting the flyback tuning in the line output stage. No modification is required for the height as this is always adequate. The CRT heater voltage read 12.3V, though a Mullard data book I have says it should be exactly 11V. No doubt this makes a significant contribution to the reliability problem with D106. Blacking the heatsink with a marker pen, though this is not as effective as a proper industrial black finish, reduced the running temperature a little.

For long-term reliability a better line output transistor and some adjustment of the line output stage tuning would be required. **I.F.**

### Compaq V55 (Model 612T)

This monitor produced a bright raster with no display. As there didn't seem to be anything wrong with the CRT's control grid circuitry the cause was likely to be to do with the cathode voltages, which were in fact very low. The 100 $\mu$ F, 100V smoothing capacitor in the supply to the video output chip was in good condition, but the supply was at just over 7V! The cause was in the odd piece of circuitry shown in Fig. 1. R121 (180k $\Omega$ ) was open-circuit. Since there was no current via R122, Q102 was cut off. I assume that the supply was driven to 7V by the CRT's cathode current!

While the fault was present I tested the monitor with the first-anode voltage turned to minimum – to protect the shadowmask. In this condition a faint, smeary display was visible. The voltages shown in Fig. 1 were measured after the repair and, yes, the CRT's heater voltage was just 5.73V. The trend seems to be to derive this supply from a chopper transformer wound to drive a Schottky-barrier rectifier diode. Since this type of diode is expensive, manufacturers often use an ordinary diode instead. This doesn't do the tube any good. When I replaced the diode concerned, D117, with a Schottky-barrier type the heater voltage rose to 6.1V. Still some way short of the 6.3V specified, but a considerable improvement. When you carry out this modification don't forget to add at least 0.33 $\mu$ F across the reservoir capacitor (C632, 1,000 $\mu$ F, 16V in this monitor) to swamp the higher junction capacitance of a Schottky-barrier diode. The diode should be rated at not less than 3A, 30V. I usually obtain the diode from a scrap power supply, typically a 12MBR30 (12A, 30V). **I.F.**

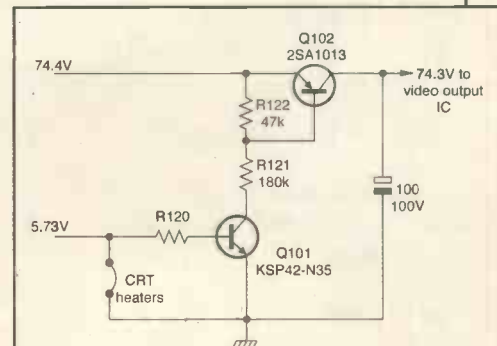


Fig. 1: The unusual circuitry in the supply to the video output chip in the Compaq V55.

# TELEVISION

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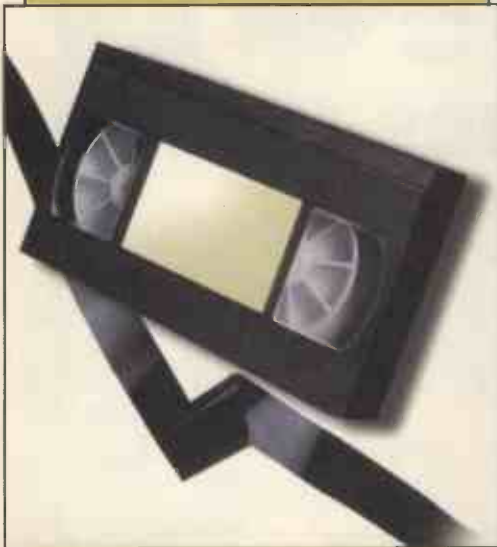
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**John Young**

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### Panasonic NVL28

The fault report said “pauses then switches off”. When I tried the machine on the bench it worked fine for a while – until I moved it, when it did what the card said. On closer inspection I found that connector P1 on the main PCB was dry-jointed. IC101 should also be checked for dry-joints. **J.S.O.**

### Philips VR453

This machine uses a JVC deck. The fault was leaving a loop of tape hanging out or chewing tapes on eject. The remedy for this is to strip and clean the idler gear assembly, which tends to seize up partially. Apply a spot of oil then reassemble. It’s starting to become a common problem with these ageing machines, but they are usually worth repair. **J.S.O.**

### GoldStar GSEQ201i

This machine was wrecking tapes. The fault is usually cured by replacing bracket assembly F/R A06, which is available from SEME. The part no. is VPAR6962. **J.S.O.**

### LG 221

This machine was jammed up. The cause was the small plastic collar that holds the pinch roller on. It had split and slipped down the shaft. As a result the pinch roller had dropped and jammed the sub-loading arm. Replace the collar and the machine will be back in normal working order.

We seem to be getting a lot of machines that use this type of roller assembly – the same thing happens. **J.S.O.**

### Goodmans VN9500S

Dead and chews tapes it said on the card. For the former fault go to the power supply section and check C822 and C823 (both 680 $\mu$ F, 25V). On this occasion they read about 500 $\mu$ F on our capacitance meter. Replacements will get the machine running again.

The tape chewing was caused by the felt part of the back-tension band parting company with the rest. It had stuck itself around the supply spool. Replacement cured this one too. **J.S.O.**

### Thomson VTH7090U

The sound was poor and the machine creased tapes. For this fault replace the pinch roller. The problem is cheap rollers with nasty plastic rollers instead of bearings. **J.S.O.**

### Sony SLV-SF99UX

There was no loading or playback. Inspection inside revealed that the ‘arm driving’ (TG8) and the ‘gear pinch pressing’ were damaged. Sony now supplies improved parts, which restored normal loading and playback operation. The part

nos: are 3-977-445-02 and 3-977-441-03. **C.B.**

### Sony SLV-SF99UX

During playback of an E180 tape there was intermittent picture noise towards the end. A look inside the machine revealed the cause of the problem. The guide roller assembly of TG3 and TG6, part no. X-3949-704-1, had to be replaced followed by tape path adjustment. **C.B.**

### Sharp VCM321

The playback sound consisted of an awful screeching noise. The fault cleared, restoring normal playback sound, when freezer was applied to Q651 (2SC3203). Warming it up again brought the fault back. A replacement transistor cured the fault – I used type BC639. **G.R.**

### GoldStar 5121

A common problem with this model is intermittently accepting or ejecting tapes or just shutting down. The cure is to fit a modified central LED tower unit, part no. G871R-1080F. It comes with a few resistors and the LED. **G.R.**

### Mitsubishi HS-MB32

Picture pulling during playback (weak video/poor sync) was caused by failure of two electrolytic capacitors, C2B4 and C2B7 (both 4.7 $\mu$ F, 35V). They both produced a horrible smell when heat was applied. **G.R.**

### Nokia VCR3716

The complaint with this Sharp clone was very poor playback pictures. When I tried it all I could get was intermittent rewind. I was told to set the clock first, which produced normal operation (thanks Genserve for this information). The poor pictures were caused by a worn upper drum (whatever happened to the good old Sharp drums that lasted forever?). As a new drum costs more than the machine it was returned to the customer. **G.R.**

### JVC HRD880EK

This Nicam VCR produced good playback pictures only very intermittently. At other times the effect was like a worn upper drum assembly. I’ve had this effect before, when the PG pulses are low or missing. But I then spotted a 3.3 $\mu$ F, 50V surface-mounted electrolytic capacitor on the lower drum. When it was checked with a Wizard tester it turned out to be open-circuit. A replacement restored good pictures. **G.R.**

### Mitsubishi HS561V

This VCR was dead with the standby 5V supply missing. It comes from the emitter of Q904, whose collector voltage was also missing because R917 (2.7 $\Omega$ , 0.5W fusible)

was open-circuit. As no shorts could be detected I fitted a replacement resistor, which restored normal operation. Incidentally R917 is mounted on the main PCB, hidden behind a subpanel that's marked 'power sub 2', and is next to a heatsink. **G.R.**

### Sharp VCM321HM

This machine wouldn't erase or record sound. The following items had to be replaced to restore normal operation: Q651 2SC3203Y; Q652 DTC323TK; IC651 BA7755A; and R6518, 47Ω, 0.5W. **G.R.**

### Sanyo VHR335E

If the symptoms are a pulsing playback picture and noise from the capstan motor, go straight to C510 (1,000μF, 16V). It's next to D510. If it has leaked, the PCB may need to be cleaned. **G.R.**

### Sony SLV757UB

This machine was a real nightmare. The cause of the trouble was easy to diagnose: the upper drum assembly was so badly worn that one of the head tips appeared to be missing altogether. This was a very impressive – and expensive – machine in its day, but there was no getting away from the fact that it was now

quite old. The owner was aware of this and although he wanted it fixed a realistic budget had been set. This ruled out the use of a genuine Sony upper drum. So a 'replacement' head drum had to be obtained, together with the normal replacement items – pinch roller, back-tension band, etc.

The problems then started. Quite a lot of pins pass through and are soldered to the upper drum PCB. Even when they were all desoldered and clear of the PCB holes, heat had to be applied to the drive flange before the old drum could be removed. But this was easy in comparison with trying to fit the replacement. It just wouldn't go on. Some pins appeared to be in line with the PCB holes while others weren't. I battled for over an hour, carefully trying to adjust the pin positioning, before I had to admit defeat and return the upper drum to the suppliers. Understandably, they were somewhat sceptical about my complaint – until they tried to fit it, again without success. A second replacement also wouldn't fit, so we had to conclude that the whole batch was out of tolerance.

Fortunately the VCR's owner then came to the rescue. One of his relatives had a scrap SLV715UB that had been fitted with a replacement head drum a cou-

ple of years ago. The two models use the same head drum. Transplanting this used head drum to the SLV757UB solved the problem. Once a new pinch roller and back-tension band had been fitted and the mechanism had been set up there was perfect operation. **D.I.S.**

### Sanyo VHRH290E

This machine was dead and for once it wasn't PR512. After removal of the smoothing block checks were carried out on the primary side of the power supply. Resistors R5002 and R5003 (1.5MΩ) were both faulty. One was open-circuit and the other high in value. **G.L.**

### Grundig 2x4 Super

This golden oldie had stopped dead. Investigation showed that C401 (100μF, 25V), which couples the drive to the BU208A chopper transistor T402, had gone low in value. Normal operation was restored by replacing the capacitor and the transistor. **J.Y.**

### Grundig 2x4 Super

Failure of the keyboard was caused by breaks in the conductors of the flat Mylar cable that goes to the main board. I was able to repair it successfully with silver-loaded paint, applied carefully. **J.Y.**

## Test Case 490

Last month we featured Real Technician's problems with an old Hitachi TV set that intermittently failed to come out of standby. This month RT doesn't come into the picture. He's been seconded to the shop to collect bad rental debts with, rumour has it, menaces. This time it's Cathode Ray who has an ancient TV on his bench, with yet again the symptom of intermittent failure to come out of standby.

As with last month's patient, this one worked perfectly most of the time. Now and again however none of the front panel or remote-control zapper keys would wake it up from standby. Heavy thumping on the cabinet when the fault was present, and percussion on its internal anatomy, didn't have any effect either. The set was a 21in. Tatung Model TUV8A02, which we have out on rental. It's fitted with the A chassis – this first saw the light of day when Cathode Ray was at primary school. Why does Test Case Rentals keep these old sets out in the field so long? Mostly it's because the customers have grown fond of them.

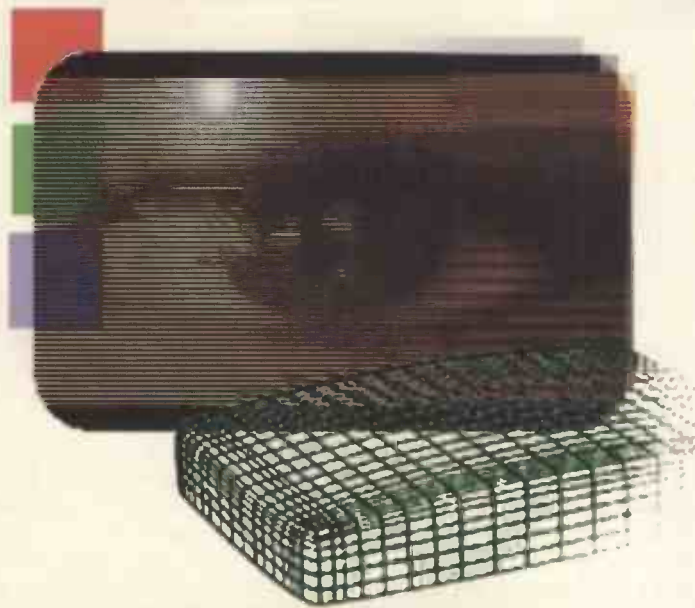
Ray connected a voltmeter across C818, the reservoir capacitor for the 110V HT supply, and left it there while he tested the set, switching it out of standby eight or ten times a day. After three days and perhaps thirty tries the set stayed asleep. CR had noticed that the 110V supply was maintained in the standby mode, so it was no surprise to find that it was not affected by the fault! Time for a closer study of the circuit diagram.

The microcontroller chip is IC701, and pin 13 of this device is labelled 'P on'. So CR traced the path from this pin and found that it went to two transistors associated with the TDA2579 timebase generator chip IC401. Not very promising!

Ray spent a while going through this circuitry before he noticed that pin 16 of the microcontroller chip is labelled 'standby'. That's more like it! This pin is connected to a transistor in the power supply, TR802, which switches the LM317T 12V regulator IC802 on and off. So the meter was connected to pin 16 of IC701 and testing continued. The next few days passed by without the fault recurring, but the meter was studied each time the set was switched out of standby.

The fault finally put in an appearance, and it was seen that IC701 failed to switch transistor TR802 as it is supposed to do. Cathode Ray was well aware of the fault described last month, but in this case the 5V supply to IC701 was present and correct. So that wasn't the cause of the problem. Could the microcontroller chip be faulty? Maybe. Hot air from a hairdryer and extreme cold from a freezer aerosol (a low-static one nowadays!) didn't provide any help. Neither did Sage, who said he was not familiar with this chassis. Television Ted was on holiday, and there were no helpful scribbles of his on the circuit diagram.

The front panel key matrix outputs and IR control pulses enter IC701 via different pins. As neither methods of control worked when the fault was present, there seemed little point in carrying out checks in this circuitry. So what, other than the microcontroller IC and its power supply, could have been responsible for the failure? Cathode Ray found out, and there's now another little note on the yellowing circuit diagram. Do you have any ideas on this one? Did another microcontroller chip go into the set? Was the cause instead some ninepenny component? To find the solution, turn to page 761.



# TV FAULT FINDING

**Reports from**  
**Philip Salkeld**  
**Philip Laws**  
**Chris Bowers**  
**Bill Bolem**  
**Arthur Jackson**  
**Martin McCluskey**  
**Glyn Dickinson and**  
**Matt Marrs**

We welcome fault reports from readers – payment for each fault is made after publication. See page 745 for details of where and how to send reports.

## **Philips 21PT1164/05S (L9.2E chassis)**

This set was totally dead. When I get this symptom with Philips sets I go straight for the line output transistor, which in this model is a BUT11APX (part no. 4822 1301 1575). Sure enough it was short-circuit, but after fitting a replacement the set was still dead. Further investigation showed that there was little activity in the power supply. After carrying out some tests I decided to order the MC44603A control chip, circuit reference IC7520 (part no. 4822 2099 0025). When the replacement arrived and was fitted the set came back to life. **P.S.**

## **Sharp LC20E1E**

I'd never seen this LCD set before. The fault was no teletext. When I phoned Sharp technical I was told that there were two options, to phone Sharp service and arrange for the set to be collected for repair or to resolder the surface-mounted chips IC1601, IC1602 and IC1603. I decided to take the bull by the horns and do the latter. This proved successful, which brought a smile to my face. **P.S.**

## **Tatung T28NE51 (E series chassis)**

Failure of the TDA8350Q field output and EW drive chip IC401 is becoming a common problem with these sets. There is usually a hole in its side, and all that's required is to fit a replacement. With this

set however there were flyback lines at the top of the picture when the replacement had been installed. On further investigation I found that R437 (1.2Ω, 0.5W) in the 45V supply had been damaged. A replacement cured the fault. **P.S.**

## **Toshiba 32ZP18Q**

Shutting down to standby with projection models that use this chassis has previously been reported. The fault also occurs with this widescreen model. The teletext panel, part no. 23786696, can be the cause. **P.S.**

## **Philips 25PT4523/25 (MD1.2E chassis)**

This set was dead with the 1N5061 mains bridge rectifiers D6510-3 short-circuit. After fitting replacements and carrying out some general checks I switched the set on. It was still dead, with no outputs on the secondary side of the power supply. The simplest thing to do seemed to be to order service kit ES7056 (part no. 4822 310 32259). This is recommended when the chopper transistor is short-circuit, though it was OK on this occasion. When the kit arrived I replaced all the items that are on the primary side of the power supply. The set then came to life. It's easier to order the kit than the separate parts. **P.S.**

## **Tatung T28W441 (4400 chassis)**

There was no sound or picture. When you get this symptom, check the voltage at the collector of the S2000AF line output transistor TL4. If it's at about 49V the set is stuck in standby. Turn your attention to the low-voltage regulator ICP3 in the power supply. Resolder it, paying particular attention pin 9 which is the 5V supply to the microcontroller chip. **P.S.**

## **Sharp 66ES-03H (CA10 chassis)**

I've reported this fault before, in connection with Model 66FW-53H (DA100 chassis). It's now showing up with these sets. The symptom is the BUH515 line output transistor blowing at switch on. The item to replace is C607 (330μF, 16V), which provides the negative supply for the line drive circuit. **P.S.**

## **Bush 2152T (Onwa chassis)**

The symptoms were no sound and a blank raster, with a slight swirling pattern present. Scope checks showed that there was a good video signal at pin 19 of the IF demodulator IC. I followed this to IC801 (teletext), where it was lost as the 5V supply was missing. It was in fact being muted by Q809, which was being switched on because there was 3V at the collector of



the standby relay driver transistor. Scope checks revealed that there were pulses at both the base and collector of this transistor. In a flash of inspiration I replaced the electrolytics on the secondary side of the power supply. This cleared the problem. I wish I had taken more notice of that swirling pattern! **P.L.**

### **Philips 25MN1550 (GR2.2AA chassis)**

The repair to this set was spread over several weeks. To start with the line output transistor was replaced and some dry-joints were attended to. Three weeks later the transistor failed again. Various capacitors and the LOFT were replaced, to no avail: the set still ate a BU508 every now and again. While I had the set on soak test I noticed that the horizontal phasing seemed to vary. I replaced the TDA2579B timebase generator chip and, after a long soak test, decided that the set was now OK. **P.L.**

### **Sharp 66FW-54H (DA100 chassis)**

No picture with a ticking noise was actually line collapse. On investigation I found that the scan-correction/coupling capacitor C613 (560nF) was open-circuit. Once a replacement had been fitted there was a narrow, bowed picture. Replacing the 2SD2391Q EW-modulator driver transistor Q506 completed the repair. **P.L.**

### **Decca/Tatung F series chassis**

A number of sets fitted with this chassis have come my way with the symptoms that they revert to standby with the LED flashing four times. This indicates that the set has been unable to achieve black-level clamping/auto grey-scale adjustment. The cause is usually one or more of the three 180k $\Omega$  resistors R909, R913 and R922 on the CRT base panel. I recommend replacing all three with high-stability, metal-film resistors. **P.L.**

### **Philips 25PT4493 (L6.3AA chassis)**

This set seemed to be lifeless, but voltage checks showed that the power supply was running and the HT was correct. Further investigation led to the microncontroller chip's 5V supply, which was missing. The cause was transistor Tr7505 (BC337) – it was open-circuit. **P.L.**

### **Sony KV32LS60U (AE6B chassis)**

When this set was switched on a buzzing noise came from inside. The buzzing sound came from the power supply, where the four ceramic capacitors around the mains bridge rectifier D6001 were

resonating. I've had this fault with a similar set before. The solution is simple. Replace the four 4.7nF, 500V capacitors C6012/3/6/7 on board G with four 1.5nF, 2kV ceramic capacitors, part no. 1-104-571-00. This stops the buzzing. **C.B.**

### **LG Flatron RZ-15LA31**

This 15in. LCD set would die if it was moved. I found that the 12V DC connector at the back produced the fault when disturbed. The AC-to-DC power supply unit lead was checked for breaks with a multimeter and found to be OK. When I looked inside I found that the cause of the trouble was dry-joints at the DC jack connector. A quick resolder cured the problem. **C.B.**

### **Sony KV28DX20U (BE3E chassis)**

Intermittent loss of digital stations (lock-up) was the complaint with this set. Inspection of board A2 with a magnifying glass showed that the shield board (can) of board N was cutting into the tracks of board A2, causing a short-circuit. The solution was to unsolder the shield board (can) and pull it away from the tracks on the top side of the board, to provide an air gap between the shield case and the board, then resolder. **C.B.**

### **Sony KD32DX100U (AE6D chassis)**

There was waviness on the menu boarders, mainly when using a Sky digibox. The solution to this problem is to improve the earthing of board D1 by adding a wire (UL1007 AWG18 30mm), if not already fitted, between Q8106's source terminal and the earth terminal of CN8615. This will restore normal, straight menu boarders. **C.B.**

### **Goodmans W280NS (F19 chassis)**

If you have a dead power supply with one of these sets, check for dry-joints at the mains choke L3. In this set further checks were required however. I found that R8 (390k $\Omega$ , 1W) and R9 (560k $\Omega$ , 1W) had both gone high in value. Replacements brought the power supply back to life.

This set also appears as the **Proline Model 28N1**. **B.B.**

### **Bush 2867NTX (11AK19-5 chassis)**

There was lack of width and EW distortion, with no control via the service menu. No voltage was present at the BUK444 EW diode-modulator driver transistor Q603. After checking R629 and a number of capacitors I came to the conclusion that the EW choke had shorted

windings – they were slightly discoloured. A replacement from CHS, part no. ALB1034, cured the fault. **B.B.**

### **JVC AV25GS1EK (MX chassis)**

The problem with this set was that the power supply shut down after two-three seconds. The cure was to replace EEPROM IC704, JVC part no. CAT93C66P. After fitting the replacement you have to enter the 'preset mode' to alter the settings and adjustments. **B.B.**

### **Hitachi C28W40TN**

There was an intermittent EW problem with this set. When the glue around the pin connections of Q700 (IRFS530A) had been carefully removed a number of dry-joints were discovered. Dealing with these cured the fault. **B.B.**

### **Toshiba 28W8DB (C7SS chassis)**

The symptoms with this set were no picture, sound OK. When the setting of the first anode control was advanced there was a full raster instead of the usual field collapse. The fault was nevertheless caused by the TA8427K field output chip IC301: the field blanking pulse at pin 7 was missing. A new IC restored the picture. **B.B.**

### **JVC C1480EK (BX11 chassis)**

If the problem is drifting off tune, the cure is to replace four capacitors in the station-select module. These are C014 and C017 (both 3.3 $\mu$ F, 50V), C015 (22 $\mu$ F, 6.3V) and C016 (0.47 $\mu$ F, 50V). **B.B.**

### **Philips 25PT4523 (MD1.2E chassis)**

This 25in. Nicam set produced a blank screen. Sound was OK. Checks showed that the CRT's supplies were all present but its cathodes were cut off. To cut a long story short, R3450 (68k $\Omega$ ) was open-circuit. It's part of a potential divider network that feeds beam-current information to pin 20 of IC7119 in the video control section.

We've had this problem a few times now. Note that the value of R3450 depends on tube type and size. **A.J.**

### **Sanyo 28XP1 (EB4A chassis)**

This Dolby set switched on for only a few seconds then reverted to standby. During its short on time a full picture could be seen with the lights off, but there was no sound. The set was going into the protection mode because of a short-circuit in the audio output section. IC3051 was the cause: it drives the centre and surround speakers and is mounted on a

separate PCB. A protect line monitors its supplies and, when activated, reports back to the microcontroller chip. A replacement for IC3051 restored perfect sound and pictures.

The customer had caused the fault by adding extra speakers in parallel with the surround outputs. A.J.

### **Panasonic TX2172 (Alpha 1 chassis)**

These are old sets now, but they have Fastext and any we see have excellent tubes. The only fault we seem to get is a blank raster, the cause every time being the TDA4505M chip IC101, which carries out sound and vision IF and sync processing. A different chip is now supplied, along with two changed-value resistors and instructions. We consider that repair is still economical, as the picture quality and reliability are excellent. A.J.

### **Philips 32PW6515 (A10E chassis)**

The unusual symptoms with this set were that the volume level couldn't be altered when it had been on for a short time, and that when a channel change was requested there was a delay of 10-15 seconds before this happened. The cause of several unusual channel-change and sound faults has been the 'painter' chip IC7064. It was once again the cause of the trouble. This model uses the EP version of the chip, part no. 3111 250 54501. A.J.

### **Sharp 51AT15H (5BSA chassis)**

The customer said that this 21in. set was dead. When it was tested however the red standby light appeared briefly then faded out. Checks showed that there were outputs at all the rectifier diodes on the secondary side of the power supply. The voltage on the +5VB line was low at only 1.3V however, because the BC338-40 series regulator transistor Q708 was almost open-circuit. This hard-working component supplies the timebase generator and video/chroma processor chip IC801. A.J.

### **Mitsubishi CT21M5BT (EE4 chassis)**

"Dead when warm, very intermittent" was the complaint with this set. When the fault finally occurred checks showed that the power supply was tripping. As the set worked normally for most of the time one of the usual overload failures seemed an unlikely cause. While carrying out checks around the regulation feedback optocoupler PC951 the set restarted and

ran normally for hours. As cold checks proved that all the associated components were OK, the optocoupler was replaced. This provided a permanent cure. A.J.

### **Schneider STV2802T**

We had fitted a new line output transformer to this set because of EHT arcing. A week later it came back with the complaint "no picture". Scope checks at the base of the line output transistor showed that the drive waveform was present for only a fraction of a second at switch on. But if the HT supply to the line output stage was disconnected the drive continued to be present.

To cut a very long story short, C307 (47nF, 100V) was found to be open-circuit. It's a small red capacitor near the line output transistor and appears to be part of a potential divider network that feeds pulses back to the timebase generator circuitry. A few days later we had the same problem after replacing the LOPT in another of these sets. We now change C307 as well. M.McC.

### **Bush WS6667**

Several of these widescreen sets have come in dead. In each case the cause has been the HT rectifier diode DP12, which goes short-circuit. The chopper transformer should also be checked for bad joints. M.McC.

### **Crown CRP2196T (SM1 mono chassis)**

This set was dead. It uses a conventional chopper power supply with a FET and a TDA4605 control chip, Q101 and IC101 respectively. The 5N90 FET was short-circuit and the 5-6 $\Omega$ , 5W surge-limiter resistor R101 was open-circuit. Checks around the IC revealed that R109 (330k $\Omega$ ) was open-circuit and R108 (220k $\Omega$ ) had risen in value to over 600k $\Omega$ . Once these components had been replaced the set produced a first-class picture. M.McC.

### **Sony KVX2152U (AETC chassis)**

The customer had complained that this set was dead, but when it was switched on a faint tripping sound was heard from the power supply. A voltage check across the mains bridge rectifier's reservoir capacitor C604 (220 $\mu$ F, 385V) produced a reading of only 170V. The capacitor was completely open-circuit! M.McC.

### **Goodmans 285NS (Daewoo CP775 chassis)**

If one of these sets comes in with a short-circuit TDA8351 field output chip (I301) and the BYV95C rectifier diode (D408)

in the 46V supply has been overheating, the cause is usually shorting in the line output transformer. So be careful with your estimate! The Eldor transformers used in cheap supermarket and own-brand sets seem to have a very short (in all senses) life. G.D.

### **JMB TV430SLR**

This is an arm's-length Philips subsidiary set, fitted with the CTV-BB chassis. It was tripping because of a short across the 95V supply. By force of habit I replaced the line output transformer, but the short-circuit was actually caused by the BYT-42M efficiency diode D6447. G.D.

### **Matsui 1408R**

A dead set is usually caused by failure of the 220k $\Omega$  start-up resistor R513. Obvious, but it's easy to overlook as this 2W metal-film resistor looks as if it should last forever. Don't forget to reconnect the speaker plug! G.D.

### **Schneider STV2802T**

"It's made by Asda" proclaimed the proud owner of this set, conjuring up the vision of an in-store factory behind the delicatessen counter. Once the back had been taken off (Torx T20, long-reach) I found a German chassis. The set was tripping because the S2055 line output transistor was short-circuit. No dry-joints could be found, so I fitted a replacement and brought up the HT gradually. Not gradually enough to prevent fireworks from the LOPT (guess the make!). A replacement was fitted, but the IC that provides the line drive had been killed. Oh dear, it's a VDP3108B, which will be familiar to Panasonic fans. But the A version doesn't work in these sets, and the B version doesn't seem to be available. Anyway the repair was now uneconomic. Perhaps supermarkets should put a "best before" date on their sets. G.D.

### **Some quickies**

**Sharp 66GS-62H:** For symptoms like tuner drift replace IC201.

**Philips 21PT4457:** It was impossible to increase the volume above fifty per cent. The cure was to replace IC7831.

**Mitsubishi CT2525TX (Euro 10 chassis):** There was no picture though the on-screen display was OK. This display showed that the colour, contrast and brightness were at maximum. The cause of the trouble was the -30V supply, which was low. The cure was to replace C962.

**Bush 1433 (11AK08 chassis):** There was a bright raster with flyback lines because the 200V supply to the RGB output stages on the CRT base panel was missing. D604 (BA157) was open-circuit. M.M. ■



In Part 7 of his series on PC servicing **Adrian Gardiner** describes some ways of improving the performance of a Windows installation

# Bench Notes

This month we take a look at improving the performance of a Windows installation. By following the suggestions given below, you should be able to achieve a significant improvement in your PC's speed and performance.

## Get rid of the junk!

Most applications install a 'quick-launch' module which is loaded into Windows whenever it starts. Many of them appear in the right-hand corner of the taskbar. They supposedly speed up the time it takes to load a program when you want it. But in reality the time difference is fairly small, and the more of these memory-hogging 'quick-load' modules you have the slower your machine will run, thus negating their whole purpose!

By pressing Ctrl Alt Del you open the task-manager program, which displays a list of the programs running. The more applications you install, the bigger the list will be.

The first performance-improving task I recommend is to stop these module programs from running. This will not prevent the main programs running, it will simply control when they run.

To carry out this task you need to launch the Windows 'System Configuration Utility'. Click on the Start menu then select Programs > Accessories > System Tools > System Information and click on this. On the screen that appears, click on the Tools tab and then on 'System Configuration Utility' to start it.

The utility will open on the 'General Tab'. Select 'Selective Startup', then remove the ticks in the 'Config.sys' and 'Autoexec.bat' boxes (click on the boxes). These are redundant features from earlier versions and can further clutter up the memory. Next click on the 'Startup' tab. You will then see a screen similar to that shown in Photo 1. It shows a list of all the programs that load during a Windows startup. Many of them are not needed and, by removing the ticks from the boxes alongside, you will free vital system resources.

The only items that should be left ticked are ScanRegistry, SystemTray, LoadPowerProfile (may appear more than once) and any 'anti-virus' entries. You can usually identify the anti-virus entries easily, either by their name or by

looking at the path next to them.

Once you have switched off the unnecessary items, click OK to finish. You will then be prompted to restart the PC. In the unlikely event that you experience any problems after restarting, simply return to the configuration facility and switch the required item back on. If you cannot identify the item that's required for your particular system, try switching them on one by one until the system behaves normally. The patience required to carry out this step is well worth it!

## Memory

Perhaps the most known-about performance booster is more memory. All computers require memory (RAM) to store temporarily the results of their calculations etc. Within limits, the more memory a computer has the faster it will operate. For Windows 98 installations, the optimum amount of memory required is 256MB. For more modern XP installations, 512MB or even 1GB of memory is advantageous.

If you are unsure about the amount of memory installed, click on the Start menu then select Settings > Control Panel. Next, click on System. The amount of memory can be seen in the window that appears. If it's less than 256MB, consider adding more. Note that there's no point in having more than 256MB with Windows 98, as this is the operating system's limit. Any extra is simply a waste.

## Visual speed

Another performance improvement can be achieved by switching off some visual effects. These are Windows enhancements that aim to make it more pleasing visually.

To disable them, right click anywhere on the desktop. Click on Properties in the menu that appears. Next click on the Effects tab, then remove the ticks from the boxes in the Visual Effects part of the screen. Click OK and you should find that the machine's response is quicker.

## Next month

We'll continue next month with more performance-enhancing techniques. ■

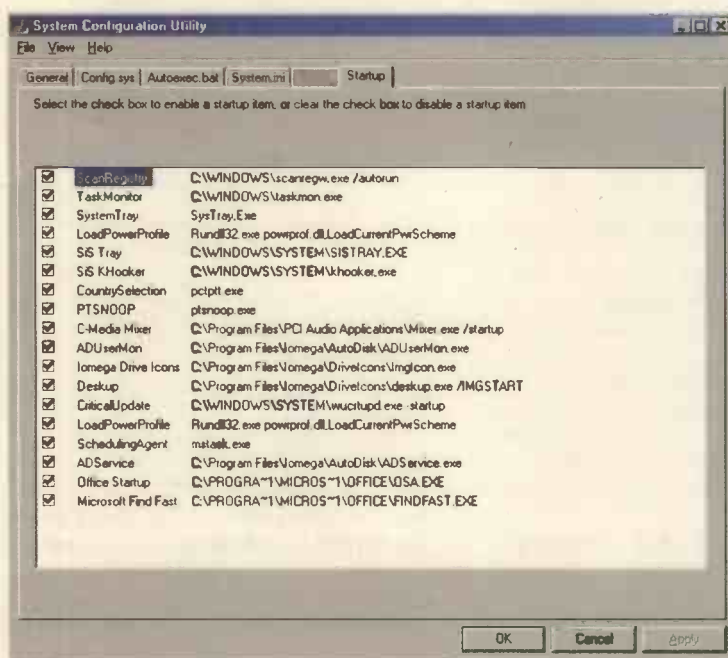


Photo 1: Typical system configuration screen.

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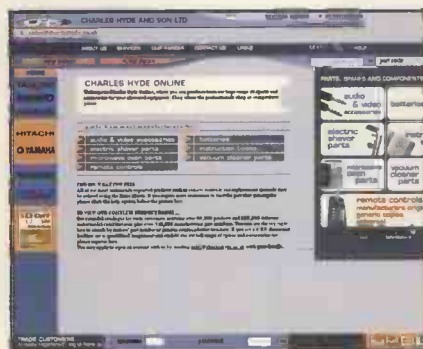
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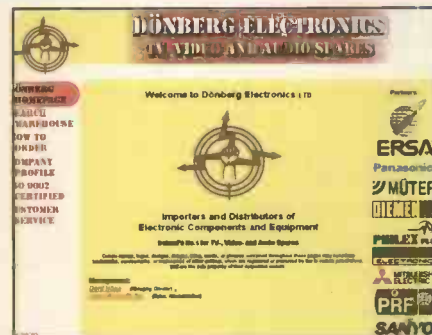
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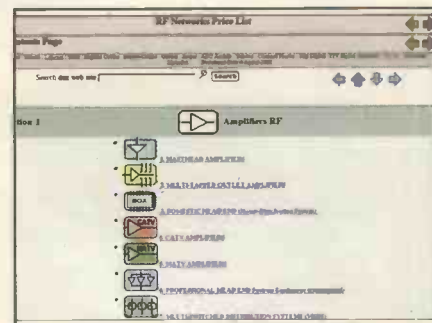
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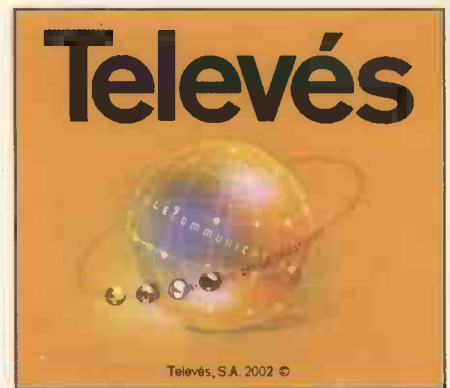
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A newsagent can order any magazine for you, whether or not the shop normally stocks it.

If you buy your copies of *Television* from a newsagent and want to make sure you get every issue, just ask at the counter.



# Service Casebook

Michael Maurice

## A request

One of my happier childhood memories is of having a reel-to-reel tape recorder, a Korting MT157. Over the years it received much use and abuse. I tried repairing and playing about with it when I was in my teens, but this just made things somewhat worse.

I've always wanted to rebuild this lovely old machine, and to help with this I imported an MT158 from Canada. I am hoping to swap its motor and mains transformer with ones from another machine. I could use my old machine as the donor, but would prefer another machine for spares. Does anyone have any spares or even an old machine? It doesn't have to work, as long as the motor runs and it works with a 220-240V, 50Hz supply. If you should have one, or know of a source of spares, please email me at Michael.ali@btinternet.com

One of the most frustrating aspects of our business is the TV sets and VCRs that you repair then find that they fail a few days later with exactly the same symptom, though the cause is often not the same. Within a week I had three examples.

## Ferguson B59F (ICC7 chassis)

This set was dead with its line output transistor short-circuit. As usual, the cause was that one end of CL21 in the EW modulator circuit was dry-jointed. When this capacitor is dry-jointed it normally fails, so I replaced it. Not with the Ferguson capacitor but with 10nF, 2kV and 1.5nF, 2kV disc capacitors in parallel. This makes up the original value. An S2000N was fitted as a replacement for the line output transistor.

The fault recurred two days later. This time I ordered the correct capacitor and a 2SD1546 transistor and fitted them. The set worked, then failed again after another two days. The line output transistor had died, but not because of the capacitor. There had to be another cause. What could it have been?

In the end I replaced the 24V supply reservoir capacitor C59 (3,300 $\mu$ F, 35V), which appeared to be leaking (as it does), and CL18 in the network across the primary winding of the line driver transformer LL19. I upgraded this capacitor to 1 $\mu$ F, 50V, as suggested by Euras. It's probably relevant that the line driver stage is fed from the 24V supply. I had to fit another line output transistor of course.

I went away for a long weekend, and phoned the customer on my return. The set was still working and, as I haven't heard since, I assume that it's now OK.

## Sharp 56FW-53H (D100 chassis)

The only sign of life with this set was that the orange standby light lit. Its line output transistor was short-circuit, the cause as usual being a dry-joint at the scan-correction capacitor C613 (560nF, 250V). The set worked once a replacement transistor and capacitor had been fitted, so I boxed it up and left it with the customer. He phoned three days later, and was not happy. He now had sound but no picture.

I collected the set and found that the line output transistor had failed again. This time the fusible resistor in the feed to the line output stage was open-circuit, hence the sound. I checked for dry-joints and found a suspect one at the EW loading coil. This was resoldered, a new transistor was fitted, then the set was put on soak test. It worked for two days after which, on a particularly cold morning, it failed. The line output

transistor was once more short-circuit.

This time I checked C607 (330 $\mu$ F, 16V) in the negative supply to the transformerless line driver stage. It was leaky, with a high ESR. I replaced it, along with the line output transistor, and put the set on test again. To ensure that the workshop was cold, I turned the heating down and left the windows open overnight. The next morning was very cold, but the set came on. So I returned it to the customer. This time it had been fixed for good.

## Panasonic TX28X1DP (Alpha 4 chassis)

This set was dead and squealing, the cause being the 2SD1577RL line output transistor Q554 which was short-circuit. I replaced it, along with the notorious 8.2nF, 2kV capacitor C558 in the EW modulator circuit. The set then worked, so I took my fee and departed.

The next day the customer was on the phone. Same fault. This time I took the set back to the workshop, where I looked very carefully for a cause and found dry-joints around the TDA2579A timebase generator chip IC501. This was resoldered, and a new STR56041M chopper chip IC821 was fitted. After that the set continued to work perfectly.

## Hitachi VTF150E

There were two problems with this VCR, a noisy capstan motor and no audio from the right-hand channel in E-E or record. The first fault was cured by replacing all the capacitors on the secondary side of the power supply. The second fault was in the Nicam circuitry, where the TDA1543 D-A converter chip had failed. A replacement restored the sound in both channels.

## Philips 20PV184/05

This combi set couldn't be brought out of standby and had a tape stuck in it. For once it wasn't the cassette section's worm drive. The line output transformer was faulty.

## Toshiba 40PW8DB

Projection TV sets are always difficult to work on and, because of their size, repairs have to be carried out in the customer's home. This was no exception, and the repair was urgent as its owner is severely disabled. His TV set and computer are his only forms of entertainment. The fault was no picture.

A quick inspection revealed that the CRT heaters were not lit. The cause was traced to a dry-joint at the heater circuit surge-limiting resistor, which is mounted on the green CRT base board. To get to it you have to dismantle both the front and back of the set. Resoldering cured the problem. ■

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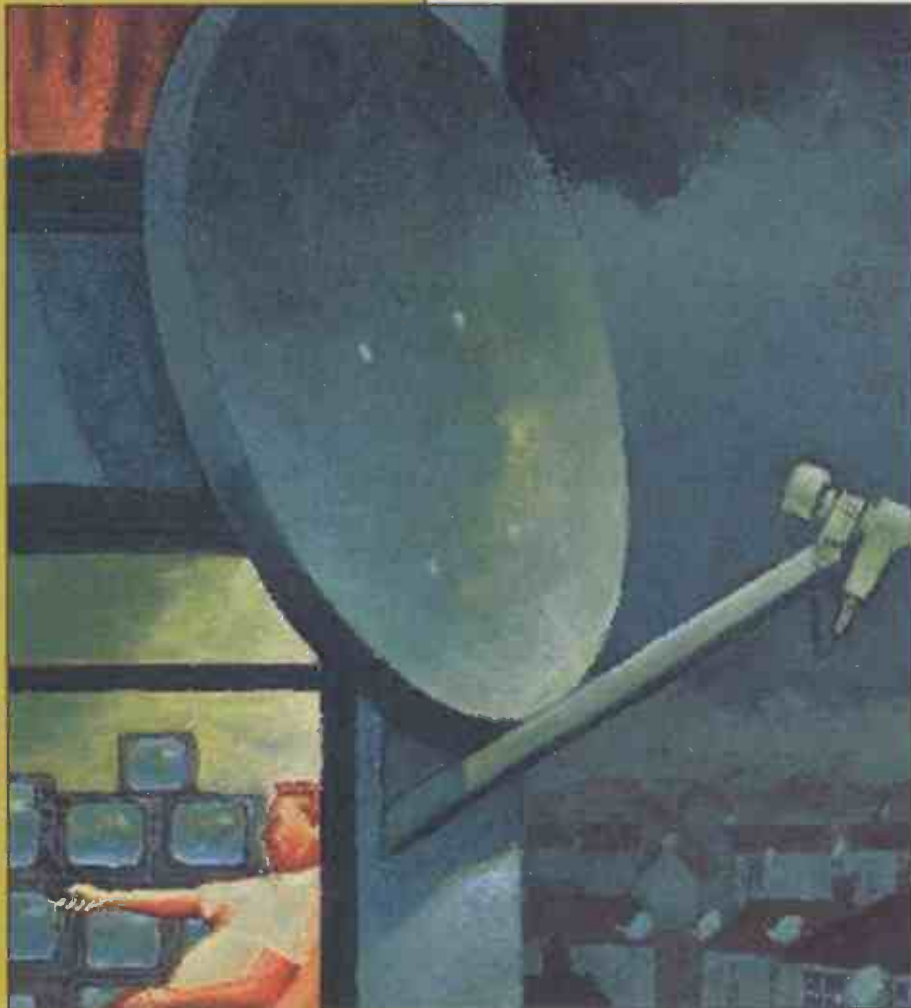


Photo 1: Sky Sports golf feed from the US via PanAmSat 3R.



Photo 2: Sky Sports golf feed from the US via PanAmSat 3R.



Photo 3: Sign-off caption, on standard NTSC colour bars, closing a feed from TVN Chile via PanAmSat 3R.



Photo 4: Fox Sports Middle East 625-line transmission via PanAmSat 3R.

# SATELLITE NOTEBOOK

**Reports from  
Hugh Cocks  
Christopher Holland  
and  
Michael Dranfield**

## An LNB problem

Mr Smith's Grundig digibox is one of three that are connected to a dish at a small block of flats. It had given trouble-free service for several years. Then he rang up to say that the digibox was displaying the 'no satellite signal being received' message, and that the usual disconnection from the mains supply followed by reconnection produced no improvement – though, oddly enough, the time appeared, with the 'searching for listings' message, prior to the reappearance of the 'no satellite signal' message. This suggested that the box was seeing at least some sort of signal. He had checked with his

neighbours who had connections to the dish and found that they had no reception problems.

I found that the symptoms were exactly as he had described. When the spectrum analyser was connected to the receiver's IF input cable it immediately produced a 'supply short' message, though I could see on the analyser display that the low-band, vertically-polarised signal was present – the LNB was being powered by the other two receivers. A multimeter check produced a resistance reading of about 40Ω between the inner and outer coaxial cable conductors, which is much lower than it should have been.

I suspected a problem with the cable, but decided to start at the dish and work backwards. The same resistance was present at the LNB F connector that was feeding Mr Smith's digibox, while the reading at the other LNB outputs was at about 700Ω. Fortunately there was an unused connector, and when this was used to feed Mr Smith's digibox his reception was OK.

I told him that the LNB could be replaced or his digibox could be left connected to this other output, but that





Photo 5: Fox Sports feed via PanAmSat 3R.



Photo 6: RTL New York caption via PanAmSat 3R.



Photo 7: An occasional feed via PanAmSat 3R at 12.638GHz H.



Photo 8: BBC International control room colour bars via Eutelsat W3.

Table 1: Latest digital channel changes at 28-2°E

Channel and EPG no.	Sat	TP	Frequency/pol
Exchange & Mart tests	EB	C5	11.391GHz H
Live TV (274)	EB	C6	11.426GHz V
Pout TV (984)	EB	C6	11.426GHz V
Trouble Reload (608)	2A	13	11.954GHz H

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

with this latter arrangement there was a risk of total LNB failure at some stage. He decided to leave the old LNB in place, and so far it has worked all right. Maybe the failure was something to do with the recent very hot weather! Why had the receiver shown the time when 'searching for listings' was displayed? Possibly this was because the low-band vertically-polarised signal was present on the faulty feed. H.C.

### Digital channel update

The latest channel additions at 28-2°E are listed in Table 1. Where allocated, the EPG number is shown in brackets after the channel name.

P-Rock TV (Eurobird transponder C5) has ceased transmissions. Playboy TV has moved from transponder D3S to transponder C6 (11.426GHz V).

In late July BBC Radio 2 and 4 FM started transmission via the Astra 2B BBC transponder 37 (12.441GHz V), which is normally used for interactive programme material. This gives improved coverage following complaints from listeners in outer parts of Europe who had lost reception with the previous move to Astra 2D. The BBC says that no other radio stations will move to transponder 37. With non-digibox satellite receivers, tune in the stations with a symbol rate of 27,500 and 2/3 FEC. Digiboxes were switched to the new frequencies on August 5. Transmissions from transponder 47, Astra 2D, ceased on August 6. BBC Radio 4 LW satellite transmissions and all other BBC satellite radio channels continue to use transponder 47 (10.803GHz H), being unaffected by the move.

Sky Movies Premier 2 (EPG no. 302) has moved from transponder 11 to transponder 7 (11.836GHz H).

Setanta Sports 1 has moved from Eurobird transponder D9S to Astra 2A transponder 22 (12.129GHz V). Setanta Sports 2 also left transponder D9S, moving to Astra 2A transponder 17 then, a couple of weeks later, transponder 18 (12.051GHz V).

The SAB/MATV promotion via Eurobird transponder C5 (11.390GHz H), reported here last month, has ceased, being replaced by colour bars. C.H.

### BBC's number games

The BBC has moved some of its new radio

stations in Sky's EPG list, apparently because it thinks that a lower EPG is more likely to be selected. One thing that can't have been given much consideration by the BBC's number jugglers is that many listeners were extremely annoyed when they entered their usual favourite station number and got the red 'channel unavailable' message. Some people with non-digibox receivers lost Radio 2 and 4 altogether after their move from 2D to 2B (see above), after having returned from 2A in May.

All being well, the period of frequency and EPG number juggling by the BBC has now come to an end. The new EPG numbers are as follows:

Radio 1 Extra	887
Radio 4 LW	893
Radio 5 Extra	894
Radio 6	870
Radio 7	881
RN Gael	905

Children's TV channels CBBC and Cbeebies have also moved, to 616 and 617 respectively, while BBC3 has moved to 115 and BBC4 to 116, thus producing more phone calls from confused customers. Please don't ring us to complain, phone the BBC! C.H.

### BBC regional variations

The BBC regional variations, which started last month, have now been included in the EPG, see list below. A BBC1 and BBC2 region will be picked automatically from the list and placed at 101 and 102 in the EPG, and will thus be missing from the regional variation numbers. If a Sky digibox has no card in its slot, 101 and 102 will be the region used by the last card inserted in the slot.

Irish digiboxes continue to show BBC1 and BBC2 Northern Ireland at 214 and 215, though all other BBC programmes are strangely missing from the EPG and have to be added via the extra channels facility. One wonders why?

Here's the EPG list:

941	BBC1 Scotland
942	BBC1 Wales
943	BBC1 N Ireland
944	BBC1 London
945	BBC1 NE and Cumbria



Photo 9: Caption transmitted prior to a news feed to TVE Spain from Colombia, S. America via Eutelsat W3.

- 946 BBC1 Yorkshire
- 947 BBC1 E Yorks/Lincs
- 948 BBC1 NW
- 949 BBC1 W Midlands
- 950 BBC1 E Midlands
- 951 BBC1 E (Eastern)
- 952 BBC1 E (Western)
- 953 BBC1 SE
- 954 BBC1 South
- 955 BBC1 Oxford
- 956 BBC1 West
- 957 BBC1 SW
- 958 BBC1 Channel Islands\*
- 959 BBC2 England
- 960 BBC2 Scotland
- 961 BBC2 Wales
- 962 BBC2 N Ireland

\*From late 2003 C.H.

### Ku-band reception at 43°W

The PanAmSat 3R satellite at 43°W uses the C and Ku bands for broadcast service links across the Atlantic. The 12.5-12.75GHz band is used in Europe, the 11.7-12.2GHz band in North America – the latter can't be received in Europe. Table 2 shows the Ku-band transmissions available in Europe.

There are occasional feeds between

12-506-12-552GHz and 12-611-12-740GHz, with a mixture of polarisations and symbol rates. Photos 1 and 2 show typical golf feeds for Sky Sports from the US at 12-694GHz V, with SR 6,620 and FEC 2/3. Photo 3 shows a sign-off caption on standard NTSC colour bars, at 12-731GHz H with SR 6,111 and FEC 3/4, closing a feed from TVN Chile.

PanAmSat 6 is co-sited with 3R at 43°W. It's used for DTH transmissions to S. America and produces no reception in Europe. H.C.

### Unusual test cards

Continuing with our series of unusual test cards and captions, Photo 8 shows the BBC International control room colour bars, taken prior to a Eurovision News Exchange via Eutelsat W3 (7°E) at 11-070GHz V. Unusually, the colour bars are surrounded by a white border area. As is the way with digital test signals these days, the circle in the middle has some colours that move around the circumference to indicate that the signal is live.

Photo 9 was taken prior to a feed, via the same satellite, for the Spanish broadcaster TVE from Columbia in S. America. The signal was at 11-096GHz H.

Both signals were transmitted in MPEG 4:2:2 format with the normal Eurovision symbol rate of 6,666 and 7/8 FEC. H.C.

### Pace 2300

This digibox wouldn't read the new card and switched to standby. I found that the software was well out of date and did a forced download. The box completed this, taking ten minutes, but the new software hadn't been stored in the flash-memory chips.

This digibox has four flash-memory chips that are arranged in two banks of two, and the micro can select which bank to boot from. The write to the flash memory must be a full 32-bit word however: both

devices in one bank must be written to together, and this is where the problem lay. Some of the pins between 25-48 of U7202 had never been soldered from new. They were just sitting on the print. The digibox will run quite happily with one of the flash-memory chips removed, but will never be able to update the operating system software. M.D.

### Panasonic TU-DSB31

This digibox was stuck in standby and I found that the 12V regulator in the power supply was red hot. It was difficult to see the cause of the problem at first, so I decided to connect my bench power supply, with the output set to 12V, to the regulator's output. Something fed from the 12V rail was drawing 1.9A. I then noticed a burning smell, which came from the tuner. A mega burn-up had taken place inside – one of the ICs was burnt to a cinder.

When I removed the tuner a small strand of wire fell from the board. I suspect that it had been there from new, and that it had shorted two of the tuner's pins when the digibox had been moved. A replacement tuner restored normal operation. M.D.

### Panasonic TU-DSB31

This digibox intermittently displayed the 'no satellite signal received' message when a BBC channel was selected. The problem could sometimes be cured by changing channel up and down. Fortunately I had seen a modification kit that's available from SatCure to cure this fault. The part no. is PANAFIX2D FILTER. It's available directly from [www.satcure.co.uk](http://www.satcure.co.uk) and can be purchased with a credit card – no account is needed. The instructions supplied are printed in colour, and it's one of the easiest modification kits to fit I have come across.

This problem can also occur with the TU-DSB30 digibox, for which SatCure has a modification kit. M.D. ■

Table 2: Ku-band transmissions available at 43°W

Frequency/pol	SR/FEC	Service
12-578GHz H	19,850 3/4	Fox Sports Middle East* (625 lines – see Photo 4) and three Fox Sports feeds (see Photo 5).
12-584GHz V	27,500 3/4	Mexican package**.
12-605GHz V	6,615 3/4	Fox News (625 lines)***.
12-638GHz H	19,850 3/4	Eternal World TV Africa, Eternal World TV Europe, RTL New York (see Photo 6) and two occasional feeds (one shown in Photo 7).

\*Fox Sports Middle East is used as a programme feed for DTH services in the Middle East.

\*\*The Mexican package is scrambled and consists of five channels that feed Spanish satellite and cable broadcasters.

\*\*\*Fox News is not scrambled and is used to feed into the Sky package, EPG no. 531. Picture quality is far better with this feed than with Sky, which in comparison is very blurred.

## Solution to Test Case 490

- see page 749 -

Aren't intermittent faults horrible?! By way of a last clue before all is revealed, the same fault in another chassis, the Daewoo T512, is known to cause the set to come on by itself while it's unattended in the standby mode.

But we shouldn't be raising further questions at this stage. Cathode Ray gave some thought to the microcontroller chip's reset circuit. However this comes into operation only at switch-on from the mains, not at the transition out of standby. Our man finally found the culprit. There were almost invisible dry-joints at the legs of the microcontroller chip's clock crystal XL701. You might think that this would have shown up during the earlier disturbance testing with the handle of a screwdriver. Bang, bang on the panel. But it was the wrong sort of dry-joint!

A clean-up of the crystal's leadout connections, followed by careful tinning, fluxing and resoldering, cured the fault. Since then the set has been working reliably, earning us a couple of pounds a week rental.

There's a tendency for dry-joints to develop at the crystals in older TV sets. This usually results in spasmodic and intermittent symptoms. The problem can occur in areas other than the microcontroller part of the circuit, for example in remote-control zappers, colour decoders, Nicam processor circuitry and elsewhere. So it's something that is well worth checking. Next month we'll get away from elderly TV sets!

## NEXT MONTH IN TELEVISION

### At the IFA Show

The Internationale Funkausstellung Show (IFA) is the world's largest consumer electronics event, which is held in Berlin every two years. This year's show highlights developments in digital broadcasting, DVD technology, flat-screen TV, SACD and DVD-Audio, memory-card products and camcorder technology. George Cole reports on major news and developments.

### Flexible CCTV system

Simple inexpensive, off-the-shelf CCTV kits are readily available but lack individual expansion capabilities and flexibility. Ian Rees has devised a system that should fulfil the needs of small-to-medium sized installations, with some added innovations found only in dedicated PC or professional systems.

### TV interference from TETRA

TETRA (Terrestrial Trunked Radio) is an international standard for digital mobile communications. The police and other emergency services in the UK are gradually adopting TETRA systems. They are high-powered, and have started to cause UHF TV interference problems — the symptoms can be misleading. Bill Wright describes the problem and the remedies that can be used.

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# WHAT A LIFE!

**The recent heat induced some reminiscences, including problems with communal aerial systems and Band III converters. There are also some audio servicing tips. Donald Bullock's servicing commentary**

The other day Steven and Paul decided to slip up to the Midlands to do a bit of shopping. Before they went, they promoted me to the position of Chief Repairman and Bottle-washer.

I received the news sombrely. The prospect of being Mr Big about the place was all very well, but it meant that I would have to handle all the customers who came in, answer the phone calls and do all the benchwork – at the same time! Not to mention lugging about TV sets as big as cars for young fellows who claimed to have bad backs and parked their flash vehicles hundreds of yards up the road . . .

Anyway, the warm weather made me feel tired. In fact I *was* tired and, as they departed, I decided to sit on a TV set behind the counter and muse away for a minute or two. Then I'd get cracking, I told myself.

The voice of a deliveryman floated over from the shop opposite. "Thank you very much, madam, goodbye!" he sang out. Then the engine of his van sprang to life and he was gone. Those words, and the way they'd come across, reminded me of old Matt Morris.

## **New job**

It had been my first day in a new job, and Matt was showing me the ropes before he went on to his next call.

"Don't particularly like this area" he sang out as we reached a row of houses

at the edge of town. Packs of dogs roamed the litter-strewn streets, and there were several old cars with their bonnets up, some receiving attention from oily characters. We stopped outside a house that looked rough. Matt banged on the knocker and, when the door opened, strode in shouting "television man, missus". I followed him.

A sour smell hit us for six. So did the tacky floor and mangy cat. Piles of empty cans and bottles contributed to the stench. "Christ" said Matt as the lady of the house gave him a toothy grin of welcome. He strode smartly on, went round the table and back out through the door, with me following. I suppose it had all taken about five seconds.

"Thank you very much, madam, goodbye!" he sang out as we jumped into the van, which immediately burst into life, taking us away at a very good lick.

I looked curiously at Matt, but received no word of explanation or clue about what might be next. Funny business, I mused . . .

## **A DVD player**

My reminiscences were brought to an end by Grenville Carter, who had sidled in carrying a DVD player. I shuddered. DVD players frighten me. And Grenville is no oasis of charm.

"Wish I had your life instead of mine" he growled

I grinned back, and decided to be uproariously funny. "Perhaps we could come to some arrangement, Grenv" I said brightly, "what's your missus like?"

As I spoke a miserable lady came in and walked up to Grenville. "'Ave he mended 'im yet?" she growled. I looked at Grenville with fresh understanding, then they departed together.

I looked at the player, which was a Sony HCD-S800. It was dead. I went straight to the fuse, but it was all right. So I reached for the meter and went gingerly round the power supply. It wasn't long before I found a diode, D909, which was short-circuit. It's type RK46LF. When I had fitted a replacement the player worked a treat. Aw, DVD players are not that bad to mend I reckoned.

## **Band III problems**

Old Grenville looked a bit like another customer we had long ago. His name had better be Carruthers. He was a tall, thin, dry character who had earned his living as a packman, selling cloths from door-to-door in the poorer parts of the town. Packmen never got all their money, but they made enough from those who did pay to live comfortably. After retirement he and his wife invested their savings in a large, four-storey house in The Square, a once-grand area. They lived in the basement and let out the rooms above.

With the advent of ITV we were given the job of installing a communal TV signal distribution system there. At the time we were in a fringe service area. The Band I BBC signal could be fairly well received, using a large multi-element aerial mounted at the highest point of a house. But the Band III ITV signal came from distant Sutton Coldfield – when it came at all. Twelve-element aerials were required for this, often with a head amplifier. The signal was weak, and sometimes faded entirely.

Carruthers was a highly-strung hypochondriac, with every illness known to man plus a few more, and his only interest in life was watching television. His grey-haired wife didn't take too readily to her self-appointed role of long-suffering nursemaid-martyr. "He's a trial, but he's worth it. I couldn't live without him" she told us.

Having installed the amplified communal-signal system, with a distribution amplifier in a cupboard on the top landing, we called that night to see how well it performed. As always Carruthers was sitting in his tall armchair, about two feet in front of the huge 23in. console set, with his long fingers ready and eager to flick about to adjust the fine tuner, the contrast, the brightness and the hold controls for the best picture.

We switched on and at first the ITV picture was excellent. "Mr Bullock, you've worked wonders – what a good picture" he cried

Then the picture faded and broke up. Carruthers started to complain like a child. "Oh dear, the picture's gone.

Gone! Mr Bullock, please do something about it. I shall have to have another cigarette. Mary, I shall just have to. Give me one, will you?"

"Certainly not!" she snapped, "you've already had one. Whatever next!"

"Some fellahs have three or four a day" he protested, "and, oh dear, I'll never know who murdered him now! It's too awful. I feel quite ill! Medicine, medicine!"

Sighing much too loudly, his wife went out and came back with a trolley that resembled a chemist's shop.

Carruthers wasn't short of money and, in the coming weeks, we tried everything to improve his ITV picture. We fitted an extra, cascaded RF head amplifier, tweaked his tuner for optimum gain rather than bandwidth, and even added an extra IF amplifier to the set. These steps improved the situation somewhat, and eventually he agreed that, having done our best, it was now for him to enjoy his pictures such as they were.

### Following weeks

As the weeks went by we had a number of calls to the Carruthers' address, all complaining about intermittent ITV. Each time the caller had been advised to get in touch with us by Mrs Carruthers. We serviced the sets at the address, one by one, and souped them up for maximum gain. In fact we improved most of them considerably, but their owners still kept complaining that ITV sometimes disappeared completely. Soon we were spending a lot of time on free repeat calls, yet each time we found that the pictures were all right. The only people in the house who didn't complain were the Carruthers.

Then one night, when we called on one of the tenants to deliver a repaired radio set, we found that he had no ITV at all. Enquiries showed that the other tenants were all in the same boat – and wanted us to do something about it. Not knowing quite what to do, we went down to the basement to check with Carruthers. Looking through the window we saw him sitting there contentedly, watching the best ITV picture we'd ever seen.

His wife saw us and ran outside to hustle us away. "He makes me do it, Mr Bullock" she exclaimed. "When ITV fades he makes me run upstairs to the cupboard to pull out all the aerial leads except ours."

### A year later

About a year later we had a call to a large house in an expensive area on the

other side of the town. It contained some high-quality flats and our caller, an upstairs tenant, complained that his ITV had completely disappeared the previous night. But it seemed to be all right to us. Soon he was joined by another tenant, and yet another, who had experienced the same trouble.

Meanwhile a chocolate-brown Bentley glided into the drive, driven by a slim and elegant blonde who had clearly seen better days. She was accompanied by a handsome and attentive young fellow.

"How nice to see you, Mr Bullock!" cried the blonde. "This is one of my boyfriends, Rock."

I looked at Rock and smiled. Then I looked at her.

"Ah, you don't recognise me" she said. "Marilyn's the name. Marilyn Carruthers! You used to do our repairs before I put my grumpy old husband to rest. Thought he'd live for ever, but . . ." She clicked her tongue twice and grinned. "You remember, we lived in The Square!"

I gave her a watery smile and made hastily for the van.

### An Amstrad

"Here, is there anyone here or not?" boomed a powerful voice.

I quickly returned to reality to see the swarthy Charlie Rowe at the counter.

"This micro-thing" he boomed. "Belongs to the missus. The little record thing in him goes round and round like the devil, but no sound comes out of 'im. I'm giving him one more chance. If he plays up again, out 'e goes."

It was an Amstrad MC2900 micro hi-fi unit, and I had a good idea what the cause of the trouble was. I opened it and studied the multi-ribbon cable that plugs into the optical block. Sure enough, it had cracked at the end. I made it good carefully, and after that it worked a treat.

"You'd better behave yourself now" I told it as I boxed it up, "or it'll be curtains for you."

### Band III converters

Bill and Hilary Wright of Rotherham have written to ask whether I know anything of the old ITV converter boxes. I'll say I do. And I've still got the scars! They used (I'm told!) to sit on the tops of early BBC-only TV sets in the Fifties to receive Band III ITV and convert it to Band I for feeding to the set. They were, I suppose, a necessary evil of their day. Bill asks if I have a photo of one. Sadly, I only have my photographic memories! If anyone can help in this respect, please get in touch at the email address at the end.

These converters were soon superseded by the large and rather clunky Cyldon and Brayhead 13-channel tuners that became available as kits for fitting into the cabinets of BBC1 only sets. We had to remove the RF amplifier and mixer valves in the set and plug the new tuner's pair of Paxolin valve connectors into their sockets. We must have fitted hundreds of them. They were all alike in that the results were largely unpredictable, and they often produced herring-bone patterning – sometimes with other people's sets if they were close by.

Fitting one of these meant using a brace-and-bit and a drill, also sometimes a keyhole saw, to cut the cabinet. I soon learnt to try them out by connecting them electrically and observing the results before deciding to fit them physically. The results weren't always all that successful, and customers who found them to be poor, with their beloved polished-wood cabinets cut about, would sometimes get shirty.

We devised various dodges to cancel or reduce unwanted patterning and to improve the gain, including wiring one of the converter's plugs straight into the circuit instead the intended valve base, using the base thus made available for an extra IF stage – because in many areas the Band III signal was extremely weak and noisy. We also had dodges to combat the patterning that converters caused with neighbour's sets. But this meant bringing in the sets concerned, and not every neighbour was happy at the prospect of fuss and bother, to say nothing of having to pay out in the hope of curing or reducing the patterning that was caused by their neighbour's activities. I could tell many tales about the troubles this caused.

### Requests

Darren Henwood, who runs a fishing-tackle shop in Romford, has asked me if I know of a computer database package. I don't, but if anyone can help I'll be delighted to pass the message on.

You can reach me by email at [donald@bullock-bros.com](mailto:donald@bullock-bros.com)

Hints and tips and reminiscences are always welcome.

Darren also asked about my recent book, *The Legend that was Clapham* (in Gloucester, not London). I gave him the publisher's website address, which is [www.wheatleypress.com](http://www.wheatleypress.com)

There aren't many copies left, which is just as well – it will encourage me to complete my autobiographical book *Hovels and Haydust*. ■

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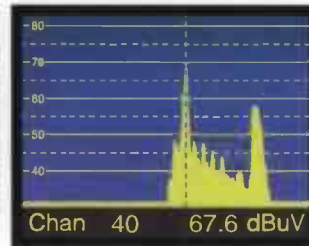
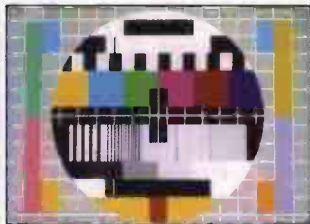
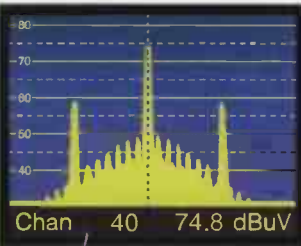
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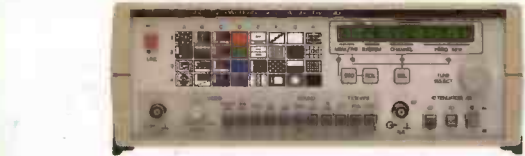
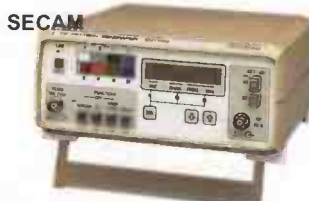
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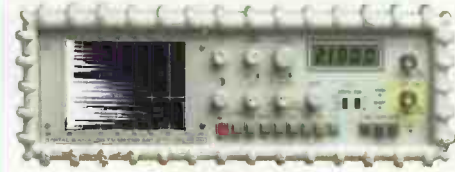
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