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

TELEVISION

AND HOME ELECTRONICS REPAIR

DECEMBER 2001 £3.00

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Picture courtesy Bush

Editor
Martin Eccles

Consultant Editor
John A. Reddihough

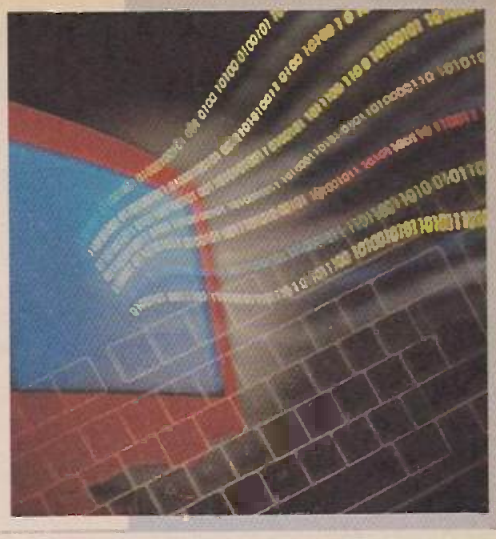
Group Advertisement Sales Executive
Pat Bunce
0208 722 6028
Fax 0208 770 2016

Editorial Office
01782 870684
Fax 01782 878233

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

Next issue, dated January, on sale December 19th.

Productivity and IT



Prior to the economic downturn that preceded the events of September 11th, the US had been enjoying a prolonged economic boom. It lasted from about 1995 until 2000, during which time there was an unusually favourable combination of economic conditions: a relatively high rate of growth in economic activity year by year, a low rate of unemployment, and a low rate of inflation. Normally inflation soon takes off during a period of rapid growth: the central bank then ups interest rates, and the boom comes to an end. But on this occasion it didn't happen that way.

What could have been the cause of this highly successful half decade of economic activity, which came to an end when the boom exhausted itself rather than when the central bank called a halt? The generally accepted answer is increased productivity. If labour and capital are increasingly productive, inflation will be held in check. It seems that the annual increase in productivity in the US during the period 1987-1995 was about 1·4 per cent: during the "economic miracle" period of 1995-2000, productivity increased by something like 2·5-3 per cent a year. What led to this productivity jump? Why, all that investment in information technology and all those PCs of course.

This has been the accepted view – after all it seems obvious, doesn't it? – and has been put forward by no less an authority than Alan Greenspan, chairman of the Federal Reserve. You might call it the current economic orthodoxy. But a report just published by McKinsey Global Institute, the management consultancy group's research arm, calls it into question. The report comes to the conclusion that in most parts of the US economy substantial increases in IT investment did not lead to any improvement in productivity. While there was "a big jump in capital spending on IT and a big jump in productivity in the economy as a whole at the end of the Nineties, the actual correlation between the two is very weak" the report says.

To find out which sectors had contributed most to productivity growth, the McKinsey researchers started off with official government data from the Bureau of Economic Affairs. Companies in each sector were then investigated to establish what produced the growth. The researchers found that nearly all the post-1995 growth in productivity occurred in six sectors: retail, wholesale, securities, telecoms, semiconductors, and industrial equipment (mainly computers). They represent just under a third of the non-agricultural private-sector economy. The other two-thirds (53 sectors) contributed only 0·3 per cent of the productivity growth. But, wait for it, they accounted for almost two thirds of the increase in IT investment! In many of them there was actually a decrease in productivity.

> The PC itself is a wonderful tool for doing things quickly and efficiently.

A number of factors contributed to the productivity increase in the six sectors that provided nearly all of it. IT investment was just one factor. For example in retailing, which accounted for almost a quarter of the total productivity increase, the main contribution came from Wal-Mart, because of its emphasis on large stores and discount pricing. Other companies were forced to follow its example. The report goes on to list economies of scale as the main contributor to increased productivity in securities, regulatory changes as the main contributor in telecoms, Intel's shorter product cycles as the main contributor in the semiconductor industry, and improvements such as enhanced software as the main contributor in the computer industry.

In many industries the researchers found what they refer to as the "IT paradox": although companies invested heavily in IT, there was little by way of any tangible gain. In fact there was a decline in productivity in the 53 sectors outside the leading six – a decrease of 0·3 per cent compared to an increase of 0·4 per cent during the previous eight years. A striking example is provided by retail banking: companies bought an average of two PCs per employee between 1995-1999 with no gain in efficiency.

Should we be surprised by all this? Not really. Information is helpful only if it is accurate and relevant to particular needs. More and more information for the sake of it doesn't help: it can just cause confusion. More information contributes to productivity when, for example, feedback from the retail end of the production chain to the manufacturing end leads to more efficient working. At the other extreme, consider the vast increase in e-mailing. Does sending out millions of e-memos add anything to productivity? It can do the opposite, as more and more time is wasted by those who send and receive them.

The PC itself is a wonderful tool for doing things quickly and efficiently. But the business improvement provided tends to be one-off. Once you've computerised a process, say the accounts or laying out the pages of *Television*, what then? The big leap has been taken, and there is not much more to be gained.

It is to everyone's benefit that the McKinsey researchers have exposed the defects in some common assumptions about IT and productivity. We still can't be sure about what led to the "economic miracle" in the US. In fact it's likely that in the years to come book upon book will try to analyse the phenomenon. In all likelihood luck played a significant part: a fortunate concurrence of factors at a particular time. What we should appreciate is that there are no simple ways of guaranteeing economic advance – and that things like cable, IT and broadband will help only if properly understood and wisely used. ■

CORRESPONDENCE
All correspondence regarding advertisements should be addressed to the Advertisement Manager, Television, Cumulus Business Media, Anne Boleyn House, 9-13 Ewell Road, Cheam, Surrey, SM3 8BZ. Editorial correspondence should be addressed to Television, Editorial Department, Cumulus Business Media, Anne Boleyn House, 9-13 Ewell Road, Cheam, Surrey, SM3 8BZ.

INDEXES AND BINDERS
Indexes for Vols. 38 to 50 are available at £3.50 each from SoftCopy Ltd., who can also supply an thirteen-year consolidated index on computer disc. For further details see page 118.
Binders that hold twelve issues of *Television* are available for £6.50 each from Television Binders, Pringle, Street Blackburn, BB1 1SA.
Make cheques payable to "Television Binders".

BACK NUMBERS
Some back issues are available at £3.00 each.

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Cumulus BUSINESS MEDIA

TELETOPICS

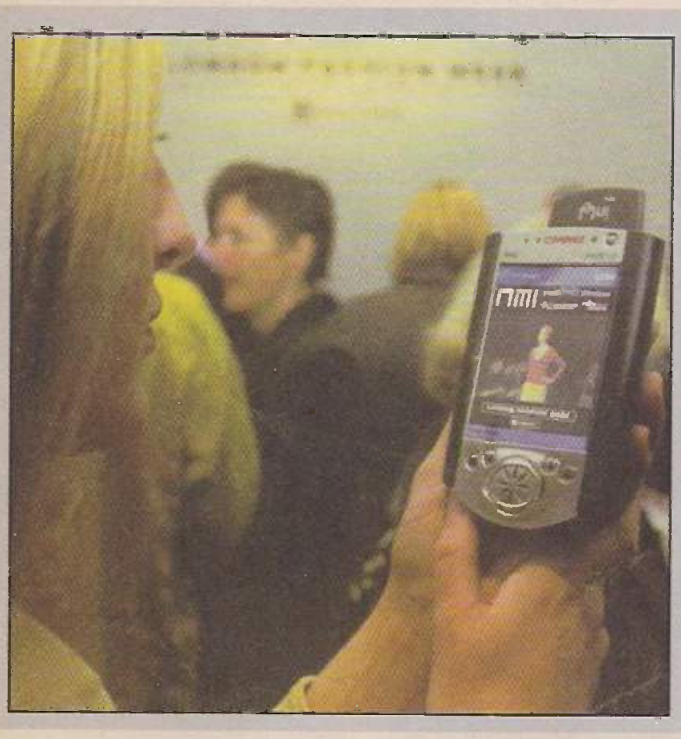
Clouds over ITV Digital

The future of ITV Digital is increasingly in doubt. Owners Carlton Communications and Granada are reputed to be loosing about £1m a day on it, something they can ill afford with the huge decrease in ITV advertising revenue during the present economic downturn. In addition the recently introduced ITV Sport, though apparently well received, is costing the companies a further £150m a year. Pressure is being put on the boards of both Carlton and Granada to close ITV Digital. RTL, Europe's largest broadcaster, which is controlled by the German media group Bertelsmann, has told the companies that it would not be prepared to buy into either of them until the problem of ITV Digital has been resolved. It's estimated that Carlton and Granada could save some £750m by shutting ITV Digital down and selling its subscriber base to the other pay-TV companies (Sky and/or the cable companies).

Carlton and Granada have held discussions with the other pay-TV operators and the government on the possible options. Granada has apparently asked its financial advisers Lazards to review the options, while the government has called in city consultants to advise on the possibilities. It seems that the future of ITV Digital will be decided early in the new year if not before.

All this is a pity as ITV Digital has been making progress since it evolved from ONdigital. The number of subscribers is now over 1·22m, and the breakeven target of 1·7m should be reached by the end of the financial year 2003-4. But Carlton and Granada might be unable to sustain the losses until then, and there are no commercial companies willing to take a gamble and invest.

If the subscriber base was sold and the services shut down that would leave just the free-to-air channels, pretty much as at present available in analogue form. This would present the government with the problem that viewers would have little incentive to convert from analogue to digital TV – unless, say, free digital STBs were made available. They could be financed from the proceeds the government expects to get from selling off the analogue TV spectrum. The problem here is just how much this might now be worth, with the telecommunications industry in recession?



The world's first real-time broadcast to wireless-enabled handheld devices was carried out during the London Fashion Week earlier this year. The project was put together by software companies Open Mobile, Sumo Technologies and Gooroo. Digital video was fed to a mixing desk, then Fujitsu servers and was finally streamed via an Intel WLAN (Wireless Local Area Network) to guests' handheld monitors. The WLAN operated at up to 11Mbits/sec. The demonstration included the world's first wireless TV advertisement.

The government's digital action plan

The Department of Trade and Industry has published a draft Digital TV Action Plan as part of the government's efforts to ensure analogue TV transmission switch-off by 2010. Its main points are: continued terrestrial digital TV transmission power increases; extending the geographical coverage so that 72 per cent of households have access to all channels and 84 per cent to the BBC, ITV nd Ch. 4 digital channels; a pre-Christmas digital TV publicity campaign to be launched, aimed at dealers and their customers; and the appointment of a "digital tsar" to co-ordinate work on digital TV. Somehow, it doesn't seem to be a very convincing way of trying to get people to spend a lot of money that, at present, they have no need to. The government is also understood to have considered obliging setmakers to manufacture digital only TV sets.

Blue laser disc technology

Matsushita has developed a rewriteable, single-sided dual-layer optical disc for use with blue lasers. It is claimed to be a world's first. The disc is CD-sized and has a 50GB rewrite capacity, achieved by using an ultra-thin half-transparent first recording layer (more than 50 per cent transmittance with a 6nm recording layer thickness) plus full recording and playback capability in the second layer. This represents a storage capacity more than ten times larger than that of a conventional rewriteable optical disc.

The new technology has a maximum recording and playback data transfer rate of 33Mbits/sec, three times faster than conventional DVD technology. These characteristics make it possible to record more than four hours of digital high-definition moving pictures at a data rate of 25Mbits/sec. Accurate recording/reading is ensured by using a transmittance-balanced structure that suppresses interlayer interference.

The new disc uses a GeSbTe (germanium-antimony-tellurium) film that can undergo more than 10,000 record cycles. High sensitivity is achieved by using a 10mW blue laser light spot – the same power level as with conventional optical-disc technology. Both layers can be easily read from one side of the disc, with highly stable tracking control.

Matsushita intends to use the new technology for recording high-definition digital video. No commercial release plans have been announced.

DVD+RW push

Sony Europe has started distributing DVD+RW disc media throughout Europe. DVD+RW is being promoted as an extension of CD-R/RW technology, with DVD+RW discs providing up to seven times more storage than a CD-R disc. They can be written and read by DVD+RW drives, and played back by most DVD-ROM drives and DVD-video players in use today.

Sony's DVD+RW disc is single-sided with a storage capacity of 4·7GB. When recording MPEG-2 data the disc provides a playback time of about two hours, with picture quality comparable to that of prerecorded DVD-Video movies. The discs employ a simple track format: a single spiral groove with radial wobble and no pre-embossed pits, the same as CD-R. A short wobble cycle (32 channel bits) ensures accurate data addressing and lossless linking.

DVD+RW discs are compatible with DVD-Video player and PC DVD-ROM drives. Those with a DVD-ROM drive and MPEG-2 decoding compatibility in their PCs can play back DVD+RW discs recorded by a DVD+RW machine. The discs use the same 8-16 modulation and RS code as a bare DVD-ROM disc, so cartridges aren't required. They have the same recording density as single-layer DVD-ROM discs.

For consumer AV use the write speeds are from 1x to 2·4x – the latter is equivalent to a data transfer rate of 26·592Mbits/sec, which is approximately 22x that of a CD-R/RW. This enables the user to record 1GB of data within five minutes.

When a DVD+RW disc is used like a floppy disc in a PC it needs formatting. 'Background formatting' is a new measure designed to reduce the formatting time significantly, to one minute or so per disc. When a DVD+RW disc is inserted into a DVD+RW PC drive it's formatted to a minimum area then, while the drive is not in use, the disc is formatted in the background.

There are six record-quality levels, giving recording times between 64 minutes (High Quality) to 8 hours and 10 minutes (Super Extended Play).

Hitachi now has introduced its CL32-PD2100 Platara-series plasma TV, the best-selling in Japan, in the UK. With a 16:9 aspect ratio and 32in. diagonal screen the display is convenient for use in ordinary-sized living rooms. Depth is just 9cm. The Nicam analogue tuner is housed in a separate unit called the Multimedia box, which also serves as a switching controller for AV sources such as a DVD player and digital satellite receiver.

The plasma display technology used includes motion-adaptive progressive scanning which overlaps fields and adds extra lines, using sophisticated predictive algorithms, and ALIS (Alternative Lighting of Surface). Panel luminance level is 650Cd/m².

For further details contact Hitachi Home Electronics (Europe), Dukes Meadow, Millboard Road, Bourne End, Bucks SL8 5XF. Phone 01628 643 000 or fax 01628 643 400.

Toshiba-Matsushita venture

Toshiba and Matsushita have announced that their LCD and next-generation display businesses will be brought together in a joint company which will come into operation in April 2002. Ownership will be 60 percent Toshiba and 40 percent Matsushita. The new venture will undertake product development, manufacturing and sales, and will be the world's third-largest LCD display company based on sales turnover. Work on next-generation products will include organic light-emitting displays (OLEDs).

The global LCD market is expected to continue its high annual growth rate of 17 per cent over the coming years, driven by increased use of personal digital assistants (PDAs), LCD TV sets and internet appliances. The new company intends to expand LCD applications by using system-on-glass technology. It will concentrate on early standardisation of design and manufacturing processes. The company also intends to develop high-density mounting technology and simplify production processes. It will take over all the parent companies' manufacturing sites for LTP TFT LCDs, amorphous silicon TFT LCDs and super-twisted nematic LCDs.

CAI directory

The latest CAI members directory, dated October 2001, has just been published. Members can obtain copies for £4.95. Price for non-members is £19.95. The excellently produced directory is ring-bound with glossy card covers. The Confederation of Aerial Industries Ltd. is at Fulton House, Fulton Road, Wembley Park, Middlesex HA9 0TF. Phone 020 8902 8998. There's a website at cai.org.uk or you can e-mail office@cai.org.uk

Technology

Cambridge Consultants has developed a digital camera, called SEE, that stores images on the internet and thus has no need for built-in memory. It writes to a server or to a mobile, using Bluetooth technology, and can produce both video and stills.

Fairchild has announced an optocoupler, type FOD2712, that incorporates an error voltage detector/amplifier and voltage reference source in an 8-pin package.

US chip manufacturer Conexant Systems claims to have developed the first single-chip, dual-channel demodulator IC, type CX24130, for use in satellite receivers. It enables two incoming TV channels to be demodulated simultaneously, so that one can be viewed and the other recorded, making it suitable for use in receivers that incorporate a hard-disk drive.

Broadcasting news

Granada has bought Border Television from Capital Radio. It now owns six of the fifteen regional ITV licences. The deal had been delayed because of media ownership rules that prevent any one ITV company serving more than a certain proportion of TV viewers: Granada overcame the problem by putting five per cent of its stake in GMTV into a trust.

Cable operator NTL has now signed up more than a million subscribers for its digital service. This, with Telewest's 564,000 digital subscribers, gives UK cable TV operators well over 1·5m digital TV subscribers.

Grandata Ltd

distributor of electronic components

CD Pick Ups and Assemblies

PART NO	PRICE
6450067983	£18.00
6450253089	£25.00
482269110487	£45.00
A4672541A (Mini Disc)	£54.00
CDM12.1 Mech	£16.00
CDM12.3BLC	£45.00
CDM12.4	£16.00
CDM9/44	£21.00
CDM9/44 Mech	£24.00
DAX11A	£26.00
H8112AF	£16.00
HOPM3	£21.50
HPC1MX	£20.00
KCP1H	£17.50
KSL2101ABM Mech	£18.00
KSM213CCM Mech	£15.00
KSM620AAA Mechanism (Suitable for Pioneer)	£26.75
KSS210A Original	£14.00
KSS210A Replace	£11.00
KSS210B	£15.00
KSS212A	£16.00
KSS212B	£11.50
KSS213B	£11.50
KSS213C	£11.50
KSS213D	£16.00
KSS213E	£13.75

PART NO	PRICE
KSS213F	£12.00
KSS320B	£22.75
KSS330A	£28.00
KSS331A	£21.00
KSS331C(RP)2	£38.00
KSS360A	£24.00
KSS363A	£22.00
KSS480A	£20.00
KSS540A	£17.00
KSS542A	£23.50
KSS543A	£22.00
KSS580A	£23.00
KSS880	£24.00
KSS240A Original	£ 30.00
NKS240A (Replacement for KSS240A)	£20.00
OPTIMA5S	£11.50
OPTIMA6S	£11.50
OPTIMA7 (Mini Disc)	£12.00
OPTIMA710A	£19.00
OPTIMA720A	£14.75
PEA1030	£44.00
PEA1179	£45.00
PEA1291	£45.00
PWY1009	£48.00
PWY1010	£45.00
RAE0113Z	£30.00
RAE0140Z	£45.00

PART NO	PRICE
RAE0150Z	£28.00
RAE1052Z	£20.00
RAE150Z Mechanism	£35.00
RCTRH8112	£14.00
RCTRH8136	£45.00
RCTRH8147 Mechanism (Suitable for Denon & Sharp)	£10.00
RCTRH8151	£16.00
RCTRH8153	£36.00
RCTRH8173 (Mini Disc)	£20.00
RCTRH8175 (Mini Disc)	£60.00
SF90	£20.00
SF91	£16.00
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SFC93	£17.00
SFP1	£12.00
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SFP101 (5 & 8 PIN PLUG)	£15.00
SFP101 with amp IC	£15.00
SFP101 without amp IC	£21.00
SFP101N15	£14.00
SFP101N16	£14.00
SOAD70A	£52.00
SOH90T4N	£17.00
SOHA1	£19.50
SOHAP	£18.00
X49460541 (Mini Disc)	£90.00
X49482601 (Mini Disc)	£65.00

New Arrivals !!!

TV Fault Finding Guide Part 2

This book has been introduced as a supplement to issue 7 (December 1998) and contains over 2500 additional faulty entries. This edition is not intended as a replacement for issue 7 but as an addition.

The data has been arranged in order by brand ,model/chassis and fault symptoms to provide a quick reference to numerous fault conditions on a range of models.

Revised model/chassis listing of about 2000 models.

A5 in size with a total of 192 pages

Order Code : BOOK02/A
Price : £ 15.00 - No VAT
(Postage £ 2.00 + vat)

Matsui "Stuck in Stand By" Kit

This kit is designed to to cure the stuck in standby fault as well as other faults on the following models :

Matsui	TVR180R/T/2080
Alba	1499Y,2099TX,BTV17
Decca/Tatung	TVC563

and other Orion derivatives

Order Code : MODKIT37
Price : £ 6.50 + vat

Safety Resistors

0.5 Watt Fusible Safety Component (Packs of 10)

Value	Code	Price
1 Ohm	RH1R	50p + vat
2.2 Ohm	RH2R2	50p + vat
3.3 Ohm	RH3R3	50p + vat
4.7 Ohm	RH4R7	50p + vat
18 Ohm	RH18R	50p + vat
22 Ohm	RH22R	50p + vat
56 Ohm	RH56R	50p + vat
1K Ohm	RH1K	50p + vat

Amstrad Sky Digibox

Amstrad DRX100 Tuner Repair Kit

Order Code : SATKIT35
Price : £ 1.40 + vat

SMD Transistors

Packet of 10 per type

Part Number	Price
BC807-40SMD	£ 1.00 + vat
BC817-40SMD	£ 1.00 + vat
BC846BSMD	£ 1.00 + vat
BC850CSMD	£ 1.00 + vat
BC856BSMD	£ 1.00 + vat
BC860BSMD	£ 1.00 + vat
IN4148SMD	£ 1.00 + vat

SMD Transistor Kit

This kit contains 10 of each of the following type :

BC807-40 , BC817-40 , BC846B , BC850C , BC856B , BC860B , IN4148

Order Code : SMDKIT1
Price : £ 5.00 + vat

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distributor of electronic components

Aerial & Digital Satelitte Accessories

SLx Distribution Amplifier Range

25mA Line powering on UHF Socket
Designed for TV , Satellite and FM Receivers
Isolation between outputs > 22db
Noise figure < 4db
Frequency Range : UHF 470-863 Mhz
VHF 47-230 Mhz

Auto line powering for masthead amps
10.5db Gain on all ports
Separate UHF/VHF inputs
Digital-Compatible
CE and EMC Test Certified

	Order Code	Price
2 Way	SLX2	£ 8.00 + vat
6 Way	SLX6	£ 18.00 + vat
4 Way	SLX4	£ 13.00 + vat
8 Way	SLX8	£ 18.50 + vat

SLx Masthead Amplifiers

UHF TV antenna pre amplifier designed for the professional aerial installer

15dB gain masthead amplifier ideal for majority of domestic installations

26dB gain masthead amplifier for longer cable runs (loss of more than 3dB) or if connected to passive splitters

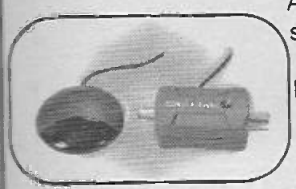
Requires 12V DC power supply via downlead either via dedicated power supply unit or from a distribution amplifier with line powering

SLx 15dB Gain Masthead Amp — Order Code : 27830R Price : £ 4.30 + vat

SLx 26dB Gain Masthead Amp — Order Code : 27831R Price : £ 4.50 + vat

SLx Masthead Amplifier Power Supply — Order Code : 27832R Price : £ 5.00 + vat

SLx Link Eye



Allows control of Sky™ Digibox via the signal feed for second TV

Fully compatible with Sky™ Digital Link

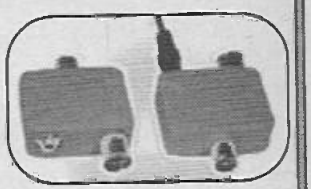
Order Code : 27833R

1 - 9 Price : £ 6.50 + vat each
10 - 24 Price : £ 5.50 + vat each
25 + Price : £ 4.50 + vat each

SLx Amp By Pass Kit

For use with aerial amplifiers and Sky™ Digibox

Allows for operation of Link Eye in conjunction with a distribution amplifier



Order Code : 27829R
Price : £ 5.00 + vat

SLx Link Eye and Magician 4 Combination Pack

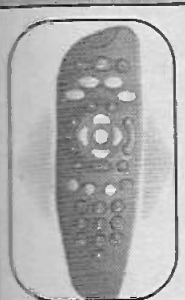
Make us of the SLx Link Eye in combination with the Magician 4 Remote Control to control your Sky™ Digibox

Magician 4 controls upto 4 different devices including full function on Sky™ Digibox

Comes in Retail Clam Pack

Order Code : 27834R

1 - 4 Price : £ 16.00 + vat 5 + Price : £ 14.50 + vat



Sky Digital Remote Control

Order Code
RCSKY

Price
£ 10.75 + vat

Sky Digital Remote & TV Link Eye Combination

Price : £ 18.50 + vat

5 + £ 17.00 + vat each

Sky Digital TV Link Eye

Order Code : TVLINKEYE

Price
£ 10.75 + vat

5 +
£ 7.99 + vat each

10+
£ 6.99 + vat each

Grundig GDS200 Digital Satellite Receiver Repair Kit

EARLY PSU
MODEL : DS0 - 0385 REV C

Order Code : SATKIT34A
Price : £ 10.00 + vat

Grundig GDS200/300 Digital Satellite Receiver Repair Kit

LATER PSU TYPE REV 03
DSO - 0375 REV A
DSO - 0385 REV 5

Order Code : SATKIT34B
Price : £ 10.00 + vat

Grandata Ltd

distributor of electronic components

Television Repair / Mod Kits

MAKE & MODEL	KIT TYPE	CODE
ALBA		
1452T	PSU	ONWAKIT
1427T	PSU	ONWAKIT
1402	PSU	ONWAKIT
1455T	PSU	ONWAKIT
1456T	PSU	ONWAKIT
1458T	PSU	ONWAKIT
1459T	PSU	ONWAKIT
2002	PSU	ONWAKIT
2009B	PSU	ONWAKIT
2052T	PSU	ONWAKIT
2152T	PSU	ONWAKIT
CTV501	PSU	ONWAKIT
CTV701	PSU	ONWAKIT
CTV840	PSU	ONWAKIT
CTV841	PSU	ONWAKIT
CTV485	PSU	ONWAKIT
AKAI		
CT1417	PSU	ONWAKIT
CT2159U	PSU	ONWAKIT
CT2162UNT	PSU	ONWAKIT
CT2863UNT	PSU	ONWAKIT
GOODMANS		
147TT	PSU	ONWAKIT
149T	PSU	ONWAKIT
1430RA	PSU	ONWAKIT
1430RS	PSU	ONWAKIT
1430RW	PSU	ONWAKIT
1450T	PSU	ONWAKIT
1455TS	PSU	ONWAKIT
2019R	PSU	ONWAKIT
2029T	PSU	ONWAKIT
2029TA	PSU	ONWAKIT
F16 CHASSIS	FRAME	GOODKIT1
F16 CHASSIS	LINE	GOODKIT1
F16	PSU	GOODKIT1
F16	VIDEO	GOODKIT1
GRUNDIG		
CUC 7350		GRUNDIGKIT1

MAKE & MODEL	KIT TYPE	CODE
GRUNDIG continued		
CUC7301/3 (BUZ90)	PSU	GRUNDIGKIT2
CUC7301/3 (MJF18004)	PSU	GRUNDIGKIT3
HINARI		
HIT14RC	PSU	ONWAKIT
JVC		
AV29SX1EK	FIELD OUTPUT KIT	JVCKIT1
AV29SX1EN	FIELD OUTPUT KIT	JVCKIT1
AV29SX1EN1	FIELD OUTPUT KIT	JVCKIT1
AV29SX1PF	FIELD OUTPUT KIT	JVCKIT1
AV29TSIE1	FIELD OUTPUT KIT	JVCKIT1
C14E1EK	PSU	ONWAKIT
C14T1EK	PSU	ONWAKIT
C21ET1EK	PSU	ONWAKIT
CS21M3EK	PSU	ONWAKIT
MATSUI		
1455	PSU	ONWAKIT
1498	PSU	ONWAKIT
2086	PSU	ONWAKIT
2098	PSU	ONWAKIT
21V1N (BUZ90)	PSU	GRUNDIGKIT1
21V1T (BUZ90)	PSU	GRUNDIGKIT1
21V1N (MJF18004)	PSU	GRUNDIGKIT3
21V1T (MJF18004)	PSU	GRUNDIGKIT3
MITSUBISHI		
AV1 SERIES	PSU	MITSKIT3
CT1M5B	PSU	MITSKIT3
CT21M5BT	PSU	MITSKIT3
CT25M5BT	PSU	MITSKIT3
CT21A2STX	TDA 8178S	MITSKIT1
CT21AX1B	PSU	MITSKIT3
CT21A3STX	TDA 8178S	MITSKIT1
CT21AV1BS	PSU	MITSKIT3
CT25A2STX	TDA 8178S	MITSKIT1
CT25A3STX	TDA 8178S	MITSKIT1
CT25A4STX	TDA 8178S	MITSKIT1
CT25A6STX	TDA 8178S	MITSKIT1

MAKE & MODEL	KIT TYPE	CODE
MITSUBISHI continued		
CT25AV1B	PSU	MITSKIT3
CT25AV1BS	PSU	MITSKIT3
CT25AV1BD	PSU	MITSKIT3
CT25AV1BDS	PSU	MITSKIT3
CT28AV1B	PSU	MITSKIT3
CT28AX1BD	PSU	MITSKIT3
CT28AV1BDS	PSU	MITSKIT3
CT29AS1	TDA 8178S	MITSKIT2
CT29A4	TDA 8178S	MITSKIT2
CT29A6	TDA 8178S	MITSKIT2
CT29B2	TDA 8178S	MITSKIT2
CT29B3	TDA 8178S	MITSKIT2
CT29B6	TDA 8178S	MITSKIT2
CT33B3	TDA 8178S	MITSKIT2
M5 SERIES	PSU	MITSKIT3
NEI/NIKKAI		
CE25 CHASSIS	PSU	NIKKAIKIT1
C289FTXN	PSU	NIKKAIKIT1
C28F41FXN	PSU	NIKKAIKIT1
PANASONIC		
IC561	TDA 8175	PANKIT1
TX25XD60	VERTICAL O/P IC	PANKIT2
TC28XD60	VERTICAL O/P IC	PANKIT2
TX28XD70	VERTICAL O/P IC	PANKIT2
TX29XD70	VERTICAL O/P IC	PANKIT2
TX-W26D3	VERTICAL O/P IC	PANKIT2
PHILIPS		
310.10708		PHILKIT3
310.20491		PHILKIT2
310.20496		PHILKIT10
310.31994		PHILKIT6
310.32252		PHILKIT5
310.32253		PHILKIT4
310.32254		PHILKIT9
310.32255		PHILKIT7
310.32262		PHILKIT8
310.62264		PHILKIT1
ANUBIS A	SOPS	PHILKIT2

MAKE & MODEL	KIT TYPE	CODE
PHILIPS continued		
CP110 CHASSIS	SOPS	PHILKIT8
G90A CHASSIS	SOPS	PHILKIT10
G90B CHASSIS	SOPS	PHILKIT10
G110 CHASSIS	SOPS	PHILKIT3
GR2.1 CHASSIS	SOPS	PHILKIT1
GR2.2 CHASSIS	SOPS	PHILKIT1
D-16 CHASSIS	SOPS	PHILKIT6
HSM VIDEO	SOPS	PHILKIT5
JSM VIDEO	SOPS	PHILKIT4
KSM VIDEO	SOPS	PHILKIT9
LSM VIDEO	SOPS	PHILKIT7
SAMSUNG		
CI5944	FRAME OUTPUT	SAMKIT2
CI6844	FRAME OUTPUT	SAMKIT2
VIK310	PSU	SAMSUNGKIT
VIK320	PSU	SAMSUNGKIT
VIK350	PSU	SAMSUNGKIT
VI375	PSU	SAMSUNGKIT
VI395	PSU	SAMSUNGKIT
WINNER 1	PSU	SAMSUNGKIT
SHARP		
51CS03H	POWER / LINE	SHARPKIT1
51CS05H	POWER / LINE	SHARPKIT1
59CS03H	POWER / LINE	SHARPKIT2
59CS05H	POWER / LINE	SHARPKIT2
59CSD8H	POWER / LINE	SHARPKIT2
66CS03H	POWER / LINE	SHARPKIT2
66CS05H	POWER / LINE	SHARPKIT2
66CSD8H	POWER / LINE	SHARPKIT2
THOMSON		
35029400		THOMKIT2
35065920		THORNKIT1
FV70	PSU	THORNKIT1
ICC7 CHASSIS	TDA 8178FS	THOMKIT1
ICC7 CHASSIS	FRAME KIT	THOMKIT3
ICC8 CHASSIS	TDA 8178FS	THOMKIT1
ICC8 CHASSIS	FRAME KIT	THOMKIT3
R3000	PSU	THOMKIT2
R4000	PSU	THOMKIT2
ICC9 CHASSIS	EAST/WEST	THOMKIT4

ORDER CODE	PRICE
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MITSKIT3	£ 6.00

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PANKIT2	£ 9.00
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PHILKIT10	£ 8.50
PHILKIT2	£ 2.50
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PHILKIT6	£ 5.50
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PHILKIT8	£ 4.25
PHILKIT9	£ 7.50
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VALUE	CODE	PRICE	PER PACK
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470uF	CAP29	£1.20	10
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16 Volts			
22uF	CAP121	£0.35	10
33uF	CAP122	£0.35	10
47uF	CAP123	£0.35	10
100uF	CAP124	£0.60	10
220uF	CAP125	£0.80	10
330uF	CAP30	£1.75	10
470uF	CAP31	£1.75	10
680uF	CAP32	£2.10	5
1000uF	CAP33	£2.10	10
2200uF	CAP34	£5.25	10
3300uF	CAP35	£5.00	5
4700uF	CAP36	£6.10	10
25 Volts			
10uF	CAP37	£0.45	10
22uF	CAP38	£0.45	10
33uF	CAP126	£0.40	10
47uF	CAP39	£0.48	5
68uF	CAP127	£0.55	10
100uF	CAP40	£0.70	10
120uF	CAP128	£0.85	10
150uF	CAP41	£0.95	5
220uF	CAP42	£1.20	10
330uF	CAP43	£1.40	5
470uF	CAP44	£1.90	10

VALUE	CODE	PRICE	PER PACK
25 Volts continued			
680uF	CAP45	£3.15	5
1000uF	CAP46	£3.65	
101500uF	CAP47	£3.90	5
2200uF	CAP48	£2.00	2
3300uF	CAP49	£2.20	2
4700uF	CAP50	£3.65	2
6800uF	CAP51	£3.90	2
35 Volts			
1uF	CAP130	£0.40	10
3.3uF	CAP131	£0.40	10
4.7uF	CAP132	£0.45	10
10uF	CAP52	£0.50	10
22uF	CAP53	£0.45	10
33uF	CAP54	£0.50	5
47uF	CAP55	£0.85	10
68uF	CAP133	£0.55	10
100uF	CAP56	£0.85	10
150uF	CAP57	£0.95	5
220uF	CAP58	£1.45	5
330uF	CAP134	£1.60	10
470uF	CAP135	£1.75	10
680uF	CAP59	£6.50	10
1000uF	CAP60	£4.35	10
2200uF	CAP61	£2.45	2
3300uF	CAP62	£10.00	5
4700uF	CAP136	£3.50	2
50 Volts			
1uF	CAP137	£0.35	10
2.2uF	CAP138	£0.35	10

VALUE	CODE	PRICE	PER PACK
50 Volts continued			
3.3uF	CAP139	£0.35	10
4.7uF	CAP140	£0.35	10
10uF	CAP63	£0.50	10
22uF	CAP64	£0.70	10
33uF	CAP141	£0.85	10
47uF	CAP65	£0.85	10
68uF	CAP142	£0.90	10
100uF	CAP66	£0.85	10
220uF	CAP67	£1.75	10
330uF	CAP68	£2.45	10
470uF	CAP69	£4.35	10
680uF	CAP70	£4.90	5
1000uF	CAP71	£5.25	10
1500uF	CAP143	£4.50	5
2200uF	CAP72	£3.25	2
3300uF	CAP144	£3.25	2
63 Volts			
0.22uF	CAP145	£0.45	10
0.47uF	CAP73	£0.35	10
1uF	CAP74	£0.35	10
2.2uF	CAP75	£0.35	10
3.3uF	CAP76	£0.50	10
4.7uF	CAP77	£0.35	10
10uF	CAP78	£0.50	10
15uF	CAP79	£0.95	5
22uF	CAP80	£0.75	10
33uF	CAP81	£0.85	10
47uF	CAP82	£0.95	10
68uF	CAP83	£1.30	5
100uF	CAP84	£1.20	10

VALUE	CODE	PRICE	PER PACK
63 Volts continued			
150uF	CAP85	£2.80	5
220uF	CAP86	£2.80	10
330uF	CAP87	£4.00	10
470uF	CAP88	£5.25	10
680uF	CAP89	£5.00	10
1000uF	CAP90	£5.40	5
100 Volts			
0.47uF	CAP91	£0.50	5
1uF	CAP92	£0.85	10
1.5uF	CAP93	£0.70	5
2.2uF	CAP94	£0.50	5
3.3uF	CAP95	£0.50	5
4.7uF	CAP96	£0.50	5
10uF	CAP97	£0.95	10
22uF	CAP98	£1.05	10
33uF	CAP99	£1.55	5
47uF	CAP100	£1.75	10
100uF	CAP101	£2.10	10
220uF	CAP102	£6.00	5
470uF	CAP103	£6.00	5
160 Volts			
2.2uF	CAP146	£0.45	10
10uF	CAP147	£1.40	10
22uF	CAP148	£1.80	10
33uF	CAP149	£2.30	10
100uF	CAP150	£3.25	5
200 Volts			
100uF	CAP151	£3.25	5

VALUE	CODE	PRICE	PER PACK
250 Volts			
1uF	CAP152	£0.60	10
3.3uF	CAP104	£1.75	10
10uF	CAP105	£2.60	10
22uF	CAP153	£2.30	10
47uF	CAP106	£4.35	10
100uF	CAP154	£4.50	5
220uF	CAP155	£2.00	2
350 Volts			
1uF	CAP156	£0.70	10
3.3uF	CAP157	£1.50	10
10uF	CAP158	£2.25	10
22uF	CAP159	£3.40	10
400 Volts			
1uF	CAP107	£2.15	5
2.2uF	CAP108	£2.25	5
4.7uF	CAP109	£3.15	5
10uF	CAP110	£4.00	5
22uF	CAP111	£2.50	2
47uF	CAP112	£3.50	2
100uF	CAP160	£4.00	2
220uF	CAP161	£7.00	2
450 Volts			
1uF	CAP113	£2.80	5
2.2uF	CAP114	£3.20	5
4.7uF	CAP115	£4.95	5
10uF	CAP116	£5.50	5
22uF	CAP117	£4.15	2

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Mitsubishi TV	RCUNI05	Matsui/Hinaril/Orion TV	RCUNI14M
Nokia TV	RCUNI06	Sky Digital	RCUNI15
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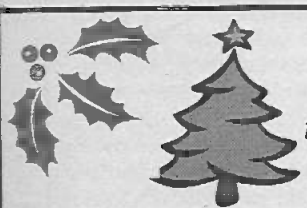

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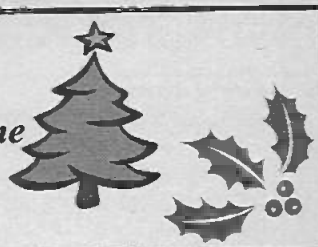

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WHAT A LIFE

It was going to be one of *those* days . . . Some of our nuttier customers came along with their sets, including the little mono portable whose owner says it provides surveillance

Many moons ago, forty-five years to be exact, I used to work with a manic-depressive fellow. He'd been all right before he came into the servicing trade mind, but that's another story. His name had better be Syd.

Some mornings Syd would get out of bed on the wrong side and stomp into work with his face all screwed up and a huge bank of black, swirling storm-cloud over his head. Within minutes something would go wrong for him. Perhaps a thrush would sing a few notes through the window, or a customer would smile at him. "Oh it's going to be another of *those* days, I can *see* it" he'd declare. "Oh, ah I can just *see* it . . ."

And he was always right.

Well, I had one of *those* days yesterday. I was on my own in the shop again. Paul was out having fun at the dentist's, and Steven had gone to see the accountant for a few laughs. I ought to have known that the enemy would strike, but I hadn't anticipated a battalion.

Early comers

It began at about a minute past nine. That's when I saw Hubert Tubbel fighting with his car door from the inside before he tumbled out and bowled towards the shop. He barged through the door and glowered at me.

"Great Big Goodmans!" he declared.

I turned around. No one there, so I faced him again.

"Great Big Goodmans. Yes or no. Just say it, yes or no?"

"Great Big Goodmans?" I countered, "Great Big Goodmans? . . ."

He wedged his knuckles on his ample hips and scowled. "Why do I have to say everything twice? All I'm asking is, joo mend Goodmans tellies?"

"Oh, er, yes. We try."

"That's all I wonnid to know" he said as he went back to his car. He came back with a huge 25in. Goodmans set.

"Absolute snowstorm" he said thickly, sweeping his unruly hair back. "Absolute snowstorm. No other word for it!"

I looked past him, through the window, but it was sunny outside. He saw me and leaned forward.

"On the set, I mean" he said quietly.

I smiled politely, pulling my mouth askew to show him the best of my teeth. It seemed a bit early to me for fisticuffs.

Under observation

As he departed Peter Nuttence came in. He's a nice enough countryman from Woodbury, but worries about his neighbours. When I first encountered him a few years ago he was convinced that they had him under surveillance. He'd grown a huge, wide wall of thick evergreen around his smallholding to ward off their influence.

"Haven't heard from you lately, Peter" I said.

"They've been leaving me alone a bit, Don" he replied, "but now they're back at it. They've erected a giant dish to monitor my movements. It points straight at my place. When they think I'm out they come poking about in my hedge. But what they don't know is that this old Sanyo telly of mine picks 'em up, as always. Worth its weight in gold. It's seen them again all right, and I've reported them."

"Er, what can I do for you Peter?" I asked.

"Well the Interference People are involved. They want to be sure that the set's all right, and not sort of making up their images. So perhaps you could satisfy yourself that it's all right then sign this form I've been given. Then they'll get to work – probably cart the villains in."

He put the little Sanyo set, a Model 12T280, down and left.

The untidy and the timid

As he left I saw this thin, gangling fellow across the road, carrying what looked like a Sharp TV set. Then I realised it was Mr Moggie, another character I'd not seen for a long time. He came in and I noticed that his hair was as long and tangled as ever. He had a silly grin on his face.

"Hello there Mr Bullock" he piped, "put on a bit of weight I see." His voice sounded like a catfight in the early hours.

I looked him over. Untidy wretch, I thought. Dirty teeth and sleepy stuff in his eyes. Horrible. I gave him a friendly grin.

"It's no bigger than this, Mr Bullock, even after half an hour" he grated, holding his hands three inches apart, one above the other.

"I don't suppose it is" I replied, increasing the friendliness of my smile. "But why are we blessed with your presence on this fine day?"

He put the set on the counter. It was a Sharp Model DV5131H (S3B chassis). "I want you to mend my set, Mr Bullock. It's got such a narrow picture you see."

"Leave it with us" I said, "we'll soon have it sorted out."

Our next caller was Ernie Twopp, a timid, thin-faced Welshman who always looks as if he's just been crossed in love. He had a Sanyo colour set with him, Model CTP3131 (80P-B14 chassis). I know it well.

He looked at me, stood back, then spoke.

"Twopp" he said, "Twopp."

"Suppose it must be" I replied, then reflected for a moment. This is getting too much, I thought. It would be nice to be a traffic warden. Lots of scope to get really nasty and wind people up – and make them pay for it! Wonder how much I'd get a week?

But Mr Twopp was on again. "Now tell me, please, Mr Bullock, would it be possible to mend this set?" he asked. "I mean, Gumboils can't. They kept it for four months, then said it wasn't worthwhile. Tried to sell me a sixty-five inch Chinybunk with two Christmas hampers and a tea set thrown in as a deal. Finally recommended you when I got a bit testy."

"Outrageous of them" I said, "but what's wrong with it?"

"Dead" he replied.

Tea

I smiled and waved him out. Then Greeneyes came in with two mugs of tea.

"One wound have been enough" I said.

"Don't be funny – one of them's mine" she said. "Now, they've got this lovely two-piece suit at Marks. Lime green. Only a hundred and fifty. It'll go really well with those nice pink shoes at Olivers. Oh, and that white frilly top I saw in Debenhams . . ."

As she spoke the door opened and a quiet, elderly man came in. Surely it must

be Eli Roberts, who lives in the cottage by Walker's Pool? I hadn't seen him for years. I looked at Greeneyes, who nodded. She'd recognised him too.

An Hitachi VCR

He placed an Hitachi video recorder on the counter, Model VT530E. "After it's been on for half an hour the picture starts to freeze every few seconds" he explained.

"All right" I replied, pulling over a job card. "How are you keeping Eli? You look well."

He stared at me. "E what" he echoed, I'm no Eli anybody. Name's Charlie Hudson. From Worcester Street."

"Oh, er, sorry" I said. "Strange, you look just like Eli Roberts, an old fellow we know."

"I'm old either, Mr Bullock." Then he smiled. "Do you know" he croaked, "this is the third time this week I've been mistaken for somebody else. The last fellow was really rude and persistent about it. 'No, I'm not Fred Weaver' I told him, 'I'm Charlie Hudson.' Then he'd looked at me and said 'You're bloody not Charlie Hudson, I know you. You're Fred Weaver!'"

"Only one answer" I said, "leave the district."

"I'm beginning to think it might be a good idea" he replied.

A busy workshop

As he left Paul and Steven came in. Paul decided to have a look at the VCR. It worked perfectly at first, so he left it running while he popped down to the Red Lion to see why their JVC AV21F1EK TV had no display. He was away for some time. When he came back the VCR was playing up exactly as Charlie Hudson had said it would. The picture froze for a second every few seconds.

"What was the trouble at the Red Lion?" I asked.

"A pint of bitter" he said.

"No, the JVC set" I persisted.

"Oh. The same old fault I've had with ever so many like it. No display, no teletext. Cause was dry-joints at the L7805ABV 5V regulator IC522."

Paul returned to the VCR. When he opened it up the fault symptom cleared. So the cause was heat-dependent. He put a blanket over the VCR and it resumed its tricks. Then, by accident, he found that the capstan motor was running hot. As he observed the motor he noticed that it was stopping in sympathy with the picture freezing. A new motor cleared the trouble.

Meanwhile Steven had been looking at the Sharp DV5131H colour receiver with the narrow picture. When the set was switched on the picture was only about an inch high: it gradually increased to about three inches. After checking around in the field output stage he went to the power supply and soon found that C712 (100µF, 35V), the reservoir capacitor for the 24V supply, was low in value. A replacement cured the fault.

The Goodmans set, Model 256NS, was fitted with the Philips L6.2 chassis. Its display consisted of snow and a strange line striation down the middle. There was no remote-control operation, and no front-button operation either. Paul checked the voltages around the microcontroller chip, then moved to the power supply where the 5V output was low at only 2V. The cause turned out to be the BC337/25 transistor TR7505, which was leaky emitter-to-base. A new transistor restored the supply and a good display.

"Anything else?" he asked.

The Sanyos

"Yeah" I said. "There's a Sanyo mono portable, Model 12T280, that picks up the pair of spies that are pestering one of our valued clients, old Mr Nuttence of Woodbury. They've tuned on to him with a big dish, and he doesn't like it."

He looked at me for a minute, then plugged the set in.

"Seems to work all right" he said. "No spies or anything. Only that strange *Weakest Link* woman. Where do they get them? I'd prefer the spies."

Then he picked up Mr Twopp's dead set, the Sanyo CTP3131. The BUT11A chopper transistor Q304 often fails. It was short-circuit, and had taken with it R313 (2·7Ω) – the two are connected in series. He replaced these items, then switched on. The set started up, made a choking sound and died. "Must have forgotten something" he said, "ah, yes, the 390kΩ start-up resistor R302." Once this had been replaced the set worked well.

But Mr Nuttence's Sanyo was playing up, if only intermittently. The loudspeaker produced choking noises, and the picture gave way to shimmering and shadowy grey shapes. There was also a faint hum on the sound.

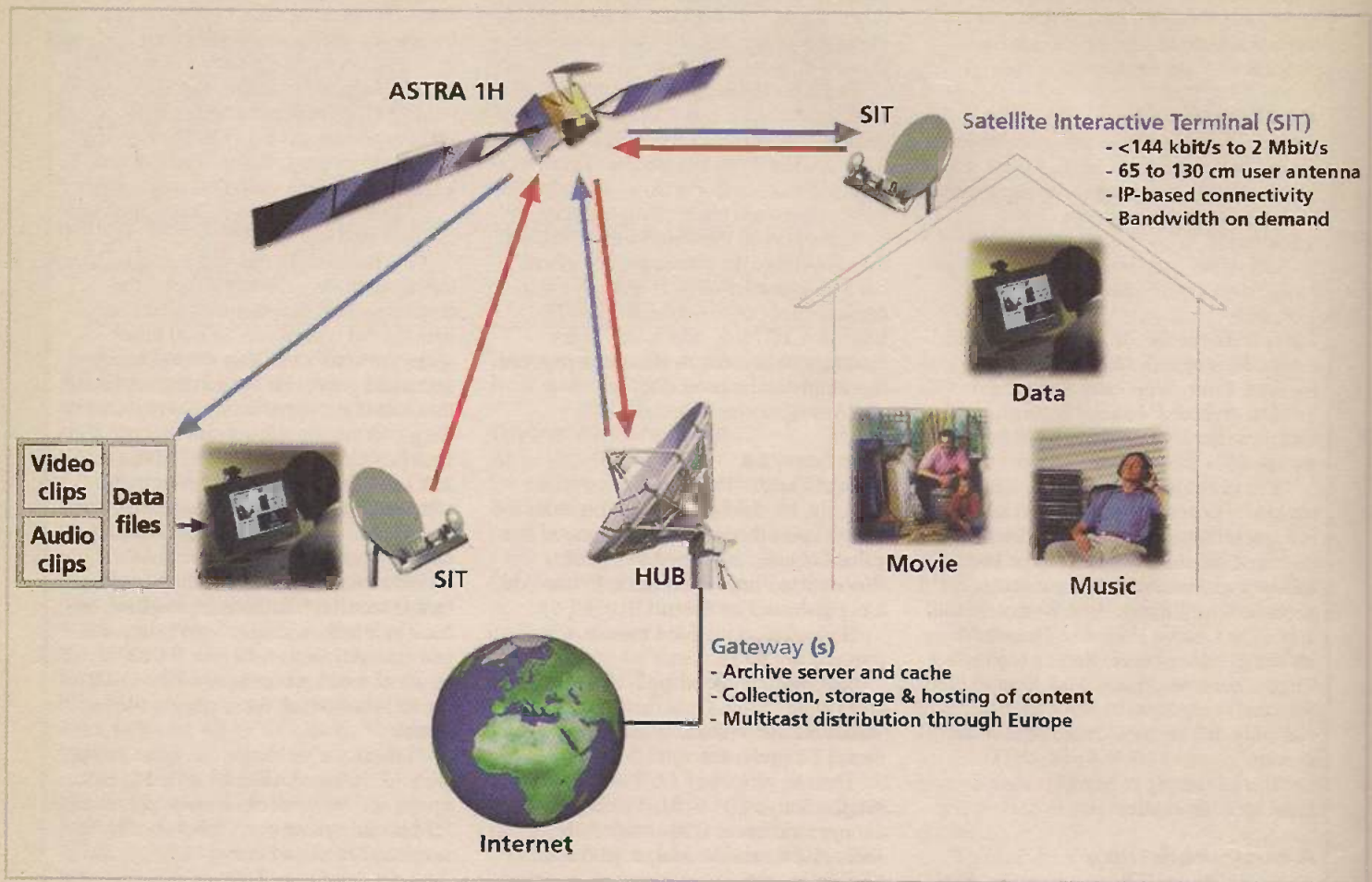
"There you are" I said, "spies, just like the man said."

Paul found that turning the rotary tuning knob very slightly affected the distortion. This happens with a set that uses the old type of mechanical tuner – when the tuner's earthing springs become green and gooey. He opened the set, found the electrolytic capacitors we'd replaced in the power supply a few years ago, and set about checking them. C705 (2,200µF, 25V) and C617 (6·8µF non-polarised) were both low in value. Once replacements had been fitted the hum had gone, but the choking and strange shapes remained.

Paul eventually tried heating the mains bridge rectifiers. A three-legged back-to-back pair had originally been fitted: we had replaced them with four BY127s, one of which had become leaky. Paul changed the lot, after which there was no further trouble.

"I think we've chased the spies away" we told Nuttence when he called to pick up the set. He went out slowly and headed for his car, eyeing everything about him suspiciously. A sad case.

Postscript: We've since had three or four of those Hitachi VCRs with the same fault. ■



Broadband technology

Mark Paul surveys the current state of broadband communications technology and the various services it can provide

The word bandwidth literally means the width of a band of electro-magnetic frequencies. It is generally used to refer to the range of frequencies used by an electronic signal in a given transmission medium. The term can also be used to refer to the width (amount) of data, or how fast that data can flow, in a given transmission path. Put simply, if we want to transmit a lot of data quickly we need a wide bandwidth. The transmission path may consist of hard-wired cabling, either copper or fibre-optic, or a wireless, satellite or infra-red link.

In digital terms, bandwidth is directly proportional to the amount of data that can be transmitted or received per unit of time. Qualitatively, bandwidth is proportional to the data required to achieve a given result. For example it takes a greater bandwidth to download a photograph, which might consist of a huge amount of data, in one second than it does to download a page of text, which can be conveyed by a relatively small amount of data. Put the other way round, a narrow-bandwidth system will take longer than a wideband one to download the same amount of information. Hence the questionable value of having web pages full of 'bells and whistles' when they have to be handled by low-bandwidth systems. The transmission of large sound files, computer programmes, animated videos, streaming, virtual reality and full-length three-dimensional audio/visual presentations calls for more and more bandwidth.

Bits and bauds

In a digital system, bandwidth may be expressed as data speed in bits per second (bits/sec or bps). A 57,600-baud modem has twice the bandwidth of one that works at 28,800 bauds. In an analogue system, bandwidth means the difference between the highest- and lowest-frequency components of a signal. A brief word is perhaps called for on the subject of modems, bauds and bps.

The word modem is a shortened way of saying modulator/demodulator. It's a device used to connect one digital system, e.g. a PC, to another or to the internet via POTS (plain old telephone system – the

standard telephone line). The data isn't simply sent down the line: it modulates a carrier which is then sent down the line. Modem speed has improved over the years: 57,600 bauds is the current standard, but you may be using a slower, earlier type operating at 33,600, 28,800, 14,400, 9,600 or even 2,400 bauds.

The terms baud and bps (bits/sec) are often used interchangeably, but the two are not the same. Bits per second is the number of bits (zeros and ones) that are transmitted each second in a communication channel – this is often referred to as the bit rate. Individual characters, letters, numbers etc. consist of eight bits (one byte). Baud rate on the other hand is the number of signal transitions per second in a communication channel – the transition may be a change of frequency, voltage level or phase angle. One baud is one such transition. So a 300-baud modem's signal changes state 300 times per second, but this does not necessarily mean that only 300 bits per second are being transmitted/received.

The confusion stems from history: early modem designs transmitted only one bit per baud. For two-way communication the baud limit is 1,200, but much higher data rates are required. The trick is to pack as many bits as possible into one baud. A modem operating at 9,600 bits/sec is still transmitting only 1,200 bauds, but is packing 8 bits into each baud. There are many multiple-state modulation systems that enable this to be done, such as QAM (quadrature amplitude modulation).

Broadband capability

Bandwidth is currently expensive, so many in-house systems that are developed are affected by budget limitation. This can result in systems with different bandwidth capability having to be interfaced. It's rather like a group of people of different height trying to hold hands while running as fast as they can – difficult! But the cost of bandwidth will fall, making this sort of thing unnecessary.

The current model for transporting information can be compared to a very large truck that stops at every town on the road it travels, off-loads everything it carries in order to find a particular delivery, then reloads everything and continues. It's slow, and is done because we can afford to run only one truck a day and the road is narrow. With broader bandwidth it will be possible to run as many trucks as we want, or send one truck to each destination without intermediate stops. Because a broadband channel is so fat, data transport costs will be incredibly cheap. Broadband is the future of communications.

Digital technology and fibre-optics are the key to this. Some digital technology, such as the various MPEG standards, can compress vast amounts of voice, video and data information. Fibre-optic cables have a far wider bandwidth capability than copper ones. Broadband working makes the so-called digital convergence or rich media developments possible.

Table 1: Time saving with DSL.

DSL speed	Multiple of 56k	Download time*
144kbits/sec	2·6	4·6
384kbits/sec	6·9	1·7
768kbits/sec	13·7	0·9
1·1Mbits/sec	19·6	0·6

*minutes per 5Mbyte MP3 file

Digital convergence

This is the merging of computing and digital media – audio, video, animation etc. – in communications technology. Phase one involved internet operation, based on the 'narrow-band' exchange of text, numbers and images. During this phase certain basic features were established, such as the web, e-mail and databases. The next phase will involve interactive multimedia. This will require advances in interfacing, to provide ease of use – computing power has to be secondary to the needs of those who use a system.

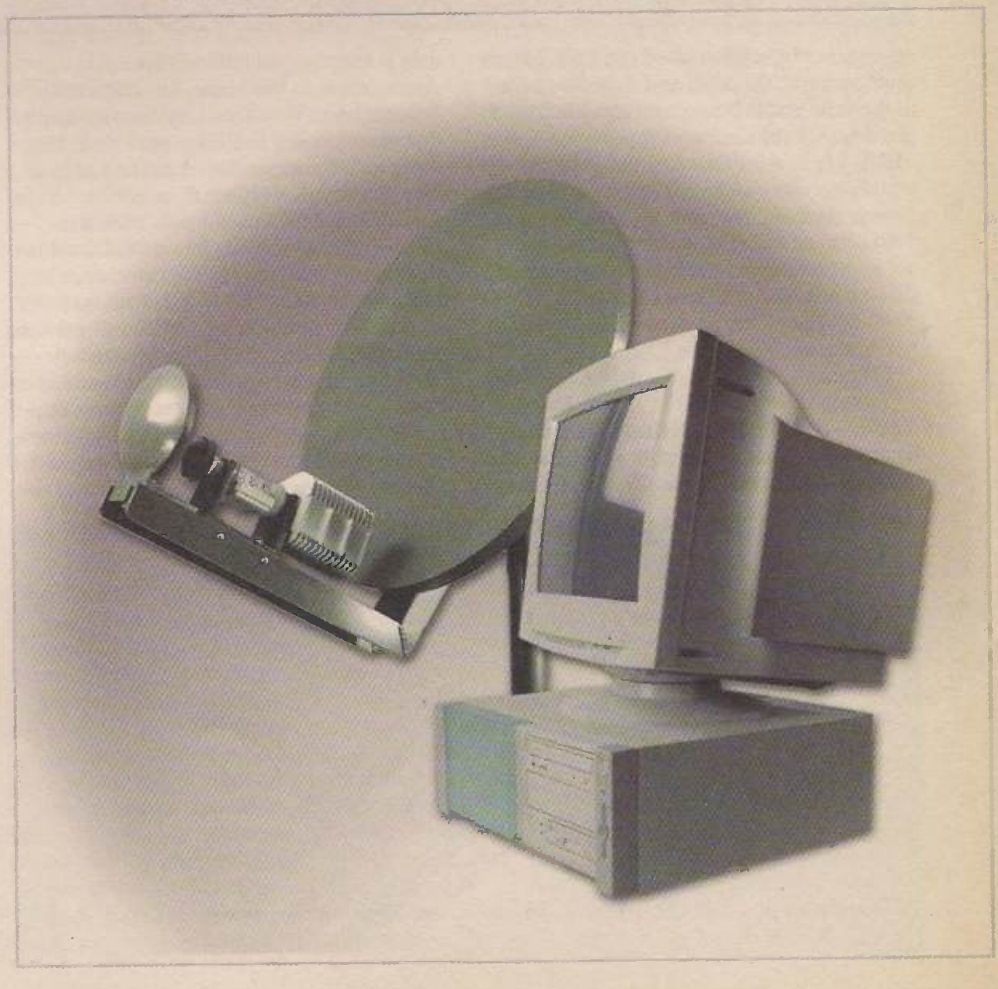
In addition to increased use of digital audio and video, this phase will provide features such as real-time interactive operation, IP telephony, media streaming, internet videoconferencing etc. This is not simply a step-up from earlier forms of networking. The move away from shared Ethernet connections and router deployment will call for difficult technical and budgetary decisions.

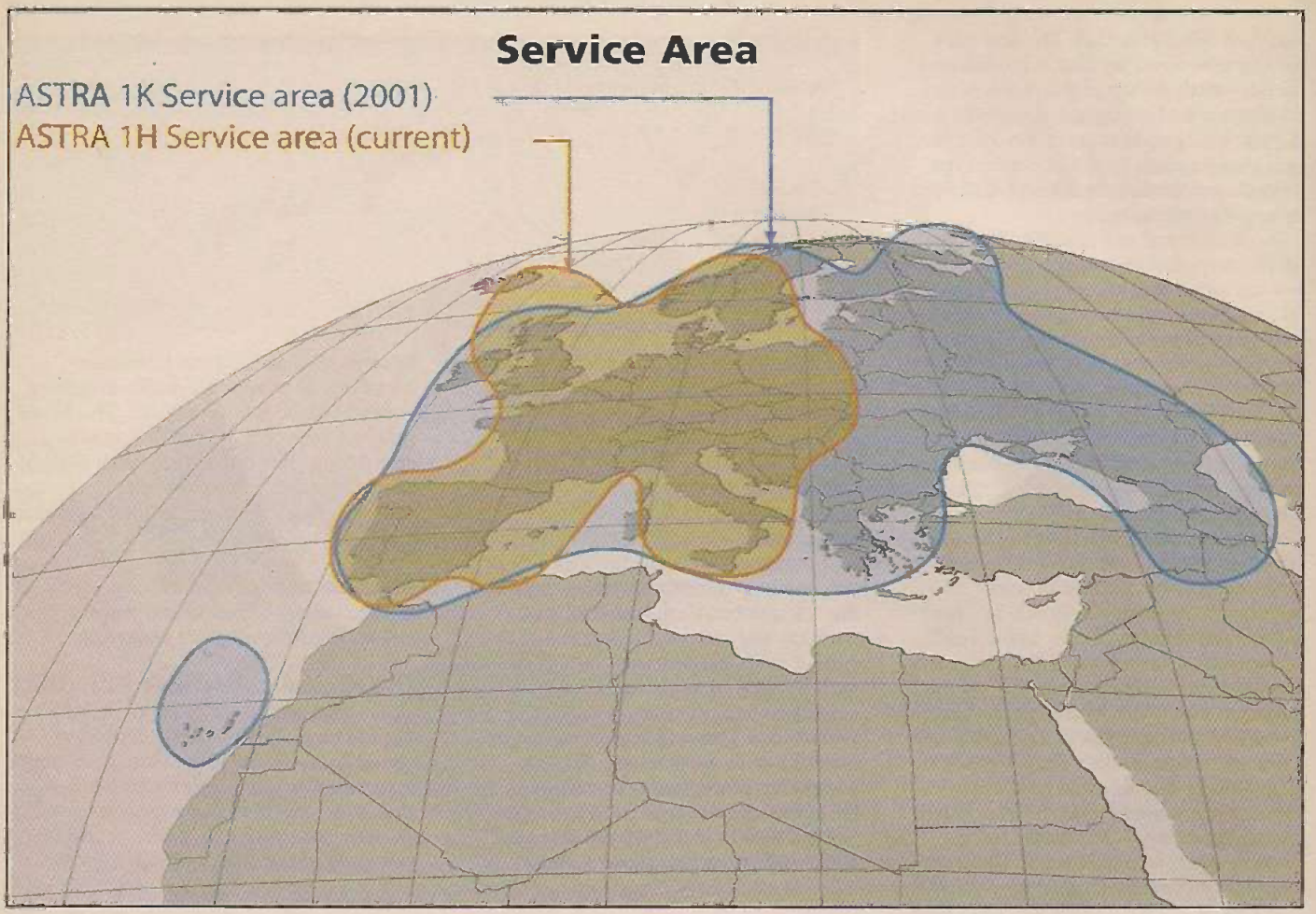
Broadband services

A wide variety of broadband services are in use. The following is a summary.

The digital subscriber line (DSL)

DSL technology enables copper telephone lines to be used as powerful carriers of digital data. Unlike ISDN (see later), which uses the switched telephone network, basic DSL provides 'always-on' operation. At the telephone company's wire centre (the other end of the local loop) DSL traffic is





aggregated by a unit called the DSL access multiplexer (DSLAM) and then forwarded to the relevant ISP (internet service provider) or data network.

DSL uses the same wires that carry telephone voice traffic. The technology can deliver data at rates ranging from 128kbits/sec to 7·1Mbits/sec, i.e. between six and 125 times faster than the standard dial-up connection speed of 28·8 or 57·6kbits/sec. This provides cost-saving on line-use time. see Table 1.

DSL comes in various forms, as follows.

ADSL – asymmetric digital subscriber line: This is intended primarily for the domestic market. Asymmetric means that data is transmitted at faster speeds downstream to the home, say from the internet, than the other way, a compromise that was adopted because users generally download far more data than they upload. The system uses higher frequencies for the data than for the voice band. With the 'Full-Rate ADSL' version, a POTS splitter is required at the customer's premises to separate the two. The ADSL Lite version, also known as Universal ADSL, G Lite and splitterless ADSL, is an easy-to-install version designed for residential use. Its cost is lower because splitters to separate the data transmissions from voice calls are not needed at the wire centre and customer site. But all phones must be connected to the line via a low-pass filter to isolate them from the higher ADSL frequencies.

HDSL – high bit-rate DSL: This is a symmetrical technology, i.e. the transmission rate is the same in both directions. It requires two cable pairs and will work at distances up to 12,000 feet. It does not allow line sharing with analogue phones. The HDSL-2 version requires only one cable pair and works at distances up to 18,000 feet.

VDSL – very high bit-rate DSL: An asymmetric DSL version that's used to provide the final link between a fibre-optic junction point and nearby consumers. Aimed at internet and TV services, it enables homes or offices to be provided with wide bandwidth services using existing copper wires, i.e. there's no need to replace the local infrastructure with optical-fibre. Like ADSL, VDSL can share the line with the telephone.

RADSL – rate-adaptive DSL: A variation of ADSL that's used to overcome varying conditions and lengths of copper cabling. It adjusts the data rate depending on signal quality: adjustment is downwards to overcome variations in outside cabling. Many ADSL technologies are actually RADSL.

SDSL – symmetrical DSL: An HDSL variation that uses only one cable pair. It's

Table 2: ADSL systems.

System	Up date rate	Down date rate	Max distance
ADSL	176kb/s	1·54Mb/s	18,000ft
	640kb/s	6·14Mb/s	12,000ft
DSL.Lite	384kb/s	1Mb/s	18,000ft
VDSL	640kb/s	13Mb/s	4,500ft
	3Mb/s	52Mb/s	1,000ft
RADSL	128kb/s	640kb/s	21,300ft
	176kb/s	1·54Mb/s	18,000ft
	1Mb/s	12Mb/s	12,000ft

All systems use one cable pair and provide analogue voice connection.

available with a wide range of speeds from 144kbits/sec to 1·5Mbits/sec. SDSL is a rate-adaptive technology and, like HDSL, cannot share lines with analogue telephones.

IDSL – integrated services DSL: ISDN (integrated services digital network) DSL provides a rather low speed (144kbits/sec) in both directions compared with other symmetrical versions but does provide 16kbits/sec more than the standard ISDN. It also provides the longest operating distance at 26,000 feet. Unlike standard ISDN, IDSL cannot be used with analogue phones, and signals are not switched through the telephone network. It works with the same customer equipment as ISDN. This is a dedicated service, so customers pay a fixed monthly charge with unlimited transmission time.

Tables 2 and 3 summarise ADSL and SDSL data rate and distance capabilities.

Cable modems

These provide connection to digital cable TV networks, which are inherently broadband. Digital cable TV systems can provide internet access, interactive TV etc. and of course telephone connection, using coaxial and fibre-optic cabling. A cable modem needs to perform a 'handshake' – agree on how to transmit/receive data – with one at the cable operator's site. This establishes between the two a protocol on the type of signalling, frequencies used and method of authentication. When you buy a cable modem from a retail outlet you should check that it's compatible with the cable system concerned. The cable industry has set modem standards, and manufacturers can have their modems tested and certified for cable TV use. DOCIS (data over cable service interface specification) has been established as a standard.

The speed of a broadband cable service depends on how many people use the service at the same time. Most cable systems average about 1Mbits/sec, which is about twenty times faster than with a 56,000kbits/sec dial-up connection, but this can be slowed down by the 'party-line' nature of the connection. Under optimum conditions a cable modem can handle information as fast as 5Mbits/sec. And because a cable modem provides an always-on connection to the internet there's no need to dial in to start a session. No need therefore to worry about busy lines or wasting time. Another advantage is that going on-line with a cable modem doesn't tie up the telephone line.

Table 4 compares the speed of various services.

Broadband interactive system (BBI)

This is an asymmetric two-way multimedia satellite communication service via Astra 1H. It's due to come into use commercially at the end of the year, extending the existing multimedia capabilities of Astra-Net. A satellite interactive terminal (SIT) is used for access.

For business applications a BBI-SIT installed at corporate premises and integrated into the LAN (local area network) will provide all standard IP (internet protocol) based needs such as file transfers, e-mail, database access/updates and internet access. Selected recipients across the Astra 1H footprint can be addressed via one satellite transmission, removing the need to deal with several telecommunications companies or ISPs for international communications.

The SIT consists of a small fixed dish and an indoor unit (IDU) which can be connected to a standalone multimedia PC or a LAN. It can transmit data at rates up to 2Mbits/sec in Ka band (29·5-30GHz) and has a receive capability of up to 38Mbits/sec (DVB MPEG-2). All communication is based on the IP, so the system is an open one that can be used with any standard internet technology. In addition, the industry-standard IPSec and its associated key distribution mechanism provide end-to-end security.

The maximum transmit bit rate depends on dish size: 144kbits/sec with a 65-75cm dish, 384kbits/sec with a 75-95cm dish and 2·048Mbits/sec with a 95-120 cm dish.

The wireless local loop (WLL)

A fourth approach to broadband communications is the fixed-wireless technique (terrestrial aerial-to-aerial), more commonly known as a wireless local loop (WLL). WLL is often designed into an integrated telecommunications system, linking with cable TV lines and fibre-optics. It has the advantage of being less labour intensive, and avoids the need to dig up the road to install cables.

Once a fixed site has been chosen for the aerial, RF signals carrying data are transmitted/received at a hub then sent to the user's central office. The RF links can be point-to-point or point-to-multipoint. WLL uses the 24-38GHz band. Aerials must be within line-of-site of each other, with no obstruction by buildings, trees (especially in bloom and when wet) or any other objects. At such high frequencies signals can travel only short distances, and adverse climatic conditions such as heavy rain can introduce serious attenuation. Thus aerial sites have to be carefully chosen, with a maximum distance between the base station and customers of about 1·5 miles.

Rich media

This term refers to the transmission of audio and video etc. via digital communications systems (audio and video streaming) for such purposes as electronic learning (e-learning). There are many current applications – technical training, business-to-business presentations and live seminars for example. Why spend money and time on travelling when you can simply switch on your PC? Another example is voice-over IP, which promises significant cost savings for companies. For those that have geographically scattered locations, VoIP offers an alternative to using the switched public telephone network.

Streaming video is set to become a major technology, with anything from low- to high-definition quality in real time.

A lot of money has been invested in all this technology. It will be interesting to monitor the take up and returns. ■

Table 3: SDSL systems.

System	Data rate	Max distance	Cable pairs
HDSL	768kb/s	12,000ft	2
	1◊544Mb/s	12,000ft	2
	2◊048mb/s	12.000ft	3
HDSL-2	1◊544Mb/s	18,000ft	1
HDSL-2	2◊048Mb/s	18,000ft	1
SDSL	160kb/s	22,700ft	1
	208kb/s	20,000ft	1
	784kb/s	15,000ft	1
	1◊5Mb/s	9,000ft	1
IDSL	144kb/s	26,000ft	1

Analogue voice connection is not possible.

Table 4: Download time with different services.

Service	Download time*
28◊8 modem	6 min, 56 sec
57◊6 modem	3 min, 34 sec
64kb/s ISDN channel	1min, 34 sec
Cable modem	8 sec

* For a 1◊5Mbit PowerPoint slide.

A serviceman's guide to the

Brian Storm describes the technical features of the Panasonic Euro-5 chassis, which includes complex video signal processing to produce optimum-quality 100Hz displays

The Panasonic Euro-5 chassis was introduced in 1997 to complement the Euro-4 chassis. It was designed specifically for use in large-screen, high-performance models and includes the following features: an owner-ID system; on-screen user 'help'; 100Hz technology with frame-based processing and an automatic movie mode; dynamic auto-focusing, which maintains a pin-sharp picture right to the edges of the screen; intelligent scart linking technology (Q-link); 100 pages of teletext memory; picture-in-picture (for simultaneous display of the AV and tuner inputs); geomagnetic correction; scan-velocity modulation; widescreen switching at pin 8 of the AV1 and AV2 connectors.

Some of these features have already been described in previous articles: see the July 2001 issue for an account of the Euro-4 chassis and the August 2001 issue for information on the Tau version of the chassis.

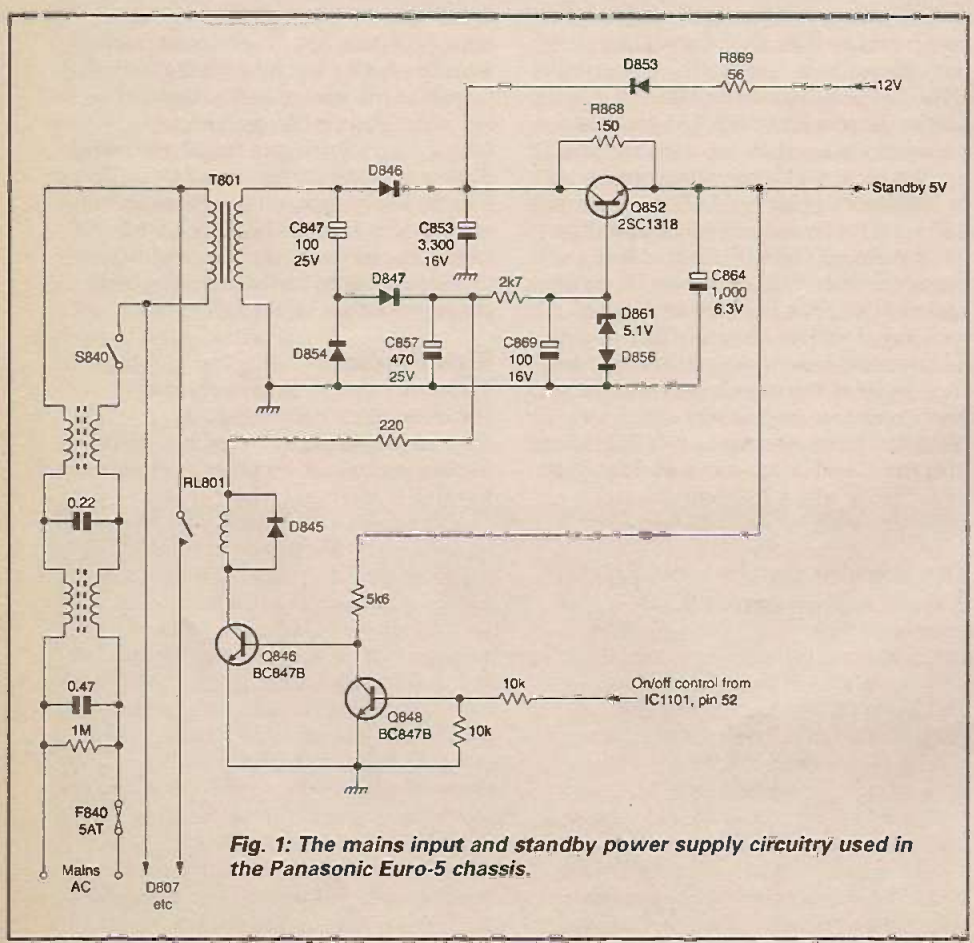


Fig. 1: The mains input and standby power supply circuitry used in the Panasonic Euro-5 chassis.

The owner-ID feature is exactly the same as in the Euro-4 chassis. It enables owners to write their name, house number and post code into the non-volatile user memory chip. Once this has been done the information can be obtained by holding down button F, which is inside the control flap at the front of the set, for more than five seconds. The owner-ID data is pin protected for access via the tuning menus.

Help! on-screen demonstrations of the menu structures and features can be obtained by pressing the ? button under the flap at the bottom of the TV remote-control unit.

Q-link is available via the AV2 scart socket. It provides general features such as downloading of preset data and direct TV record, also Panasonic-specific features such as auto VCR power on/off when the TV set is switched on or off.

The standby power supply

The standby power supply used in the Euro-5 chassis (see Fig. 1) was designed on 'green' principles: in the standby mode the set's power consumption is kept below 1·9W. Mains transformer T801 supplies, via the 5V regulator Q852, just enough power to maintain the system-control circuitry in the standby condition.

When the main microcontroller chip IC1101 decides to switch on the main power supply, using relay RL801, the unregulated supply to Q852 could fall very quickly. As Q852's 5V output decreased, a point would be reached where IC1101 would be reset. To prevent this happening and still maintain a low power consumption in standby, diode D853 and resistor R869 provide a helper feed to maintain the standby 5V supply after power-on. They are fed from the regulated 12V supply.

If the standby light is faint and the set is stuck in standby, check diodes D854, D847 and D846 which can develop high resistance or become leaky. If the standby light is bright and the set won't come out of standby, check Q846 and D845 which can be damaged by arcing contacts in the standby relay RL801. In this case RL801, Q846 and D845 should all be replaced.

The main power supply

The main power supply is considerably more complex than in the Euro-4 chassis, using an AN8029 control chip (IC801) to drive a MOSFET chopper device (Q801). Again, energy saving and efficiency were

Panasonic Euro-5 chassis

the design principles: FET technology is considerably more efficient than bipolar transistor technology. Fig. 2 shows the circuitry on the primary side of the main power supply.

There is an additional energy-saving feature in the form of thyristor D806, which is connected in parallel with the surge-limiting resistor R809. At switch on R809 provides limiting of the initial surge current, in the usual way. Once the chopper circuit has started up D806 is switched on, shorting out R809. This reduces the power consumption after the start-up period.

IC801 receives a start-up feed at pin 7 via resistors R820 and R821. As the chopper circuit starts to oscillate and power becomes available from the feedback winding on the chopper (flyback converter) transformer T802, D814 and C823 take over to supply pin 7 of IC801.

If the voltage at pin 7 rises excessively or transients appear on the line the 12V zener diode D803 will conduct, feeding pin 8. This is the overvoltage protection pin. When activated in this way IC801 will latch off. The only way to release the latch is to remove the supply and then reapply it. The latch is also thermally activated when the body temperature of IC801 exceeds 150°C. Zener diode D820 and the associated filter circuit prevent mis-operation of the latch, or in extreme cases damage to IC801, should high-frequency spikes appear at pin 8.

Basic on/off timing of the chopper circuit is set by C812, R811 and C816 which are connected to pins 2 and 3 of IC801. The output pulses at pin 6 drive the MOSFET chopper device Q801. Q803 and Q804 provide a latch which operates in the event of spikes and transients appearing on the drive, thus protecting Q801. Once again release of the latch can be achieved only by removing then reapplying the supply.

Excess current is monitored at pin 4 of IC801. The voltage here is developed across resistors R823-5 and R830, which are connected in series with Q801. Zener diode D818 prevents misoperation of the excess-current trip and also prevents

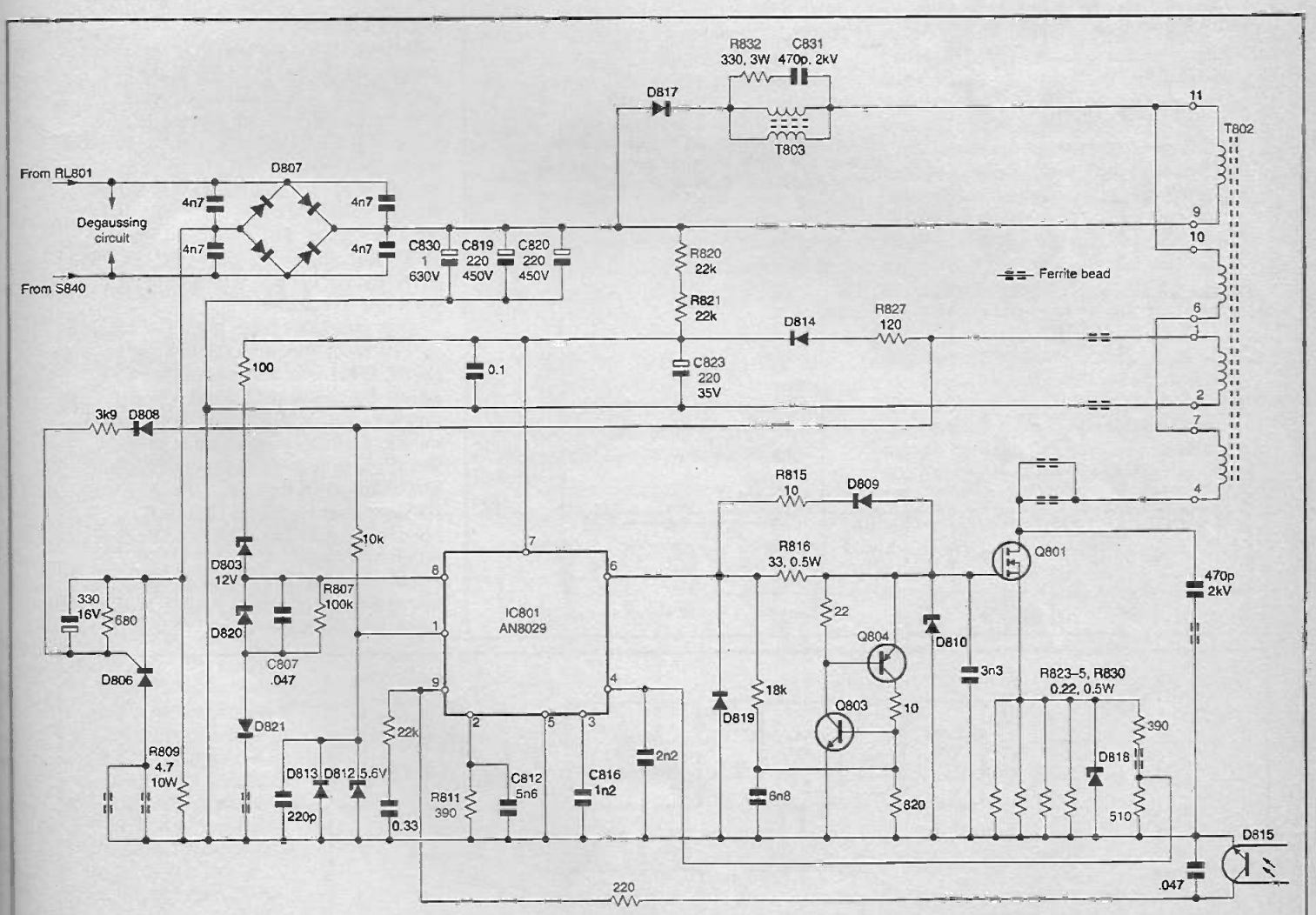


Fig. 2: The circuitry on the primary side of the main chopper power supply in the Panasonic Euro-5 chassis.

damage to IC801 should the voltage across the resistors rise excessively.

Pin 1 of IC801 monitors the drive state at T802, helping to increase the speed of the on/off switching.

Feedback for regulation is at pin 9, which monitors the HT and 15V supplies on the secondary side of the circuit via the optocoupler D815.

Fig. 3 shows the secondary side of the main power supply. T802 and D815 provide mains isolation between the primary and secondary sides. IC845 (SE140N) is a constant-voltage reference which is connected to the two supplies subject to the greatest load variation: the 147V HT supply to the line output stage and the busy 15V supply. Any voltage variations at these outputs produce current variations through IC845. Such variations are passed via D815 to IC801. Q854 and Q853 increase the sensitivity of the monitoring circuitry and thus improve the regulation.

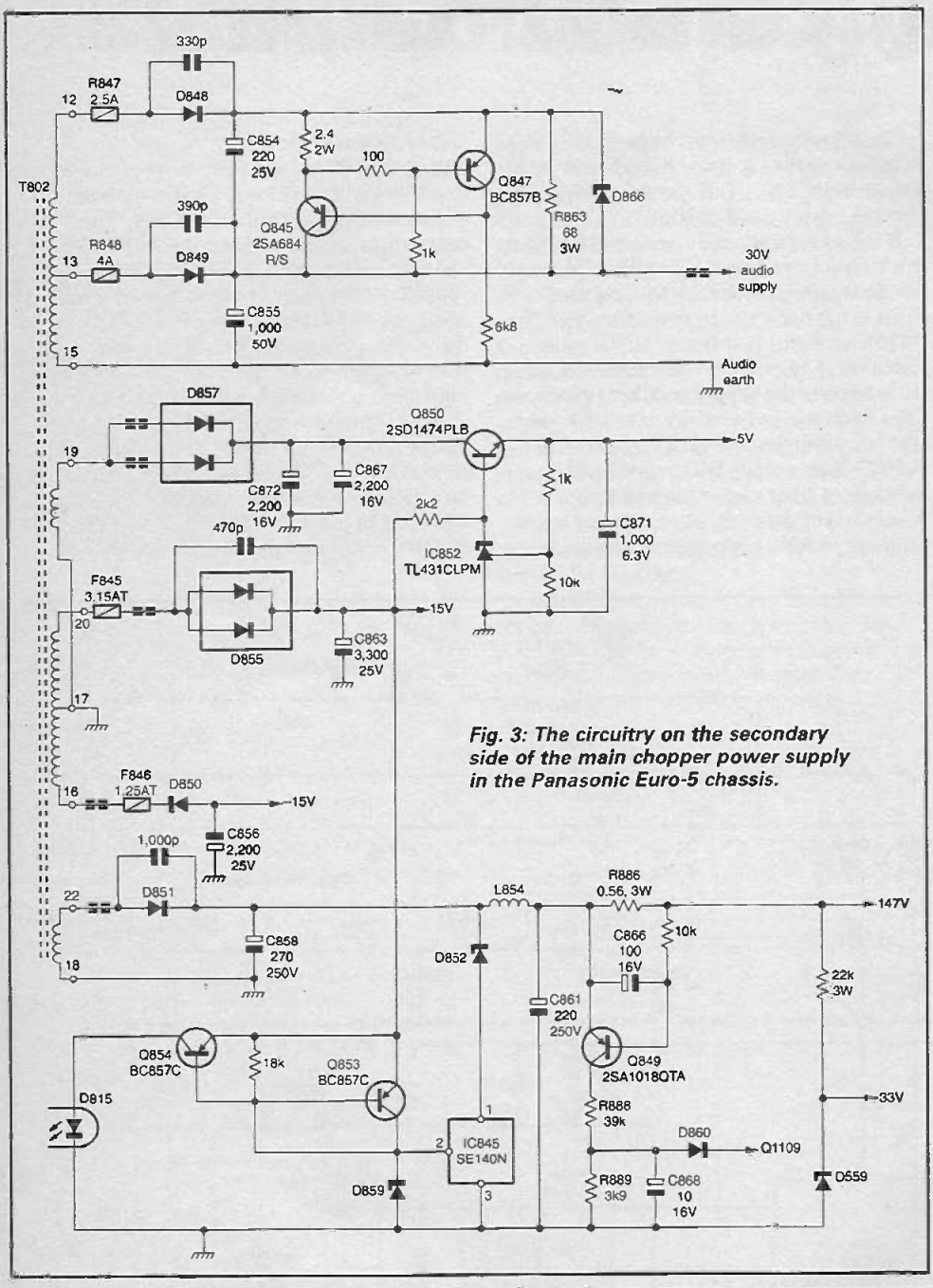


Fig. 3: The circuitry on the secondary side of the main chopper power supply in the Panasonic Euro-5 chassis.

Protection circuitry

All protection circuitry in the Euro-5 chassis is connected via buffer transistor Q1109 to pin 75 of the main microcontroller chip IC1101. This pin is usually high (5V). When a protection circuit is activated, Q1109 switches on and pin 75 of IC1101 goes low. Five seconds later the mains relay RL801 is deactivated, the set thus switching to standby. When this happens the standby LED will flash at regular intervals.

Resistor R886 (see Fig. 3) is connected in series with the 147V supply to the line output stage. It provides monitoring to prevent excessive beam current. With a value of 0·56Ω, the voltage across R886 is normally about 0·5V. When there's excessive HT current the voltage across R886 will increase and Q849 will switch on. The voltage thus developed across R889, smoothed by C868, is fed via D860 to the base of Q1109, which initiates reversion to standby.

Other protection feeds to Q1109 are from Q1110 which monitors the 15V supply for shorts, Q401 which monitors the –15V supply for shorts and Q1108 which monitors the 5V supply for shorts. Q400 monitors the field output stage to check that the scan waveform is present, while Q3908 monitors the dynamic auto-focus (DAF) output stages for abnormal operating conditions such as no field or line DAF drive.

Thus pin 75 of IC1101 could be driven low as a result of a fault in several different areas. It is not however a good idea to

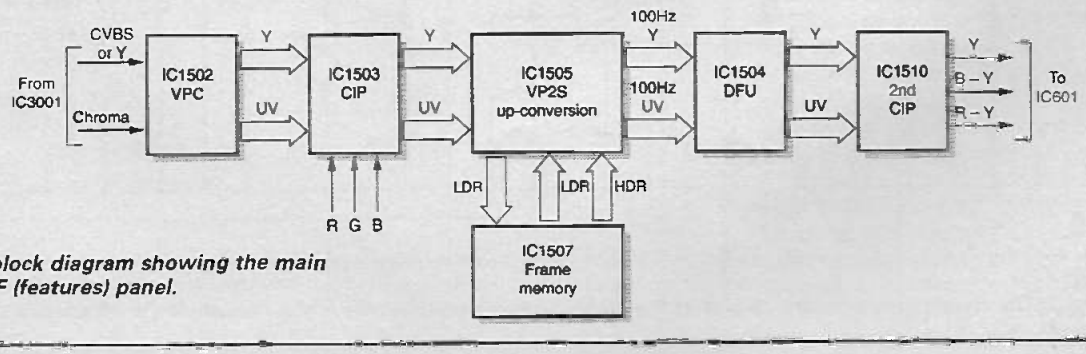


Fig. 4: Basic block diagram showing the main chips on the F (features) panel.

disconnect pin 75 or Q1109 when fault finding. To force the set to come on without first isolating the cause of protection being activated is to ask for trouble. There might well be a puff of smoke that indicates the premature demise of many innocent semiconductor devices – especially if the 147V rail and the DAF circuit are not checked first. It is a simple matter to check the isolating diodes between Q1109 and the monitoring transistors mentioned above to see which diode is conducting. Once the faulty section has been located, appropriate checks can be carried out in this area.

The main microcontroller and system control

The main microcontroller chip IC1101 is similar to that in the Euro-4 chassis, with the teletext processor and on-screen display generator built in. This family of microcontrollers (SDA5450 series) also has the AV-link (Q-link) processing on board. Be careful when ordering replacements, as an inaccurate part number can leave you with a dual-in-line package version instead of the four-sided J-leg versions used in the Euro-4 and Euro-5 chassis.

In the Euro-5 chassis the main microcontroller chip operates with three memory chips, IC1102 (EEPROM), IC1103 (SRAM) and IC1104 (EPROM). IC1104 contains the address and data information for every digital processor chip used in the Euro-5 chassis range, the menu structure and menu-specific control data. IC1103 provides additional page memory for the teletext features. IC1102 is used for user-data storage and model-specific control data.

Table 1 lists the various pin functions for IC1101.

The video processor

The surface-mounted TDA9330H video processor chip IC601 takes video feeds from the 100Hz processor, the picture-in-picture section and the OSDs/teletext outputs from IC1101. IC601 also acts as the timebase generator, producing field drive outputs at pins 1 and 2, an EW drive output at pin 3 and the line drive output at pin 8. The latter can be set to double the line frequency for 100Hz operation by leaving pin 12 open, as in this chassis. For normal line-frequency operation pin 12 would be connected to chassis. Pin 5 is connected to pin 54 of IC1101 to switch off the line drive. Pin 4 is an input for EHT breathing compensation.

Pins 10 and 11 are connected to the I²C bus for device control and data loading. Pin 13 is the line flyback pulse input to synchronise the line drive. Pins 15 and 16 are connected to the field ramp generator components C616 and R622. Pin 17 is the 5V supply and pin 19 the chassis connection. Pins 20 and 21 are connected to a 12MHz crystal (X601) which provides the reference clock for IC601.

Pin 23 is the 100Hz field timing pulse input for the line to field scan divider, and pin 24 the 2H line scan timing pulse for the internal PLL.

Pin 25 is used to switch beam-current monitoring sensitivity between 4:3 and 16:9 operation, via Q553.

Pins 26-28 are R – Y, B – Y and Y inputs from board F (100Hz up-conversion). In normal operation IC601 passes 100Hz video signals from this source to the CRT base PCB as RGB outputs at pins 40-42. If the fast-blanking input pin 33 is activated however, RGB OSD or teletext outputs from IC1101 are fed in at pins 35-37 for display via pins 40-42.

Pin 39 is the 8V supply.

Pins 40-42 are the RGB drives to the CRT base PCB, with pin 43 used for beam current limiting. Pin 44 monitors the black current of each CRT drive for automatic grey scale and CRT ageing compensation.

100Hz processing

The heart of the 100Hz processing in the chassis is the features board F, where all the really difficult work takes place.

Normal TV video information is broadcast at a rate of 25 complete pictures per second. To avoid flicker, each picture (frame) is transmitted as two separate interlaced fields per second, increasing the screen refresh rate to 50Hz. This improvement becomes less effective with large-screen sets. Wide area flicker is noticeable, and prolonged viewing can be quite tiring. For large-screen sets it is better to increase the field rate artificially to 100Hz.

This is not as easy as it might sound. Simply doubling the normal scanning by repeating fields A and B will provide A, B followed by A, B, at 100Hz. But because the transmitted video will have movement between fields A and B, if this is repeated by storing the two fields in a memory then reading them out again at a faster rate the movement will also be repeated.

Consider a car moving across the screen. It will move during two fields and then start its movement again. The motion will continue for four fields and go back two. This will continue until the car has crossed the screen. Clearly such a series of fields cannot be used for moving pictures, only for stills. The system we have to adopt to reduce these motion artefacts is fields A, A then B, B. With this system the car will cross the screen in a more linear fashion. Motion problems will still be present however, because we are effectively stopping the motion with each field repetition.

So we need to shift each second raster vertically to interlace raster A with raster A and raster B with raster B. This introduces a slight vertical jitter, which has to be removed by reprocessing each second raster, using a line-by-line averaging system. This gives us a scanning system that consists of fields A, A*, B, B*, where the asterisks indicate reprocessed as opposed to transmitted fields.

The minimum memory requirement for such processing is one field store, but this can provide only minimal information for line reprocessing. The Euro-5 chassis employs a frame memory to store fields A and B. This provides a higher vertical resolution for moving pictures and enables still pictures to be shown at full resolution.

Movie mode

The Euro-5 chassis also has an automatic 'movie' mode in which the field scanning reverts to A, B, A, B when there is no motion between fields. Films are produced at a frame rate of 24 pictures per second.

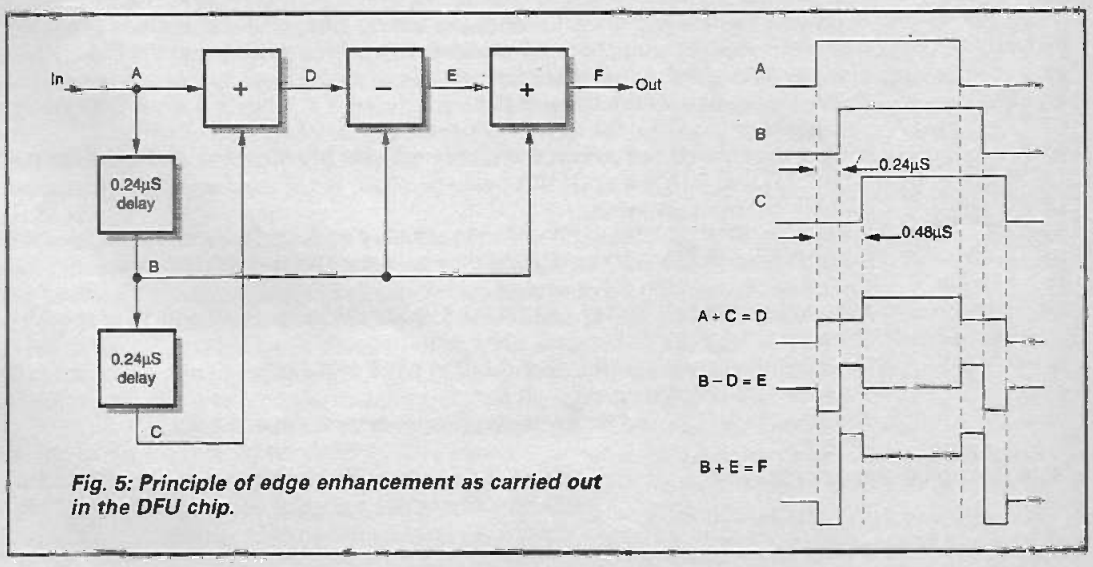


Fig. 5: Principle of edge enhancement as carried out in the DFU chip.

They are then used for TV transmission or recorded on tape or disc with each picture effectively a still frame and with a buffer frame added to make 25 a second. As this effectively ensures that there is no movement between fields A and B, the TV set can use the field A, B, A, B format without motion problems. So there is no need for the extra processing, which in fact degrades the picture slightly.

With the Euro-5 chassis the jitter reduction can be switched off via the user menus to improve the resolution when film material is being shown.

Extended noise reduction

Extended noise reduction means a three-dimensional noise reduction system that's used to maintain good resolution and picture sharpness. This process uses the frame memory to reinforce video signals on a line-by-line basis, using temporal and

Table 1: Main microcontroller chip pin functions.

Pin(s)	*Function*
1	Chassis connection.
2	Standby 5V supply.
3-4	6MHz clock crystal.
5	Main reset input.
6-36	Connections to the EPROM and SRAM chips.
37-9	RGB on-screen display and teletext outputs. These leave IC1101 in 100Hz form to match the 100Hz video from the features PCB.
40	Fast-blanking output.
42	Chassis connection.
43	Standby 5V supply.
44-5	Serial clock and data connections SCL3 and SDA3. These go to pins 10 and 12 of the AV1 scart connector. They are used for writing and reading data to and from a Panasonic memory pack. As these are not standard scart socket connections, transistors Q1112 and Q1113 enable the connections only for the service modes.
46-7	Line and field sync feeds to lock the on-screen displays when a suitably strong signal is available. Otherwise the OSDs lock to an internally-generated timebase. If the OSDs were always locked to the internal timebase there would be beating between the picture information and OSDs, showing up as annoying jitter.
48-51	These are the SCL1, SDA1, SCL2 and SDA2 lines, providing data-loading and device-control connections to every digital IC in the chassis via standard I^2C bus technology.
52	The mains relay control pin. High is off and low is on.
53	Master reset output from IC1101. Once IC1101 has sent a data load to all the digital processor ICs it has to reset them and start them all off together again.
54	Line drive on/off switching to pin 5 of IC601.
55	Power off detection. Should power to certain parts of the set fail momentarily, IC1101 may be unaware of this and try to control a digital processor that has lost its set-up data. IC1105 sends a signal to this pin to tell IC1101 that it needs to send out a data load and then a master reset to regain control of the system.
58-9	Slow-switching from pin 8 of AV1 and AV2. These pins enable automatic AV switching. In this chassis they also provide widescreen switching dependent on the voltage. If there is 12V at pin 8, AV mode with an aspect ratio of 4:3 is selected. If there is 6V at pin 8, AV mode with 16:9 aspect ratio is selected. It is important to note that this does not happen with scart connector AV4. Pin 71 does not have the widescreen AV switching facility.
60	Although most circuits show this as a key-scan pin this is not so. Pin 60 is a voltage-sensing input that's connected to a local keypad. Keypad connections short out various parts of a resistive ladder. Depending on the button pressed, there will be different voltages at the top of the ladder. IC1101 checks the voltage at pin 60 to determine which key has been pressed.
61	AFC monitoring input for search tuning. When the AFC voltage at this pin reaches the centre position between highest and lowest swings the tuning data is held and made available for storage.
63-5	Filter component connections for teletext data phase shifting and the PLL.
66	Standby 5V supply via separate filtering.
67	Current reference for the teletext PLL.
68	Composite video input for teletext processing.
72-3	AV link data in and out connections, connected to pin 10 of the AV2 scart connector via switching transistors Q1103, Q1104, Q1106 and Q1107.
74	Remote-control data input.
75	Protection input, to initiate reversion to standby under a fault condition. See main text.
76	Selects whether the OSD or teletext data is in the 100Hz or 50Hz mode.
77	Geomagnetic rotation drive control.
78	Activates transistors Q1112 and Q1113 to pass data to pins 10 and 12 of the AV1 connector in the service mode.
79	Headphone volume control, connected to pin 9 of IC2351.
81	Standby LED on/off control.
82-4	These pins can be used for switching Secam circuitry in and out.

Note that some pins are not used.

spatial processing. When there is motion in a picture however these processes will tend to destroy it.

The Euro-5 chassis uses motion detection to reduce this processing inversely, depending on the amount of motion detected. This reduces the so-called "dirty-window effect" you can get with 100Hz processing.

The results of all this are improved resolution and more natural pictures.

Line interpolation

The extensive processing on board F includes rescaling of the picture for various widescreen formats. When the active picture content is magnified to fill the screen with a letterbox transmission, line interpolation techniques are used to improve the vertical resolution. This involves generating new line information by line averaging and inserting this information into the picture. (Panasonic didn't subscribe to PAL+, as the technology was considered to be redundant before it was implemented.)

F board circuitry

Fig. 4 shows in block diagram form the basic chip arrangement on board F. The first and most important requirement for large-screen TV is a high-quality, wide bandwidth luminance signal. If the quality of the luminance signal is even slightly suspect, every defect will be magnified and cause problems in the subsequent video processing stages.

So the first chip on board F is IC1502, which is a high-quality digital video processor and colour decoder with a built-in adaptive 2H comb filter. This guarantees a 5·5MHz luminance signal free from cross-colour artefacts and patterning. With normal Y/C separation the luminance signal bandwidth is restricted to 3·8MHz.

The composite or separate luminance signal is fed in at pin 62 of IC1502, with the chrominance input at pin 63. Other inputs are available but are not used in the Euro-5 chassis. The signals are then analogue-to-digital converted and fed to the 2H adaptive comb filter for high-quality separation. If the input is luminance only from an S-video input the comb filter can be switched off via software.

The chrominance signals are extracted in the decoder stage. The digital luminance output is available at pins 20-25, 28 and 29. Digital UV outputs are available at pins 38-43, 46 and 47. Other important pins are 5 and 6 for the 20·25MHz crystal timebase, 4 and 66 for the 5V processor supply and 54 for the master reset from IC1101. Pins 55 and 56 are the serial data and clock connections for data loading and software control.

Most importantly IC1502 provides, at pin 18, the 13·5MHz line-locked clock for the 50Hz processing stages and, at pin 19, the 27MHz line-locked clock for the 100Hz processing stages. Vertical and horizontal timing signals for the next stage are produced at pins 12 and 16.

The 'component interface processor' IC1503 interfaces the digital luminance and multiplexed UV data with the analogue RGB inputs from scart socket AV1, feeding them directly to the 100Hz up-conversion processor IC1505. Most of the supplies for IC1503 come from the 3·3V regulator IC3806 on board E and IC1506 which provides 3·5V. The eight-bit luminance input to IC1503 is at pins 31-38, with the multiplexed UV data input at pins 21-28. Analogue RGB enters at pins 69, 60 and 52 and is then A-D converted. A fast-blanking input at pin 77 selects the RGB inputs – the digital video inputs generally have priority over the RGB inputs. IC1503's digital luminance outputs are at pins 101-106, 98 and 99, the multiplexed UV data outputs being at pins 111-116, 108 and 109. Pins 82 and 83 are used for serial clock and data control.

IC1505 is the heart of the up-conversion processing, in conjunction with the memory IC1507. It also carries out line-flicker reduction, automatic letterbox detection, motion-adaptive noise reduction, movie-mode detection, line interpolation, vertical zooming and freeze frame. Horizontal zooming is carried out in the second component interface processor, IC1510. The 100Hz luminance leaves IC1505 at pins 47-49 and 51-55, with 100Hz UV leaving at pins 56-58 and 61-65.

The digital features unit (DFU) chip IC1504 is used to improve picture edge detail for both luminance and chrominance. Fig. 5 shows the basic principle of edge enhancement as carried out in IC1504, which also provides black-level enhancement or adaptive intensification – sometimes known as artificial intelligence or AI.

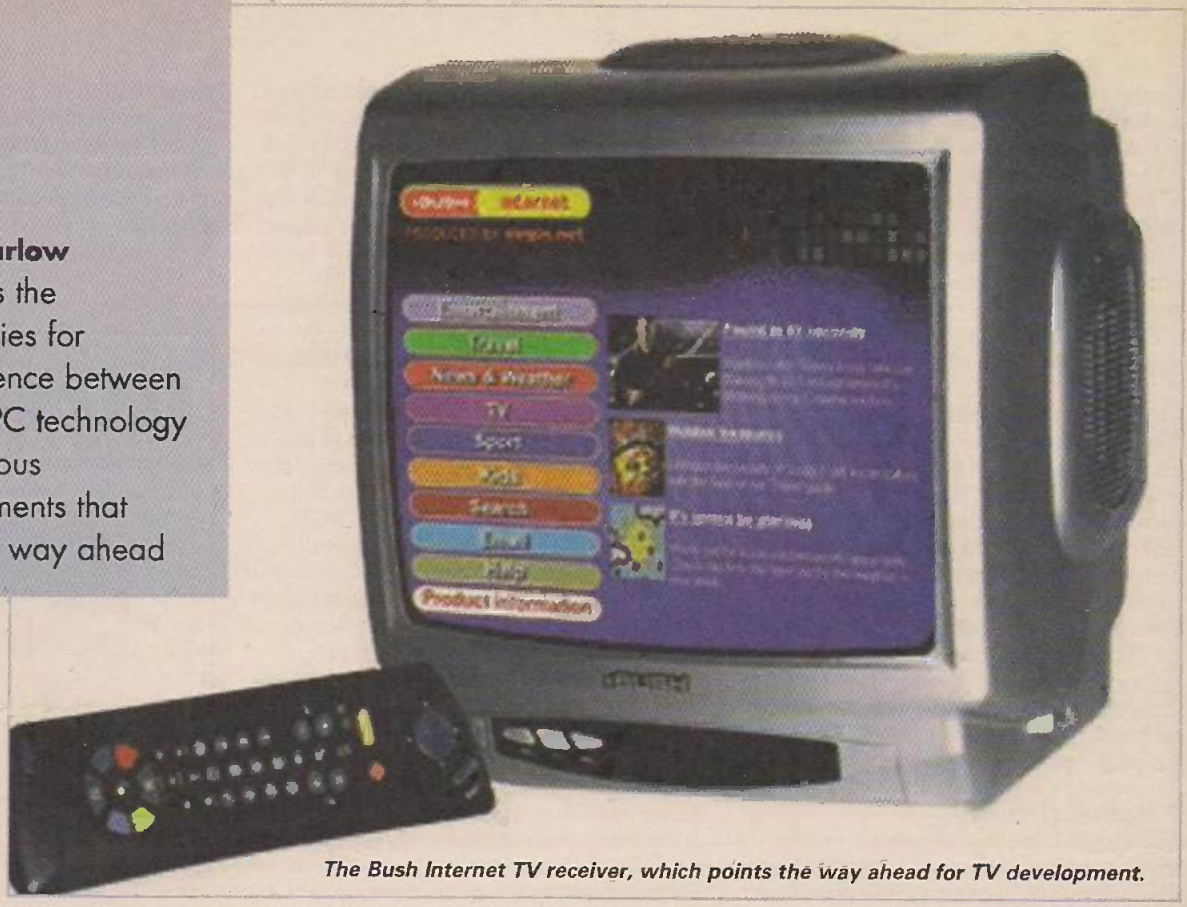
Chrominance transient improvement and chrominance resolution improvement are carried out alongside luminance transient improvement. These processes improve the picture before the second interface processor IC1510 converts the 100Hz digital signals back to analogue 100Hz Y, B – Y and R – Y outputs. IC1510 also provides horizontal rescaling for widescreen displays. The 100Hz analogue signals are fed to IC601 on board E.

In conclusion

The circuitry after these stages is mostly conventional. The Euro-5 chassis employs dynamic auto-focusing. It's very similar to that in Euro-4 chassis Tau sets, but at twice the line frequency.

Watch out for dull pictures with flaring highlights, as some people I know have replaced very heavy CRTs when confronted with this fault then found that the guilty party is a considerably smaller, lighter and cheaper component, namely C386 (3·9nF, 2kV) or C397 (2·2nF, 2kV). These capacitors, which are mounted on the CRT base panel, decouple the first anode supply. They usually develop a slight leak, thus reducing the first anode voltage. ■

Peter Marlow discusses the possibilities for convergence between TV and PC technology and various developments that point the way ahead



The Bush Internet TV receiver, which points the way ahead for TV development.

TV and the PC

The launch of the Bush Internet TV set last year and the arrival of internet services from ITV Digital and SkyDigital have raised interesting questions about the future of the domestic TV set and the personal computer. For example, could we eventually be presented with a single 'composite' product, and would it look more like a PC or a TV set?

Historical background

To reduce costs, the first 'personal computers' twenty five years ago used a TV set to provide the display. I have fond memories of the ZX81! But then IBM came along a put a separate monitor on a computer base unit. And this is the way it has remained ever since, despite efforts by Amstrad and others to integrate the computer into the monitor – remember the PCW8512? The fact is that a modern PC's display requirements involve much higher frame and line scan rates than those used for TV pictures.

Yet despite the popularity of the internet relatively few UK homes are equipped with a PC – about 25 per cent are at present. So attempts have been made to turn the TV set into a sort of computer by offering internet access and e-mail – either by adding another set-top box or by means of a custom-designed product such as the Bush Internet TV. Is this just a passing phase while the penetration rate of PCs into peoples homes improves? The important point however is that TV sets and PCs are fundamentally different in what they do.

TV/PC comparison

First, the PC provides a one-to-one experience while TV is one-to-many. Secondly the PC is interactive while, until recently, the TV is basically passive. You can now switch between camera shots with SkyDigital and vote in game shows with cable TV, but this is nothing like the complex data processing you use with a PC. Thirdly, the PC requires a much higher screen resolution than a TV set. TV sets do not display internet pages very well and, in fact, pages have to be specially designed to appear satisfactorily on a TV screen.

The PC contains considerable processing power to manipulate and process video images. For some time PC-TV cards have been available. They enable a PC to capture off-air pictures and teletext. While TV sets have incorporated microcontroller chips since the early Eighties, to keep the cost down their processing power has been limited. Even teletext is usually decoded using custom chips, though this processing has been incorporated in some microcontroller chips.

A further major difference is that whereas control of a basic TV set requires only an on/off switch plus volume and channel-selection controls, a PC is quite complex to operate. More expensive TV models now incorporate interactive setting up via menus, but this is limited in comparison with PC programs. And you don't, with a TV set, get those 'terror' messages that tell you very little ("an illegitimate operation type XXXX has been performed" and that sort of thing). The only similar messaging is the "no signal is being

received" with a satellite TV set-top box.

A final difference is that whereas a PC is slow to boot up a TV set is operational within a few seconds. Something must be done about this!

PC penetration

Three factors have retarded the expansion of domestic PC use in the UK. The first is the cost of a PC. It's difficult to buy one for less than £400, even if you build it yourself. Then the cost of software, particularly games programs, pushes the price a lot higher. This makes quite a big hole in the average family budget. There is unfortunately no real second-hand PC market, because PCs have been evolving so rapidly – Moore's Law states that the price will reduce or the performance improve by a factor of two every eighteen months, but the price has remained fairly constant. Even upgrades don't keep a PC going for much longer, because of evolving motherboard architectures. PC cost is the biggest factor that is holding back internet use in the UK at present. There was once talk of giving away a PC with an internet subscription, but this is never likely to be practical. Meanwhile, internet cafes have proved to be surprisingly popular.

A second factor is the cost of internet access in the UK. Freeserve led the way with free access, but the cost of calls is still a discouragement. Our US cousins have enjoyed free local calls for years. This enables them to stay on line all day if they want, though it can cause problems for the access providers. BT has introduced SurfTime however, giving unlimited access for a fixed monthly fee, and has promised free local calls from next year.

A third problem is access time. The initials www have frequently been interpreted as "world wide wait". Even with the fastest modems the download times are pathetically slow. There is need for improvement here.

TV evolution

TV sets and technology are nevertheless evolving rapidly. Wide screens are gaining acceptance, and the TV aspect ratio is changing from the traditional 4:3 to 16:9 or 14:9. It's quite a challenge for film makers to enable their output to be viewed in different ways. Video recording is changing dramatically, with the use of hard disks as an addition to tapes. This makes all

A TiVo selection menu. The PTR (personal TV recorder) enables you to see what you want when you want.

sorts of things possible, such as the ability to pause a live programme and return to it later. It's also becoming normal to connect a telephone line to a TV set, providing a return loop to the broadcaster. And the viewer can now chose from a much increased number of channels, sometimes with the same content but a different camera shot or in a different language.

Telephone improvements

BT's Openworld service, which uses ASDL technology, is improving the telephone 'local loop', enabling the internet access speed to increased tenfold. This makes video streaming over the internet a practical possibility, for subscription sport and video-on-demand. A number of companies have already been set up to provide such services.

While bandwidth is limited with conventional broadcasting, the internet is capable of providing an almost unlimited number of channels which can cater for a vast range of specialist interests. But public broadcasting will continue – it's nice to have someone else to make the programme choice sometimes!

The way ahead

So, will the PC replace the TV or vice versa? No. I can't imaging the home TV set being used for word processing or to do the accounts. But TV sets will incorporate internet facilities, because it will give them interactivity and access to almost unlimited channels. More channels, you may groan! Yes, and they will mostly be quality channels, because the internet has brought broadcasting and publishing together.

Content is the key. You can liken the future TV schedule to the magazine bookstall, where there will be copious offerings available on payment of a modest fee. Copyright and conditional-access systems have advanced to the stage where content can be properly protected, though there is the possibility of ultimate misuse here.

The biggest change however will be that the TV signal comes via a telephone line or cable rather than over the air. Maybe the analogue TV switch-off will not be such a big issue after all.

When is this likely to happen? I believe that it has already started with the Bush Internet TV set, and that it will really take off when fast internet access is available to most of the public. People want more choice – look at the success of multi-screen cinemas – and they want to make the most of their limited viewing hours.

But the evolution will not be exclusive. After all radio has not been replaced by TV, and the cinema has survived. But it will happen, with the consumer in the driving seat.

A cautionary note is that what is best technically is not always adopted – all sorts of compromises tend to be made, mainly on compatibility grounds. This tends to slow things. but the evolutionary tendencies always prevail. ■

LETTERS

Send letters to "Television", Cumulus Business Media, Anne Boleyn House, 9-13 Ewell Road, Cheam, Surrey SM3 8BZ or e-mail tessa2@btinternet.com using subject heading 'Television Letters'.

Please send plain text messages. Do NOT send attachments. Be sure to type your full name, address, postcode, telephone and e-mail address (if any).
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.

Spares ordering problems

One of my customers asked me to repair a Fidelity CTV3228NF colour TV receiver that had been bought two years previously from our local Safeway store. The problem was sound but no picture. After several checks I found that the line driver transistor was leaky collector-to-emitter. Once a replacement had been fitted, the set sprang to life. But several hours later I received a call to say that the same thing had happened again.

Was there something special about the transistor I wondered? Not having a service manual, I phoned the very helpful Willow Vale technical line and was told that the line driver transformer in this model is troublesome. A call to CPC brought the information that 59 were in stock. As the price was under £1.20, I ordered three. Next day the postman delivered a jiffy bag which was stamped CPC all over. Inside there was a letter to say that because of a stock discrepancy one of the items ordered had been put on back order – needless to say it was the transformers.

I got on the phone to make my feelings known – how could they have thought they had 59 and all that? My mood was not improved when I was told that the parts had to come from Turkey and would take three weeks.

My next move was to see if SEME, ARD, Wizard or Willow Vale could help. No luck. A check with the last *Television* Spares Guide showed that HRS also stocks Fidelity spares. As I don't have an account with HRS, I decided to phone the public order line. When I did so they said they couldn't help and gave me another number. I tried this and was told they don't stock Fidelity spares. On asking whether I was speaking to HRS, the reply was "no this is Willow Vale, but I can give you the right number"! A call to this one got me through to HRS spares, but as I didn't have an account I was given another number. This took me back to the public order line. I was about to be given yet another number when I asked whose telephone number it was. "Willow Vale" the lady said.

I was going round in circles, so I decided to contact Fidelity direct. Directory Enquiries could give me only Fidelity Colour, which was of no help. Time for some lateral thinking. As the CPC part number starts AM, it seemed reasonable to assume that the set originated from Amstrad. It does, but they didn't want to know. I was referred to CPC as "the supplier of our parts". I explained that CPC didn't have what I needed in stock, and that I had a very upset customer. It made no difference.

So all I can do is wait in the hope that the transformers come from Turkey during the next three weeks. It shows what we small repair businesses are up against. Why do so many manufacturers adopt such an unhelpful attitude towards those who have bought their products? If I treated my customers in the way that Amstrad seems to do I would soon be bankrupt. It's another case of a TV manufacturer being interested only in selling the product, not in providing adequate back up. The time taken and the phone costs mean that I will be out of pocket. Can anyone see the big repair boys offering the sort of service I've tried to provide? I doubt it.

What angers me is that we live in a society where bad news travels fast. We've all seen references in the media and on television to cowboys and rip-off merchants. Am I naïve in thinking that these are the minority, and that most of us try to provide a good service? The problem is that the sort of difficulties I've described above don't sell papers or attract TV audiences. Who wants to know when we

A shiny red plastic box

I recently visited a new customer to discuss the positioning of her proposed satellite dish. Noticing a shiny red plastic box fitted to the aerial mast, I assumed it was a splitter. So I came to the conclusion that the house must have two or more TV sets, despite the fact that the customer was an elderly lady who lived alone, and asked whether Sky reception would be required in other rooms. As the customer said she had only one set, I explained why I thought there were others.

"Oh no" she said, "the red box is a booster. It cost an extra £80, but it was worth every penny. It's very poor reception here you know."

Now this puzzled me, because the house has clear line-of-sight to the main transmitter only twenty miles away, and a masthead amplifier would have been severely overloaded with signal. What's more, there was no sign of a power supply unit behind the TV set.

Apparently the "very nice, polite young man" who had installed the aerial had been unable to obtain good reception. After finishing on the roof, he'd fiddled about with the tuning for some time. But the picture had remained obstinately snowy on all channels. Very snowy in fact. "I couldn't have put up with it. It was all swirling around, and I know it would have set off my migraine" she said.

The nice young man had explained that reception must be poor in the area and had suggested that a booster, although expensive, might solve the problem. There was perfect reception after he'd scurried up the ladder and fitted the costly red box.

Although she had been a bit startled by the demand for a total of £160 (cash only, no invoice), the old lady was very pleased that the installer had been knowledgeable enough to solve the problem.

When I went back to fit the dish I climbed on to the roof to have a look inside the magic red box. It was empty of course, except for two ends of coaxial cable twisted together. Presumably the "nice young man" had cut the cable near the aerial before attempting to tune in a picture. He'd probably bared a short length of inner conductor to provide a faint signal. An old amplifier housing, no doubt carefully polished on the scoundrel's overalls in advance, had completed the job.

Bill Wright,
Sheffield.

bend over backwards to repair equipment that the makers feel is not their responsibility?
Matthew Biddlecombe,
West Wight Vision, Isle of Wight.

DVD player servicing

I've been following K.F. Ibrahim's informative and well-presented series on DVD player servicing with interest. There are however several points I'd like to qualify in Part 2 (October).

(1) Disc-diameter evaluation at tray-close time. While this takes place with LaserVision disc players, which also accept 30cm karaoke discs, I've yet to come across a DVD player that expects anything other than a standard 12cm disc. Focus search is the first operation carried out by the syscon.

(2) It's implied that the tracking-servo control signal is derived in exactly the same way as in a CD player, i.e. by using three beams, two photodiodes (E and F) in the optical unit, and linear amplitude summation of the outputs from these photodiodes in an operational amplifier. While this is so when the player is operating in the CD mode, the method is nothing like sufficiently accurate when a DVD is being played. An entirely different method is used in the DVD mode. The outputs from diodes A-D are fed in pairs, B + D and A + C, to a phase comparator. There will be no phase difference between the squarish-edge outputs from the diode pairs when the single beam is correctly centred on the spiral track. Should the beam wander to either side of the track however, A + C will either lag or lead B + D and the phase comparator will produce an output. This is further processed to produce the tracking-error correction signal.

(3) The article implies that tilt- or skew-control of the optical unit is normal practice. This is more relevant to a LaserVision disc player, where the tilt of a 30cm disc is very important, than to modern DVD players. While some DVD optical assemblies use dynamic tilt correction, notably the Sony KHM220AAA RP deck unit (which uses the cutest little motor you've ever seen), the majority of DVD players I've come across don't. This includes Hitachi/Samsung, Panasonic, JVC etc. models. Panasonic decks have tilt variation as a mechanical adjustment that requires checking and, seldom, resetting only when major deck components such as the laser unit have been replaced.

(4) Laser wavelength, see page 735, column 1 and Table 4. 650nm is correct for DVD reading, but it's red light. I can confirm this from personal repair experience: when working on units where the top surface of the disc is visible, the intense red dot of the laser beam can be clearly seen through the disc. 780nm is correct for CD reading, but this is near infra-red – true infra-red starts at about 800nm.

I understand that blue semiconductor lasers have only recently been produced, and are not yet in mass production. The wavelength of these devices is between 420-490nm, much shorter than that of a DVD laser. It is, apparently, difficult to make efficient detectors for blue laser light, so these diodes will not be appearing in commercial players for some time to come.

(5) The objective lens material for a DVD laser unit is not necessarily glass. I have examined six different optical units, five of which were single-lens types. Of the six, two had glass lenses and four conventional plastic lenses. With the dual-lens block, both were glass. Use of glass or plastic lenses does not seem to relate to specific manufacturers. Of two laser units produced by the same manufacturer, one had a glass and the other a plastic lens.
Geoff R. Darby,
Northampton.

Lead-free solder

The monitor industry has taken to the use of lead-free solder. This means solder free of the metallic element lead of course, but could almost as well mean free of the associated leads! The exclusion of lead from electronic equipment is supposed to help the environment, but I'm not sure how it does this when the result is that equipment ends up in the skip several years earlier than would otherwise have been the case. And most manufacturers are finding it necessary to rework, during production, safety-critical connections that would create a fire hazard as a result of arcing dry-joints, for example at mains connectors and high-voltage, high-frequency devices. The majority of this rework is done using regular lead/tin alloy solder. The net result is a large increase in scrap electronic equipment that still contains lead!

The poor quality of the soldering that is produced with lead-free solder does on the other hand mean more work for service engineers. But the cost of materials for reworking the huge number of unsatisfactory connections can mount up rapidly. And, increasingly with modern design practices, dry-joints in signals and control circuitry can cause damage in the power stages. This means an increase in the number of monitors that are uneconomic to repair.

There also seems to be a sharp rise in the number of early-life failures. The monitor industry appears to be suffering from the dreadful LOPT reliability problems that plagued the TV industry in the late Seventies and early Eighties. And, with the arrival of multiple line-frequency monitors that use PWM width compensation, there came yet more vulnerable, obscure and difficult/expensive-to-obtain inductors in the fault-current path to add to the casualty list.
Ian Field,
Letchworth, Herts. ■

Vintage repair tips

Many newcomers to vintage radio repair can get caught out when checking resistors. For example, I was trying to get an EM84 magic-eye tuning indicator to work. It was in a Grundig push-button radio (LW/MW/SW/VHF) that dated from about 1958. The indicator glowed green, but refused to deflect when a strong station was tuned in. I naturally checked the 470kΩ resistor that supplies HT to the target electrode. When one end was disconnected the reading I obtained was 483kΩ, which is clearly within tolerance. The resistor measured OK when cold, but when voltage was applied it changed value! Once a replacement 470kΩ resistor had been fitted the magic-eye tuning indicator worked perfectly.

Other resistors, like the early carbon-rod type with the wire lead-outs looped around the carbon tube to make good contact, often develop bad connections because of the heat from the resistor. As a result they become 'noisy'. It's best to replace them whenever possible. Their colour code is read by the body, tip, spot method.

I've found that valve pins can become badly tarnished and then make poor contact with their sockets. This applies especially with the B8A type base, e.g. the UL41. The pins lose their 'silvering'. I recently invested in a Dremel multi-purpose electric tool (well worth the expense) and carefully cleaned the tarnish from some valve pins. It's amazing how modern-day appliances can be really helpful with the craft of valve radio restoration!

A good tip when trying to restring a dial cord (every radio engineer's favourite job!) is to use medical forceps. They are very useful for tensioning dial cords and even securing dial drums. Blue-Tac is helpful for temporarily securing the cord on pulleys and drums. Once the cord has been tied to the spring you can pull this on to its anchoring point on the drum. You will have to remove all the Blue-Tac from the cord-drive path of course.

I have found that Blue-Tac is also handy for filling holes in Bakelite cabinets and knobs. Use it as a former, then fill the hole or chip with epoxy-resin adhesive such as Araldite or Devcon. Once the adhesive has dried, the Blue-Tac can be peeled off from the back of the repair surface. Then buff and colour to match the rest of the Bakelite. Just thought these tips might be useful for those who have time to repair Bakelite.
Mike Horne,
Leeds.

In this concluding instalment **Alan Dent** deals with the teletext, scart and control sections of the chassis

Servicing the NEI CE25/CE28 series chassis

In this final instalment I'll provide a quick run-down on various faults you could encounter in the teletext, scart and the control sections of these chassis. Incidentally the TDA8380 chopper control chip in the power supply, see Part 1 (October), is a Philips device. So, although it was not widely used, it shouldn't be too difficult to obtain replacements.

Teletext

The teletext system uses four ICs, one of which is a co-processor that's mounted on a sub-panel – it determines the text features (FastText, Tops Text etc.). The teletext system will not operate without the sub-panel.

No text: If there are no headers or page numbers, check whether XL701 on the FastText panel is open-circuit. If the header and Fast/Tops boxes are OK, check whether C186 (22nF) is open-circuit. If the page number only is present, check XL101 (13·875MHz), C189 (15pF), and whether L105 (15µH), C190 (27pF) or R200 (5·6kΩ) is open-circuit.

Corrupt text, headers and page numbers OK: Check whether C184 (1nF) is open-circuit or leaky or whether any of the following are open-circuit: C185 (470pF), C187 (270pF), C188 (100pF) and R201 (68kΩ).

Scart sockets

Most models have two scart sockets with different features. AV1 has composite video in and out, stereo audio in and out, SVHS input and switching at pin 8. AV2 has composite video in and out, mono audio out, stereo audio in, RGB and fast blanking inputs, and switching at pin 8.

Switching problems (pin 8) can be caused by the voltage-clamp circuits on the teletext sub-panel; horizontal shift problems can be caused by the shift circuit on the teletext sub-panel.

If there's no video input at AV2, check TR904 (JC501P) on the audio switch module.

The microcontroller chip

A dedicated microcontroller chip (IC117) from the PCA84C640 range is used, with its functions determined by a mask program designed solely for NEI. There were several software versions. The chip controls all digital functions (text, tuning and key panel) and analogue functions (volume, brightness, saturation, contrast) via an I^2C bus system. At power on a reset cycle starts.

Here are some possible fault conditions in this area.

Will not come out of standby: In this condition the red LED stays at half brightness. The standby switching output at pin 41 of IC117 is applied to the base of TR133 (see Fig. 2, page 728, October issue). If pin 41 stays low, suspect XL103 (9·83MHz) which is connected between pins 31 and 32 of IC117. Because of scope probe capacitance loading, this cannot be checked directly. So look for pulses at strobe pins 13-19. If these are missing, replace XL103. If strobe pulses are present, disconnect all the ICs connected to the I^2C bus except the memory chip IC112 – leave the pull-up resistors R296/7 connected. Check that the amplitude of the pulses on the SDA and SCL lines (pins 40 and 39) is correct at 5V peak-to-peak. If the microcontroller chip then produces the switch-on condition (high) at pin 41, check each of the items connected to the I^2C bus, not forgetting the audio control chip IC115 (TDA8425).

Reset components C263 (680nF) and R295 (100kΩ) or their supply (5V standby, see Fig. 2) may be faulty.

Check the connections of PL950 in version one and two sets: if the pads are broken the set won't operate.

Set comes out of standby but there are no functions, no raster and the set won't return to standby: This is typical of the I^2C bus crashing. Disconnecting all the items connected to the bus will lead to identification of the cause of the fault. Note however that the same symptom will be present if the earth connection via link 172 (under C130) is open-circuit.

Will not tune (OSD OK): Check the tuning voltage line (tuner pin TV), which should swing between 0-28V depending on the OSD display position. If there is no change of voltage, check at pin 1 of IC117 for a 5V peak-to-peak squarewave with a varying mark/space ratio. If this is missing, replace IC117. If the output at pin 1 of IC117 is OK, suspect the integrating circuit transistor TR126 (2N3904) and its associated components. If there is no voltage at all, check the 33V supply (see Fig. 2).

If the tuner is a multi-band type, check that just one of the band-switch pins is active. If more than one pin is high, the tuner will not work correctly. Check TR108-110, TR112-4 and the associated components.

Tunes but will not store channels (OSD OK): Check R320 (56kΩ), C266 (3·3nF) and IC112 (PCF8582A).

Tuning will not stop at channels (OSD OK): To stop the tuning sweep, press fine tune on the remote-control unit. This will enable the video signal to be tuned, then the cause of the trouble traced more easily. Check pin 29 (ident) of IC117: it should go high when a signal is present. If it doesn't, check the ident output at pin 14 of IC001 on the jungle module – the pull-up resistor R011 (15kΩ) may be open-circuit. Check for video at pin 27 of IC110. If missing, R217 (75Ω) is probably open-circuit.

Check the adjustment of RV001 (line frequency) on the jungle module.

Will not store analogue levels in PP mode: Check the memory chip IC112 – there are different segments for tuning and analogue.

No on-screen display: Check that the sync inputs, line and field, are present at pins 26 and 27 respectively of IC117. Both must be present. If there is no field sync at pin 27, check whether D133 (1N4148) is short-circuit. Check the outputs at pins 22 (red), 23 (green), 24 (blue) and 25 (blanking) of IC117.

OSD wrong colours or wrong levels: If text is OK, check at pins 22/23/24 (RGB) of IC117 for 5V peak-to-peak levels then trace via TR117, TR118 and TR123 to pins 14, 18 and 16 respectively of the colour decoder chip IC111.

If the text levels are also incorrect, check IC111 (TDA8391), C258, C255 and C259 (all 100nF) and R279, R281 and R283 (all 150Ω).

OSD shifted horizontally, squashed or elongated: Check R288 (2·2kΩ) and C260 (22pF – 33pF with some versions of the chip) in the OSD oscillator circuit. These components are connected to pin 28 of IC117.

Analogue functions incorrect: If one control, for example brightness, has an effect on the others, check the 5V supply to R315/6/7. If one function isn't working, check the relevant component network and IC117.

AV switching incorrect: Pin 36 of IC117 is low for TV, high for AV; pin 34 is low for TV/AV1 and high for AV2. If these outputs are OK, check the following inverter transistors, TR116 and TR115 respectively (both type JC501P), and the few associated components. There are further inverters on the audio switch module, which produces TV low/AV high at pin 16 and AV1 high/AV2 low at pin 15.

Defaults to AV1 at switch on: Pin 12 of IC117 must be at 0V. Check earthing to ensure that this pin isn't floating.

No remote functions: Check the IR receiver chip IC951 and R298 (10kΩ).

Keypad/IR module

This was intended for version three of the chassis but could be retrofitted to earlier versions with a new cabinet front, connector CON950 and a headphone/IR panel added.

Important: To protect the microcontroller chip if either CON952 or CON953 is open-circuit C952/C953 and R960 must be fitted, otherwise large voltages can be generated via the speaker wires running across the CRT.

Keypad will not function (one or all keys): This can be caused by the connector from PL955 or the membrane itself. To test, short-circuit pins 1 and 7 of CON950. This should make the set step up one channel. If suspect, carefully replace the membrane. With 28in. models the CRT must be removed to refit the PCB because of the short membrane tail.

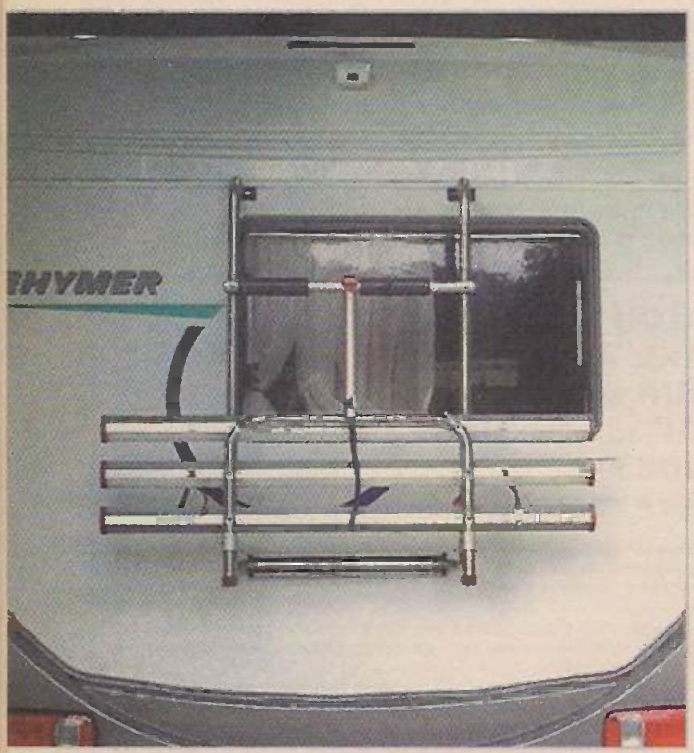
Either LED not working or working incorrectly: For the green LED, check whether Nicam is OK. If yes, connect another LED to pin 12 of CON950. If OK, remove PCB carefully. For the red LED, check associated components after checking that pin 10 of CON950 is at 0V. R955 (1kΩ), which is in parallel with TR951, ensures that the red LED shines dimly when the set is working normally. In standby, R954 (22kΩ) ensures that the red LED is bright, i.e. TR951 (JA101P) is fully on.

No output from either speaker: The contacts of headphone connector SK951 are faulty or C952/3 (100pF) are both short-circuit.

No output to one/both headphones: Connector SK951 faulty or check which of R956/7/8/9 (all 68Ω) is/are open-circuit. ■

Caravans and motor homes are a booming business. There's over three quarters of a million members and their families in the Caravan Club alone. In this series, **Tom Baker** explains various ways that you can benefit from this boom by enhancing your customers' caravans and mobile homes.

Fitting a rear-view camera



A job I'm often asked to do is to fit a rear-mounted camera system to a motor home so that the driver can see what's behind when reversing. The display consists of a small 5in. monitor on the dashboard. It's not a particularly difficult job, but it can take a whole day. Make sure that your quotation takes this into account.

Switching

The system is normally wired to come on when reversing, but the reversing switch can be overridden so that the driver can use the camera as a rear-view mirror while driving. There is also a reverse-image switch, so that you know when you are being followed by an eciloP vehicle or an ecnalubmA on an emergency call. I also find that some of my customers like to leave the system switched on while they are parked, so that they can see who might be lurking around the back of the vehicle when they are settling down to watch the telly.

Photos 1 and 2: Rear-view camera mounted towards the top centre at the rear of a motor home.

Position

The first thing to consider is the position of the camera. If it's mounted too low down it will be easy to steal or may be damaged by vandals. If it's fitted behind a bicycle rack it will be useless when the rack is loaded with bikes. This may sound obvious but, believe me, I've seen it done. Correcting the mess afterwards can be expensive. Photo 1 shows the best position.

Wiring

Once you have decided where you want the camera, the next step is to find out what lies behind the position you have earmarked, inside the vehicle, because you have to get the wire through. I normally take with me some lengths of electrical trunking to attach inside the vehicle to hide the wire. I take the wire straight down the inside back then drill another hole, this time through the floor, and carefully run the cable underneath the length of the vehicle, attaching it to other convenient wires, or the chassis if there is nowhere else, using tie-wraps or cable clips. The floor is wooden, so it can take small nails or screws. Be very careful not to restrict the movement of any cables, i.e. the hand brake etc., and also to avoid fixing the cable near the exhaust system or anything else that gets hot.

Bringing the wires back into the vehicle isn't too tricky, as there is ample space to get into the engine compartment. Once again, use cable ties. Get the wire safely up behind the engine – again be careful to avoid hot spots. Feed the

wires through one of the unused holes that manufacturers like to leave. For safety's sake, any holes through the bulkhead (firewall) should be sealed with silicone elastomer. See Photo 3.

When you are working inside the engine compartment you will need to find the reversing switch cable. Run a wire from the side that goes live when reverse is selected. Thus when the live and earth feeds are connected to the monitor it will switch on automatically while the vehicle is being reversed, switching off again when forward movement starts.

A permanent live connection is required to enable the system to work independently of the ignition switch. This needs an in-line fuse. A chassis connection also has to be made.

Final steps

In my experience there is only one place to put the monitor: at the middle of the dashboard, as far forward as possible, angled slightly towards the driver but enabling it to be turned so that it can be seen from the comfort of a bunk seat when the vehicle is parked. See Photos 4 and 5.

Reversing detectors

These are similar to a camera to fit except that all you need to do is to drill two or three holes in the vehicle's bumper, depending on the type of unit.

Find out where the reversing light wire is in the loom, and the earth wire, and make a note of them. Find somewhere inside the vehicle, at the rear, to hide the control box. Drill one hole through the floor, large enough to take all the wires from the sensors and the reversing light. Connect them all to the control box. Run the long wire to the driver's sensor in the same way that you would run the wire to the monitor, see earlier. Find the best position for the driver's unit on the dashboard, so that it can be seen easily, and connect up.

Switch on the ignition, put the gearbox in reverse and go behind the vehicle. Listen for the change in tone as you get closer to the back bumper. Or get someone else to do this for you.

Finally, when you are sure that everything is set up correctly, start the vehicle, reverse it and see for yourself.

You need only two-three hours for this type of job. But the end result is another day's wages and another happy customer. ■

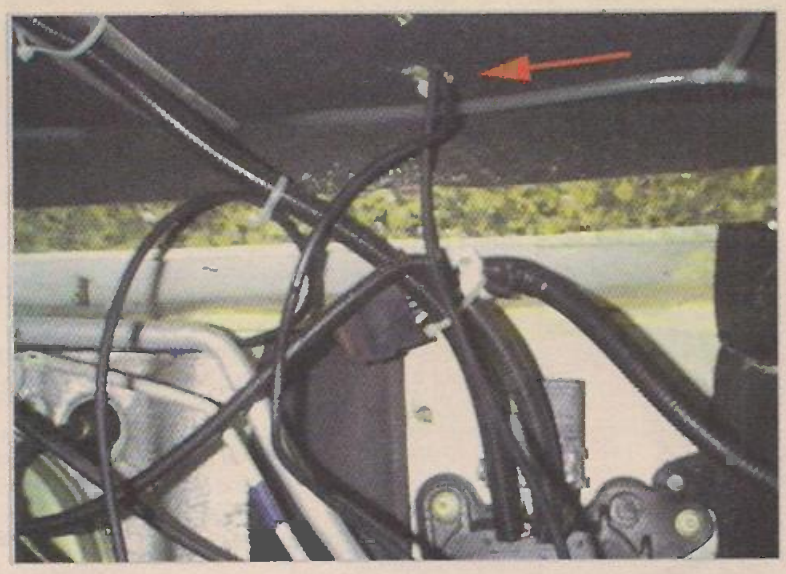


Photo 3: Wiring in the engine compartment. The red arrow shows the exit point to the monitor.

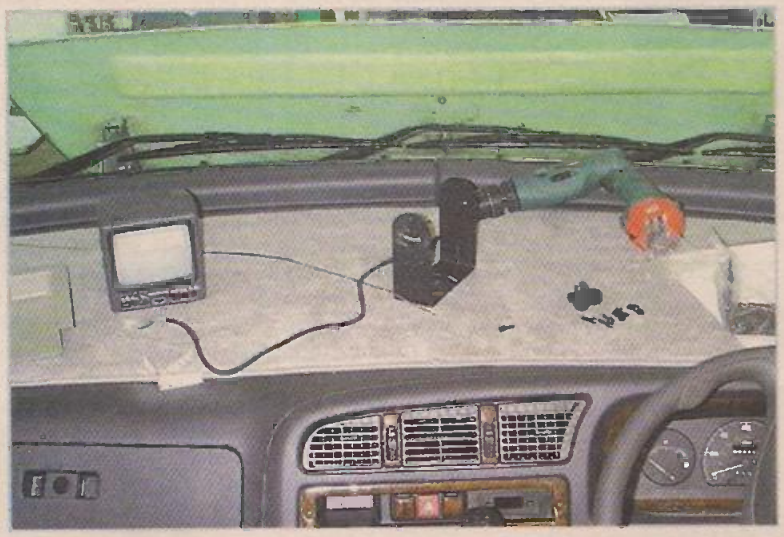


Photo 4: Assembling the 5in. monitor on the dashboard.

Photo 5: The monitor in use as a rear-view mirror.

What next?

Next in this series I'll deal with fitting a satellite dish to a motor home.

Service Casebook

Michael Maurice

Saisho VRS6600

This machine belongs to some friends of ours who live a considerable distance away. For that reason it had been elsewhere for attention, where it had been declared beyond economic repair because parts were not available. I was asked to take a look at it when we were next in their part of the world.

When I removed the covers I found that one of the fuses in the power supply had blown. Once a replacement had been fitted the machine powered up normally. When a tape was inserted however the machine tried to load it but didn't succeed, because the loading belts were stretched and worn. These were easily replaced, along with the mode switch.

When I reassembled the machine to test it something odd occurred. In the playback mode the screen turned blue. I removed the cover, which restored the picture – but only until the fuse blew. The cause of the problem was that the previous engineer hadn't reassembled the machine properly.

On the right-hand side there's a spring clip which is designed to connect and earth the bottom cover to the top main cover. The previous engineer had removed the main PCB and forgotten how to reinstall the clip. It should go past the PCB and be seen on the print side of the board, so that it makes contact with the bottom metal cover. Refitting it correctly cured the blue picture and the intermittent fuse blowing – it had been shorting the connectors of the YC daughter board.

VCRs are nowadays too often rejected as being beyond economic repair.

Twin LNB

Another friend, another problem. He wanted a twin LNB fitted, so that he could run two SkyDigital receivers. I obtained one, called round and tried to align the dish. But whenever I turned the meter on it would check the battery content then switch off. I suspected a faulty LNB, so I took it back to the wholesaler.

Luckily I took the meter along as well. When we tried another LNB it was the same. Then another and another. The whole batch was faulty! An LNB of different make solved the problem, getting me past the battery check to the searching part. Correct dish alignment resulted in another happy friend.

Hitachi 46TN series

The problems caused by dry-joints at regulators IC950, IC951 and IC952 in Hitachi C21/25/2846TN series receivers have been well documented in these pages. So when I had a call to one of these receivers that intermittently "went off" I though to myself easy. How wrong I was!

The set had received previous attention and the regulators just mentioned had all been resoldered. I eventually discovered that the cause of the trouble was in the standby switching circuit, where R956 (1kΩ) was dry-jointed. It's buried in a mound of hot-melt glue.

Hitachi had obviously thought that securing these items to the board with some kind of glue would stop them becoming dry-jointed. In fact it didn't quite work out like that.

Philips 21PT166B

Another trader brought along this 21in. set. It's fitted with the AA5 AB chassis, which is a new one to me. The set was described as being "dead", and it didn't take long to establish that the 630mAT LT fuse F1571 was open-circuit because there was a short across the 8V supply. But where? The 8V supply goes to a lot of places. In fact the cause turned out to be the TDA8361E IF/colour decoder/timebase generator chip IC7015. When I obtained and fitted a replacement the set started up, but there was arcing from the line output transformer, which had probably been the cause of the IC's failure. Once a new LOPT had been fitted and the first anode and focus controls had been set up there were good pictures and sound.

Unfortunately for the trader, he had provided a quote before he knew what was wrong with the set.

NEI 2591FXTN

The original complaint with this set was that it wouldn't come on. When I checked the set it worked all right. Thinking that there might have been a starting problem, I replaced a couple of capacitors on the primary side of the power supply, ran the set on test for a day then returned it to the customer. A couple of weeks later he called to say that the set had gone off and stayed off.

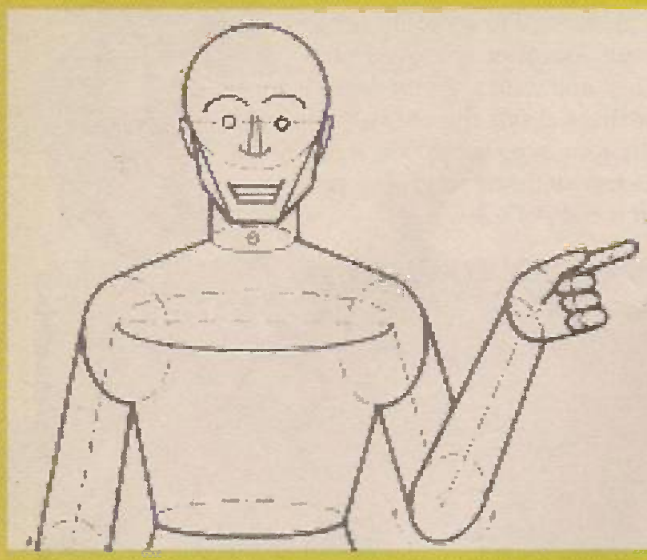
It would come on in standby when switched on at the mains, but when asked to come out of standby it just sat there and did nothing. Checks showed that there was HT up to and including the line output stage, but there was no line drive. This comes from a TDA4504 IF/timebase generator chip.

I found that the tuner's chassis connection and the signals chassis were at about 7V. There appeared to be a 22Ω resistance between chassis potential on the secondary side of the power supply and the signals chassis line. I looked for dry-joints, cracked print etc. but couldn't find any. So I decided that the simplest solution would be to hard-wire the chassis connections. I did this with a length of wire connected between the IF can and chassis at the power supply. After that the set powered up and ran normally.

Mitsubishi HS640V

Failure of the right-hand carriage arm lever is a well-known problem with models that use this deck. What is now becoming a common problem is that the carriage runners, which are part of the main chassis, crack and disintegrate. Modification kits were introduced to overcome this problem, but they were not a success.

The only solution is to replace the entire deck, which is available from Mitsubishi at a reasonable price. It comes complete except for the head drum assembly. Replacement is easy, and there's no setting up. All you have to do is to persuade the customer not to buy a new machine! ■



Toshiba Service Briefs

More know-how from Toshiba Technical, based on Bulletins AH83 and AH84

Technical and Service website

The Toshiba Technical and Service website (http://tesc.toshiba.co.uk) has been in operation since June. An authorised user name and password are required to access service manuals and technical bulletins, plus a PIN number for spare part ordering. Customer access is open and gives FAQs and owner's books.

Model 28N03B

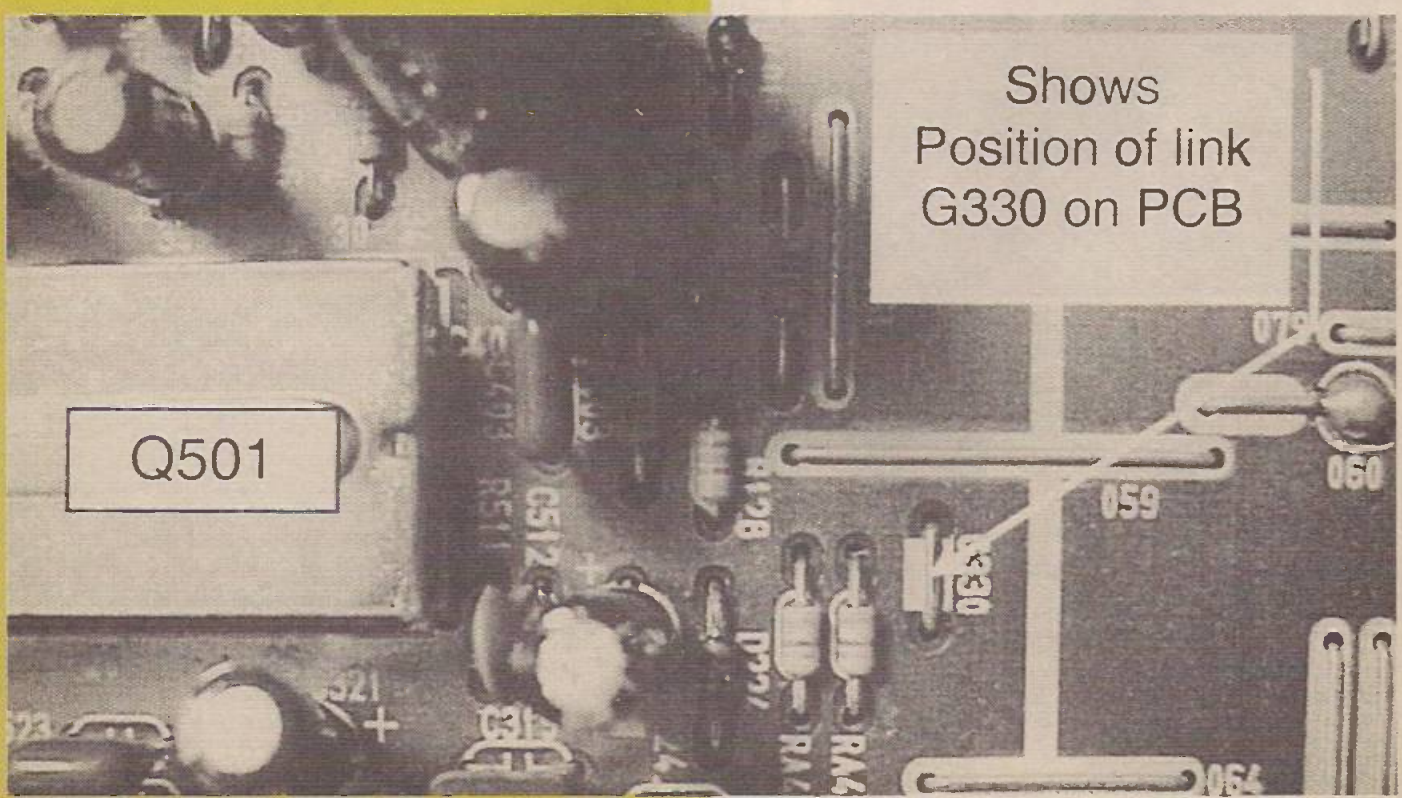
Intermittent switching on by itself, sound muting or teletext appearing without request: Microcontroller chip QA01 is detecting noise from the infra-red remote-control input and converting this to a set function. The cure is to fit version 1.14 of the SAA5563PS chip, part no. 23000616.

Field collapse because the field drive output at pin 26 of IC Q501 is missing: The VCD chip Q501, type TB1251N, has an internal fault. Its part no. is B0102103. A modification is required when this chip is replaced: remove link G330 and fit a 1kΩ, 1/6W resistor in this position. Fig. 1 shows the location of G330, which is in the field feedback path to pin 25 if Q501.

Model 28W93B

No on-screen displays and no teletext: It's likely that the 27MHz crystal XF01 on text module U907 is faulty. The part no. is 23153472.

Fig. 1: Location of link G330 in Model 28N03B.



Models 28WD98B and 32WD98B

Stuck in standby: If the main HT rail is at 71V instead of 125V, the HIC1016 IC Z801 is faulty. R479 (68Ω, 0·5W fusible) and R471 (270Ω, 0·5W fusible) will probably be open-circuit. Replace these three items. The part nos. are 23904998 for the HIC1016 IC, 24531680 for R479 and 24531271 for R471.

Model 32WD98B/G

There have been complaints about buzzing (resonance) from the centre speakers with this model. The cure is to fit three pieces of felt tape, 125 x 25 x 0·4mm, to the lower mask area. The tape is available as part no. 23466494 – cut three pieces from the tape supplied. The CRT has to be removed to fit the tape. When it's replaced, ensure that it is pushed down on to the lower support ribs and that the four fixing screws are fully tightened (35kgcm).

Figs. 2 and 3 show the position of the tape. Fit it to the raised edge of the mask area: it must not overlap the edge so as to be visible from outside. Remove the centre speaker grille, which is a snap fit, by using a flat-bladed screwdriver to push out the clips from below, then pull up the grille and lever it out of the side and top clips. Refit the grille to the front cover by inserting the lower clips first, then the side and top clips.

Models 40WH08B and 46WH08B

Green convergence too wide on bright scenes, OK with dark scenes: The cause is likely to be a faulty green CRT. Confirm by swapping over the green and blue CRT bases and convergence connectors. The part no. for the green tube is 28908030 for Model 40WH08B and 28908033 for Model 46WH08B.

Model 43PJ93B

Set dead with the red power LED on the front panel out: The 5V-1 (5V) supply in this model is produced by a separate non-switch-mode power supply circuit. It feeds the microcontroller chip and power LED. In the standby mode all other supplies are switched off by a relay that's controlled by the micro chip. Thus when the 5V-1 supply is missing there are no other supplies in the receiver. The usual cause of failure of the 5V-1 supply is the 6·1V zener diode D7709, which goes short-circuit. It's on the convergence PCB U907 (PB9405A). The part no. for D7709 is 23316675.

Models 50PJ98B and 61PJ98B

Set is stuck in standby with the red power LED on the front panel lit: The usual cause is that bridge rectifier D802 on power supply PCB PB8772 has gone short-circuit because of an AC mains supply surge. As a result R821 will be open-circuit. The part nos. are as follows: D802 23357041; R821 24510497. To prevent a repeat failure, remove C8130 on the audio power supply PCB (PB8971).

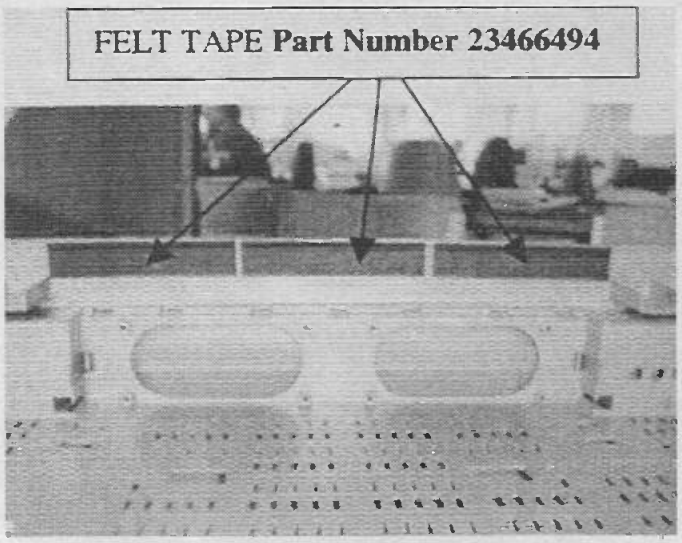


Fig. 2: Where to fit the felt tape in Model 32WD98B/G to prevent centre speaker buzz.

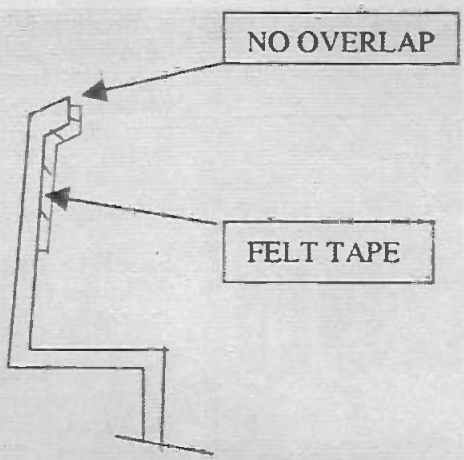


Fig. 3: How the tape should be fitted. Section of front cover, lower mask area.

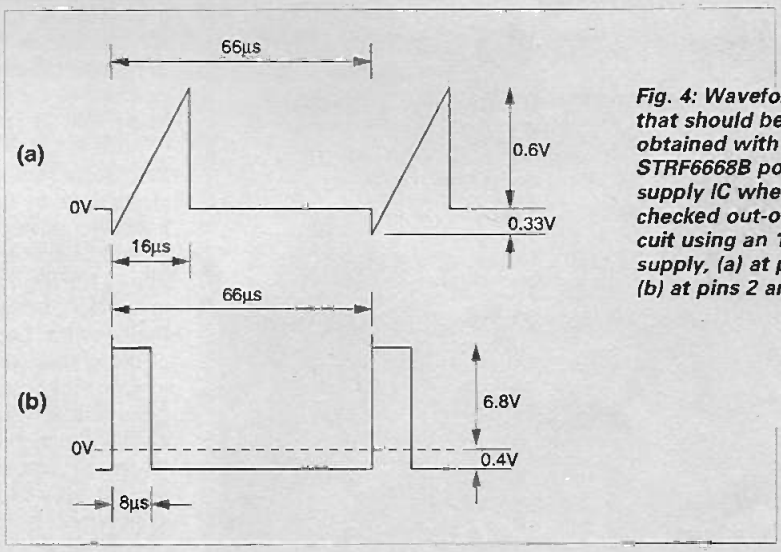
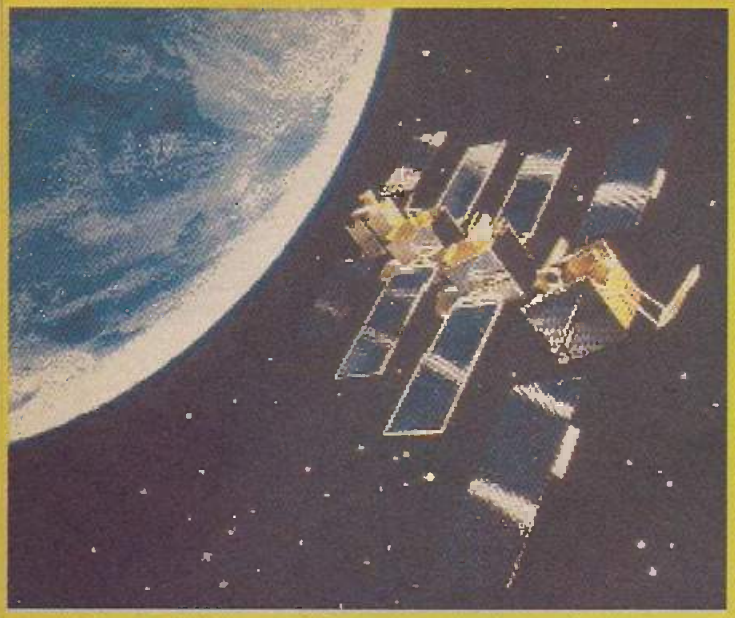


Fig. 4: Waveforms that should be obtained with an STRF6668B power supply IC when checked out-of-circuit using an 18V supply, (a) at pin 1, (b) at pins 2 and 3.

Service tip

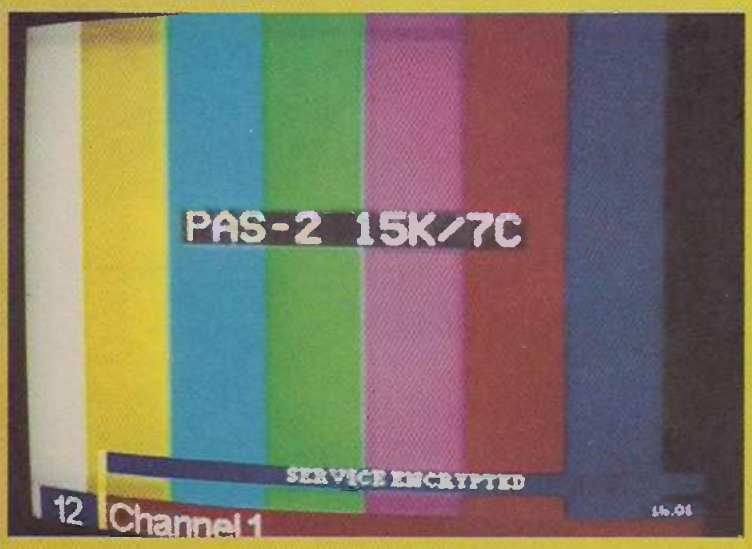
The STRF6668B power supply IC used in some models can be checked out-of-circuit by connecting 18V (two PP3 batteries in series) between pins 4 and 5 (positive to pin 4, negative to pin 5) then using a scope to monitor the waveforms at pins 1, 2 and 3. Make the scope's Y input connection via a x10 probe. Fig. 4 shows the waveforms that should be obtained.

This method of testing was devised by Toshiba's Northern Area Technical and Training Manager Ian Thompson. ■



DX and Satellite Reception

Terrestrial DX and satellite TV reception reports. News on broadcast TV and satellite band changes. High mains voltage problems with SMPSs. Satellite signal retransmission systems. **Roger Bunney** reports



The month under review, September 2001, was eventful and tragic. More on this later. The beginning of autumn usually means the end of any significant Sporadic E reception in the UK, though with luck you may get a tropospheric lift – not this time however. The following very thin Band I SpE log for the period tells the story:

2/9/01	RAI (Italy) ch. IA; Tele-A (Italy) ch. E2–; TVA (Italy) ch. E3–; BTV (Belarus) ch. R1; LRT (Lithuania) ch. R2.
3/9/01	RTP (Portugal) E2, 3; TVE (Spain) E3; NRK (Norway) E2, 3.
4/9/01	Tele-A E2–; TVA E3–.
5/9/01	Unidentified signals in channels R1, R2 and E3.
7/9/01	BTV R1.
8/9/01	TVE E2; RTP E3.
9/9/01	PTP (Russia) R1; TVE E2.
19/9/01	Unidentified ch. E3 signals.

Well, at any rate the Band I TVE channels are still on-air, despite listings that suggested closure during mid summer.

As the winter in the northern hemisphere approaches, the maximum usable frequency has been slowly rising. In the UK, Cyril Willis (King's Lynn) has been monitoring signals at just under 40MHz during the daytime. Hugh Cocks in the Algarve, Portugal reports that TE (Trans Equatorial skip) propagation has been active nightly, with "very strong" signals as high as 56MHz (ch. A2 vision). TE signals were received from South Africa at about 2000-2100 hours in mid-September. It looks as if we might have a busy winter.

Satellite sightings

September 11th 2001 will forever be a date to be remembered. The sight of the World Trade Tower 1 on fire, followed by pictures of the second aircraft hitting Tower 2, then a third plane hitting the Pentagon and a fourth crashing in Pennsylvania defied belief initially. A loss of life of some 7,000 played out on our TV screens. My son was on the Hudson at the time, and saw both the impact and the fires, returning three days later when the bridge/tunnel to New York was reopened. He told me that TV screens couldn't convey the full horror of what it was really like in Manhattan even days after the attack. But, just before he returned to the UK six days later, there were Tower T-shirts being sold by street hawkers in NY.

NSS K (21·5°W) and PAS-3R (43°W) carried the output from local stations showing the devastation. These pictures were also shown by the UK networks and need no further comment here. We all know what happened.

A few days later Sky News UKI-784 uplinked, via Eutelsat 2F3 (21·5°E) at 11·047GHz H (SR 5,632, FEC 3/4), a gathering at the US garden of remembrance, Franklin Roosevelt Memorial Park, central London. The Sky News reporter Mark White spoke of those attending the garden to express their sorrow.

Once it became apparent that Afghanistan was involved a rapid military build-up began. As with the Gulf and Balkans affairs, the media soon followed. From about September 18th, 'fly-away' satellite uplink equipment was being installed at various places to provide the latest news from as near the 'front' as possible. Hotel roofs seem to be a common location, but a camera shot of the CNN reporting position showed a pile of equipment under a large garden-barbecue type tent with a dish behind. The Europe*Star-1 satellite (45°E) became the main carrier of feeds uplinked from Pakistan to Europe, directly in PAL form then onwards to the US in NTSC form. Strangely, on the occasions when I have checked I've found that Eutelsat W4

Reception of the Brisbane Goodwill Games live via PAS-2 and NSS K, with a further intervening hop across the US.

(36°E) has been devoid of news circuits. But Europe*Star-1 had at least eight news circuits between 11·470-11·668GHz V (all 5,632 and 3/4). They were on-air for most of the day through the evenings, either running test patterns or one- or two-way reports, with very strong signals.

Most uplinks were from Islamabad, though CNN moved closer to the Pakistan/Afghan border at Quetta. A couple of NTL links were operational. On the 27th APTN moved to Dushanbe, Tajikistan, using 11·560GHz V. As I write this at the end of September there is a lull in the news, though there are now reports on the refugee/humanitarian problems.

While most of my monitoring time has been concentrated on these dramatic events as they unfolded, I did move the dish to PAS-3R (43°W) and checked a new digital package at 11·579GHz H (19,875 and 3/4). It has four channels, two of which were transmitting colour bars. A third, Middle East – Channel 1, carried Fox Sports while the fourth was the Fox News Channel. Nearby, at 11·544GHz H (6,111 and 3/4), there was a ZDF-WASH-DC news circuit with the test pattern and just occasionally a news offering.

On a lighter note, NSS K carried female volleyball on the 6th at 11·590GHz V (20,145 and 3/4) – a Globecast digital package. Interesting that this was live from Brisbane via PAS-2 over the Pacific. Five days later the world changed.

Broadcast news

Digital TV: TF1 chairman Patrick Le Lay has said that plans to launch DTT in France by the end of 2002 are a disaster and recommends that the government scraps its introduction. He says that DTT is intended for pay-TV use and that there are "too many channels in France".

DTT is likely to start in the Netherlands by March 2002, with Nozema transmitting programme material provided by the Digitenne group. Transmissions will initially be in the main centres of population, extending to cover the whole country over the next few years.

The analogue TV switch-off in Russia is not likely to be before 2015. So far there have been DTT test transmissions in Nizhni Novgorod and St Petersburg.

DTT tests have been started in Niamey, capital of Niger, over the recently-opened ORTN-2 channel.

Switzerland: The small commercial TV station Tele-24 has closed down. One cause is said to be the high level of regulation. This is likely to be eased in 2004, when the present broadcasting laws change.

Israel: The government has approved the opening an Arab-language TV channel. It will receive help from the state broadcasting authority, and to start with the channel is expected to be on-air for twelve hours daily.

Mexico: Cable company Multivision in Mexico City is to use UHF channel M52 for a ten-channel DTT multiplex. The service is due to start by the end of the year. Another cable company, Cablevision, is already operating an internet site and a DTT UHF channel. The companies expect the top-end pay-TV market to be slow to develop and meanwhile seek to exploit the cheaper end of the market, offering DTT pay-TV packages for as little as $US5 a month.

Estonia: The government has passed a bill that will merge the TV service ETV and Estonian Radio into Eesti Rahvusringhaaling (Estonian National Broadcasting). Advertisements will be dropped by ETV and commercial stations will have to pay for on-air licences.

Switch-mode power supplies

Not long since I mentioned the failure rate with satellite receiver switch-mode power supplies. Nowadays a receiver with a large, cool-running mains transformer is a collector's item! With imported equipment the switch-mode power supply is typically designed to operate with an input over the range 100-230V AC. Unfortunately 240V is generally used in the UK and, allowing for a ten per cent variation, the supply voltage is often higher than this. The result is a hot power supply and, depending on design, possible early failure.

One answer is to reduce the mains input to the receiver, perhaps via a mains transformer. A colleague who was having

CNN reportage of the New York terror attacks on September 11th, retransmitted by PTP Moscow. Reception via the Reuters Moscow-London link (NSS K).

problems with an early widescreen Sony model that kept tripping off re-invented the mains dropper, using two large green wirewound resistors to reduce the input from 240V to 220V. Easy, cheap and the TV set has worked satisfactorily ever since.

Telescopic masts

Telescopic masts are expensive. So I was interested to come across a company that buys and sells new, used and refurbished masts, pump-up and tilt-over types, hardware etc. I don't know the company personally, but anyone interested can obtain information from Aerial Ltd., 9 Troopers Drive, Romford, Essex RM3 9DE. The e-mail address is g3rcq@supanet.com

Night view of downtown Manhattan on September 13th, as seen from Liberty Island. Reception via NSS K.

A complete active satellite signal deflection system with US DirecTV receiving dish at the bottom and tranmitting aerials for vertical and horizontal polarisation above. Electronics on the left.

Satellite news

Intelsat 902 has been launched into orbit at 62°E, over the Indian Ocean, replacing 602 which is being moved to 33°E. 902 is equipped with 72 C-band and 22 Ku-band transponders. Eutelsat's Atlantic Bird 2 in now in orbit at 8°W, providing Ku-band coverage across the east coast of the US, down to South America, across to Europe and the Middle East, extending as far as the Urals and Pakistan.

The United Tribes of Africa News television channel (UTAN) has opened recently, covering Africa, North America, parts of Europe and the Caribbean. This Ku-band channel is produced in Manhattan and uplinked via Telstar. For further information check at www. utantv.com

A possible merger between digital pay-TV groups Canal Satellite and TPS is being discussed. In a recent (early September) anti-piracy move, Canal Plus carried out a major ECM (electronic counter measure) to knock out pirate cards in use throughout France and the neighbouring countries. Canal Plus Espana had previously carried out an ECM in the Spanish region. Canal Satellite is likely to adopt an upgraded card in early 2002.

The Cologne-based satellite channel HAKK TV, which described itself as the "broadcast organ of Islamic Society", has been closed down by the German authorities. It didn't have a licence and had been broadcasting inflammatory programmes aimed at the Turkish government. The Tunisian government has served a writ on the London-based Al Mustaquilla Arabic-language satellite TV channel, on the basis that its propaganda flouts ITC broadcast regulations. TV Liberty, a London-based anti-government channel run by the Iraqi National Congress, is being broadcast via Telstar 12. This digital service is aimed at viewers throughout northern and central Iraq. Interesting that the programme material is sent from London to the US via fibre cable then downlinked from 37.5°W.

Active satellite signal deflectors

Those in the more remote parts of the UK and the Irish Republic will be familiar with the active deflector, a means of providing TV services to screened locations. The idea is to install a high-gain receiving aerial with head amplifier atop a nearby hill (the usual cause of the screening), connect its output to a drive amplifier such as a cable distribution 'launch' type, and feed the output from this to a high-gain transmit aerial operated with opposite polarisation to the receiving aerial. Very low-loss cable runs are used to link the receive and transmit aerials to the drive amplifier. If the community being served is relatively compact, a highly directional stacked Yagi array can be used for the retransmission. Otherwise a wideband array such as a stacked bowtie may be required. Coverage can extend over several miles, depending on the output from the drive amplifier. The important point is to change the polarisation – it's not necessary to change the channels. Powering might be provided by solar cells or a wind generator to trickle-charge a battery system, or even a long DC power line from the nearest house.

Last month I briefly mentioned Bob Cooper's work in New Zealand on shared dish systems (SDSs), described in his trade magazine *SatFACTS*. This technique has now been taken up commercially, with a range of equipment due to be launched by the end of the year.

While high-level Sky Digital signals are available throughout the UK, with 35cm dishes providing excellent reception, in many parts of the world there are only low-level signals. A 3-4m dish might be required, quite possibly for C-band reception. Cost, visual impact and local planners – yes, they do have them in distant parts – make this a problem. One solution is use a shared-dish system, which operates on similar principles to the

terrestrial active deflector system described above. Bob Cooper has tested two prototype systems at his North Island location, and checked the feasibility of operating over distances of nearly 20km. The systems work!

The incoming signals may be picked up by a single or several dishes, operating in the C and/or Ku bands. The first system that Bob tested uses a dedicated satellite receiver for each channel required, analogue or digital. Each receiver's baseband audio and video outputs are used to frequency-modulate L-band carriers. These analogue RF signals are then diplexed together, amplified and fed to a wideband aerial for transmission. The first aerial tried was an L-band discone, chosen for its flat bandwidth and accurate matching across the band. The discone is an omni-directional, vertically-polarised aerial. With only 200mW input, noise-free reception was provided at a distance of over 2km. In New Zealand L band covers 950-1,450MHz, which is the IF output bandwidth from the standard LNBs used. Domestic reception is via a vertically-polarised L-band log-periodic aerial, perhaps with a head amplifier. This feeds a standard satellite receiver, which responds as if fed from a standard LNB. The arrangement is simple, cheap and effective.

The second system tested takes the IF output from the LNB(s) and separates the vertically- and horizontally-polarised signals. Each group of signals is amplified, bandpass filtered and then fed to a wideband power amplifier to increase the level to something between 100mW and 10W. The power amplifier output is fed to a vertically- or horizontally-polarised transmit aerial. If the reception area being served is small, high-gain Yagi aerials can be used for transmission. With a service area that's more spread out, wider beamwidth transmission aerials are required. Domestic reception is via a compact L-band log-periodic aerial with a gain of 6dBd and a head amplifier, feeding a standard satellite receiver. The advantage of this direct L-band transmission is that any encryption/encoding of the original signals, e.g. pay-TV subscription information, passes through the system directly without data loss. When the transmission power is about 10W, excellent line-of-sight reception is achieved at up to 15 miles.

This is only a brief outline of what is involved. In practice careful filtering is required to prevent interference to other band users. It all works, and the NZ Ministry of Economic Development is carrying out a feasibility study of SDS transmission at frequencies above 500MHz for local coverage at, for example, educational establishments. My thanks to Bob Cooper for allowing me to use information from *SatFACTS* (July-September 2001 issues) in this report. ■

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

WANTED

Wanted: Working teletext panel for the Philips CP90 chassis. Main panel plus four subpanels for the Amstrad VCR6100, also a head and drum assembly plus guide unit (TM82). Can anyone supply a copy of the Amstrad VCR6000/6100 service manual? All expenses paid for good parts. J. Alder, 37 Palm Avenue, Fenham, Newcastle upon Tyne NE4 9QT. Phone 0191 241 0167.

Wanted: IC002, type MDA3060, programmed, for the Minoka portable Model MK1498N. Phone J. Fedorak on 01274 602 337.

Wanted: Information on replacing the 5532 dual analogue op-amp in the Nad 524 CD player with a Burr Brown OPA2604 FET op-amp. A circuit showing this modification and component values would be a great help. The op-amps are a direct swap pin-for-pin, but I understand that there are different bias and current requirements. I am also in need of a service manual or circuit diagram for the Pioneer AM/FM tuner Model 8100 – FM is fine but the AM band is dead, anyone know why? R.N. Baker, 17 Chapel Lane, Upwey, Weymouth, Dorset DT3 5NA.

Wanted: I am trying to restore a Pye TV Model FV1, which dates from about 1951. Does anyone have a field output transformer (T5)? Winding resistances are 1·7kΩ primary, 3Ω secondary, and the following identification is printed on the core body – 770533 FQD. I also need the mains connector at the rear of the chassis, with protective cover for fuses. Is there anyone out there with knowledge of UHF to VHF, 625- to 405-line conversion? Or anyone with a group I bar/test card generator? Donald Henry, Tongland Hall, Kirkcudbright, Scotland DG6 4NA. Phone 01557 330 462 or e-mail donaldmhenry5@yahoo.com

Wanted: For repair or spares, Quad 405 or 405-2 power amplifiers, Quad FM3 tuners, Quad 33 preamplifiers, Quad 303 power amplifiers, Spendor BC1 speakers, Denon DL103 or DL103S pickup cartridges. Phone Mike on 01758 613 790.

For disposal: Between 8/10,000 TV and audio service manuals. Manufacturers own releases for last fifty years, from Bush and Decca DM40 to current models. Nearly all makes covered. Space needed – you would require a van to collect. F. Mills-Clifton, Fentham House, Church Lane, Meriden, West Midlands CV7 7HX. Phone 01676 522 858.

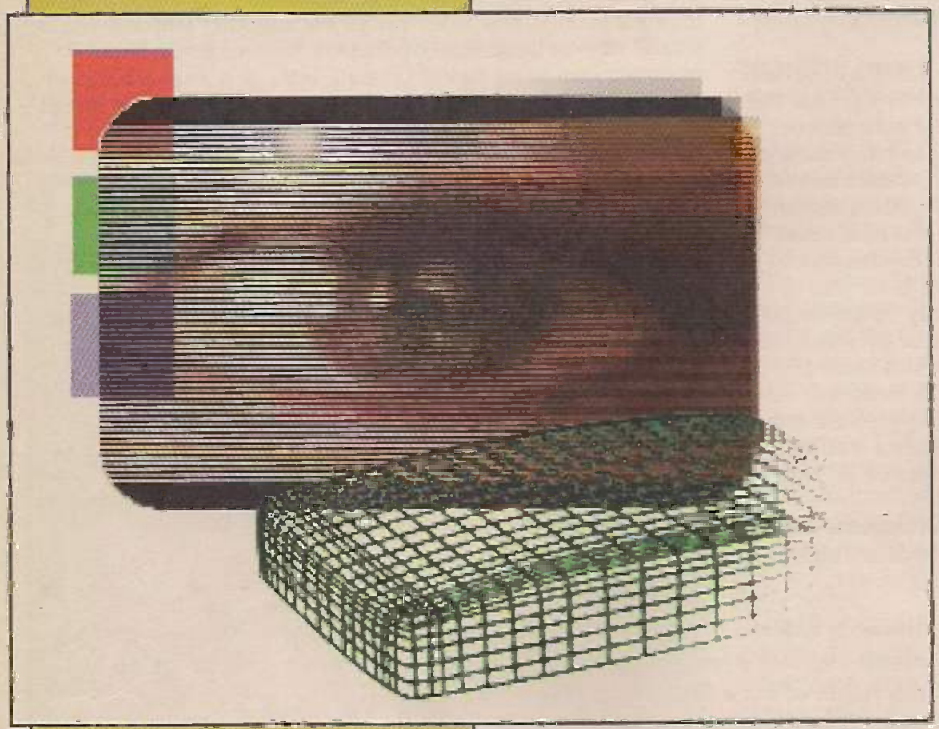
Wanted: Manual/circuit description for the Philips CP90 chassis, code no. 725 15748, photocopy or original. Also the following parts for the Panasonic NV366 VCR, or a scrap machine: video head discharge arm angle unit part no. VXA1584, manual reference 4/1; and video cassette brake release lever, part no. VMD0370, manual reference 120/3. Does anyone know what a Fallen UK Ltd., London automatic signal stabiliser is? It has power in, video in/out and controls dem, gain and balance. Any information welcome. Nothing happens when it's connected up. D. Lee, 16 Devonshire Place, Claughton, Birkenhead, Wirral, Cheshire CH43 1TU16.

Wanted: Redundant but working Olivetti PC type PCS286. P.J. Axbey, Swansea. Phone 01792 523 577.

Wanted: Circuit diagram and manual for the Mullard high-speed valve tester. Photocopies OK. Martin Scobie, Suncourt, Meadfoot Sea Road. Torquay, Devon TQ1 2LQ. Phone 01803 293 157.

Wanted: Circuit diagram and if possible alignment instructions for the Armstrong 227M mono tuner-amplifier chassis. Photocopy OK. John Langley, 125 Station Road, Burton Latimer, Kettering, Northants NN15 5PA. Telephone 01536 723 411.

Wanted: Tube type A59ESF002X11 for the Panasonic Model TX25AD2P, also a remote-control unit for the Toshiba VCR Model V703B and an SDA5273CP IC. Phone 029 2049 6815 (Cardiff).



TV FAULT FINDING

Reports from
Michael Dranfield
Roy B. Dell
Geoff Butcher
Paul Sargent, LCGI
Peter Nutkins
Graham Richards
Philip Salkeld
Ivan Levy, LCGI
Nick Beer
David Smith
Chris Dakin
Roger F. White and
Mike Leach

We welcome fault reports from readers – payment for each fault is made after publiation. See page 106 for details of where and how to send reports.

Alba CTV4808 (Vestel 11AK19 chassis)

This set would come on in standby. If a button was pressed the red light would change to green, become dim and start flashing faintly. The power supply appeared to be running all right, and no obvious causes of the tripping could be found. A 100W bulb touched on the HT rail lit up, and the line timebase then came into operation. The screen was over bright, with flyback lines.

Checks on the tube base panel led me to the 47Ω safety resistor R914, which was open-circuit. It provides the 180V feed for the RGB output stages, which are in the TDA6108JK IC. The resistor had failed because of an internal short within this IC. Replacement of these two items restored normal operation.

I can only conclude that the set was tripping because insufficient current was being drawn from the power supply. **M.D.**

Tatung 180 Series Chassis

The problem with this set was lack of contrast. It's an easy enough one to deal with, just replace R430 (120kΩ, 0·5W) in the beam limiter circuit. The only difficulty is that R430 is underneath the line output transformer's A1 and focus controls. To get at the resistor you have to remove the transformer. **M.D.**

Samsung CI3352AT (P68 chassis)

A good picture appeared at switch on but channel changing via either the remote-control unit or the front panel took several seconds after the button was pressed. Other adjustments – volume, contrast, colour and brightness – were also slow to react. A clue was provided by the fact that teletext was intermittent, with a blank screen most of the time. Replacement of the 27MHz crystal TX01 in the teletext area restored normal operation. **R.B.D.**

Matsui 2092T

This set was dead and the customer had been told that the chopper chip was faulty. There were complications because the phantom fiddler had been at work. First of all the mains fuse was missing. These sets often blow the fuse because the degaussing posistor TH501 is disintegrating inside. Sure enough it was. When a replacement fuse and posistor had been fitted however the set still continued to draw excessive current. There were no obvious shorts, but when I powered up slowly via a variac I found that the mains rectifier's reservoir capacitor was getting very hot. Its tags had fresh solder on them, and close inspection showed that it had been replaced the wrong way round, presumably because the PCB track at its negative end had etched patterns that looked exactly like + symbols. To be on the safe side I fitted a replacement.

I assumed that everything was now OK, but half an hour into a soak test the picture suddenly vanished. The line output transformer's primary winding had shorted to chassis. This damaged the standby HT switching transistor Q503. Once these items had been replaced there was no further trouble. **G.Bu.**

Panasonic TX21/25MD1 (Euro-2L chassis)

On four separate occasions I have cured very intermittent grainy pictures or flickering, which can easily be mistaken for aerial problems, by replacing the tuner unit (type ENV87880G3). Tapping the unit will sometimes instigate the fault. It was another case of crossed fingers during a soak test! **Pa.S.**

Ferguson D49F (TX90E chassis)

There seemed to be two separate faults with this set: intermittent loss of the picture and sound, returning to a blank (untuned) channel); and field cramping when hot. Both faults could be instigated by tapping the heatsink of the TDA8218 timebase generator/field output chip IL01. Resoldering failed to provide a cure. The IC had to be replaced, being defective mechanically. Incidentally this item is becoming hard to obtain. **Pa.S.**

Panasonic TX25MD3

At switch on from cold this set produced intermittent flashes of field scan with no sound. After about half an hour the picture and sound came on but the height was excessive. The fault was cured by replacing the video processor chip IC601, type VDP3108APPA1. But the chip is supplied as a kit with a replacement EPROM, which wouldn't work with this set. If the original chip (IC601) is type VDP3108-29, fit the new EPROM. The part number of the kit is TZS9EK002-2. **Pa.S.**

Alba CTV4859

This neat 21in. set also appears in the Goodmans, Beko etc. ranges. It looked new enough for its warranty to have just expired. Bad luck for the customer, as the cause of low brightness and poor focus was a prematurely low-emission CRT. **Pa.S.**

Bush 2867NTX (11AK19 chassis)

I wasted a lot of time on this set initially as I thought it was stuck in standby. What was actually happening was that every time the set was switched off it would come back on in standby, but could be brought out of standby by pressing channel up or down. The real fault however was loss of line drive. The safety resistor in the feed to the line driver transformer was OK, the cause of the trouble being the 0·33Ω resistor R866 which is in series with the 14V rectifier. It was open-circuit, and after replacement the set worked perfectly. To confuse matters, R866 is not shown in the circuit diagram. **P.N.**

Toshiba 2512DB

After fitting a replacement line output transformer, type AT2078/25, the set worked – but with a small raster, and it wouldn't go to standby! Because of this the set's parameters couldn't be memorised.

Both faults were cured by replacing the standby switching transistor Q845. It was type 2SC2023, but a BUT12A works all right in this position. It now went into standby and memorised the new data, putting right the small picture. **G.R.**

Sharp CV2133H (8PSR chassis)

This set tripped once (the LED lit once) then there was nothing. On investigation I found that the 3·3µF, 63V bipolar electrolytic capacitor C723 in the chopper power supply (primary side) was faulty. Two 4·7µF, 63V electrolytics were wired back-to-back as a replacement. The set then produced a picture which was good except that there was a 'water mark' down it. This final fault was cured by replacing the LT reservoir capacitor C318 (220µF, 25V) on the secondary side of the chopper circuit. **G.R.**

Beko 28128NX

The power supply could be heard tripping, and on investigation I found that the BU508DF line output transistor was short-circuit. As there was no obvious cause for its failure I fitted a replacement and powered the set. It now worked, but the width would occasionally vary.

The line driver transformer seemed to be faulty and, once it had been removed from the PCB, the cause of the trouble was obvious. The ends of the windings are wrapped around the pins, which fit the PCB and are soldered. But one of the pins hadn't been soldered during manufacture. A clean and solder put matter right. **G.R.**

Sharp DV5132

When this set was switched on it tried to start up then went to standby. I found that if the channel button was pressed continuously field collapse appeared. Investigation in the field output stage revealed that the TDA8175 chip's 28V supply was missing. The cause of this was R612 (2·2Ω, 0·5W) which was open-circuit. **Ph.S.**

Panasonic TX25MD1 (Euro-2L chassis)

If the problem is field foldover with a red/green pencil line at the top of the screen the quickest way to deal with it is to order kit TZS5EK001. It contains the two components required to clear the fault, IC451 (TDA8175) and D456 (MA2160B). **Ph.S.**

Bush 2857NTX

If the left-hand side of the screen is darker than the right-hand side, replace C424 (10µF, 160V). It's the reservoir capacitor for the supply to the RGB output stages. **P.S.**

Mitsubishi CT25AV1BD (EE3 chassis)

At switch on this set produced a blank raster. There was also no sound, and the on-screen graphics couldn't be displayed. It's a common fault with this chassis, the cause being loss of the 8V supply. Fit the 8VREG-KIT which is available from SEME. **Ph.S.**

JVC CV14EKW

The symptoms were unbelievable: the colour was OK over half the screen, half way down there was a green line, while the other half of the screen had a greenish monochrome picture. Use of freezer revealed the cause of the trouble, which was the STV2180A chroma delay line chip IC402. The part no. is 033-E02180-31. **Ph.S.**

Ferguson RP46

The picture went red at switch on then this rear-projection set shut down. I found that RG18 (680kΩ) on the sub G2 board was open-circuit. It's in series with the G2 potentiometer PG03. With RG18 open-circuit there was over 800V instead of 400V at the tube. **I.L.**

Thomson 14MK15U1 (TX807C chassis)

There was failure of the composite video via the scart socket with this set – off-air operation was OK. I discovered a break (not visible) between RV023 and RV022. **I.L.**

Mitsubishi C2857B

This set was dead with the standby light flashing. On investigation I found that the voltages at the secondary side of the power supply were all present and correct. A check on the drive at the base of the line output transistor showed that it was OK initially but became distorted and low in amplitude after about fifteen seconds.

When I checked through the line drive circuitry I found that the waveform at the base of Q501 was correct but the waveform at its collector was very low and distorted. When the base of the line driver transistor Q551 was disconnected the waveform at the collector of Q501 was OK. This was a red herring however. The cause of the trouble was Q501, which went open-circuit under load. It measured OK out of circuit, but a replacement cured the fault. **I.L.**

Ferguson 36MK48TV

This radio/TV combi set was dead. The cause was soon found: there was no HT at the cathode of DP20 because CP36 was dry-jointed. **I.L.**

Ferguson RP46

There was an unusual fault with this rear-projection set. Volume control via the remote-control unit was OK, but strange symptoms would occur when the on-board keypad was used. For example if the volume down button was pressed the volume would decrease initially then, after about a minute, it would creep up to a much higher level. After much testing, which included a substitute keyboard and microcontroller chip (IR01), I eventually discovered that CR11 was open-circuit. It's near IR01. **I.L.**

Panasonic TX25T2 (Alpha 2W chassis)

This set came on but after a few seconds, before a raster appeared, it went off, i.e.

the power supply shut down but the channel number remained. While the set was on there was EHT and all the supplies were present. A colleague had concluded that the STR54041 chopper chip IC801 was faulty, but a replacement had made no difference. When I checked I found that the power supply was being told to switch off by the microcontroller circuit – pin 7 of connector E20 (the P ON line) dropped to the low state just before the power supply died.

Checks on board M showed that the microcontroller chip was doing everything it should, but the DC conditions around Q1310-3 and Q1212 were not right. To disable the effect of these transistors I lifted R1245, which is actually a wire link. The set then came on and stayed on. While it was in this condition I was able to look at the DC biasing around the transistors and found that the collector of Q1310 was high at 4·5V. The cause of the trouble was D1315 (MA700), a Schottky diode, which was leaky. **N.B.**

Panasonic TXC71 (Alpha 1 chassis)

I wondered whether this old set would be worth repair, but the tube was lively enough. The complaint was noisy and distorted audio. It sounded like IF trouble, which seemed to be confirmed by the fact that audio fed in via the AV inputs was as clean as a whistle.

When I removed the back of the set the symptom became intermittent. I found that the fault was very sensitive to mechanical pressure around the front left-hand side (viewed from the rear) of the chassis, where the daughter boards are plugged in. Gentle prodding brought me to C2401, an electrolytic capacitor at the front edge of the AV/tuning/control board. It was dry-jointed at both legs. **N.B.**

Sony KVM2171U (BE4 chassis)

This set would work normally for about half an hour then go completely dead. Various tests and component checks in the power supply led me nowhere. But when the STRS5706 chopper chip IC601 was replaced the fault disappeared. I should have known, having had this sort of problem in the past with STR-type chips. **D.S.**

Hitachi C2556TN

This set would trip to standby or go off completely, usually after ten minutes or so but sometimes as soon as it was switched on. Stamping on the floor, as the customer demonstrated, would bring the set back on. It would then continue to work, sometimes for hours, until it felt like going off again.

Sometimes the lightest tap on the PCB would trip the set. On other occasions the set would remain on no matter what was disturbed, or how hard. When the fault was present there was no drive at the base of the BF489 line driver transistor Q707. While investigating the cause of this I found that there were several wire links that had very little solder on them. The set worked perfectly once all the wire links towards the front of the PCB, and several others in the middle, had been resoldered. **D.S.**

Panasonic TX24T1 (Alpha 2W chassis)

The cause of no picture was traced to R390 (120kΩ, 0·5W) on the tube base panel. It's the top part of the potential divider that provides base bias for the upper transistors in the cascode RGB output stages. A good-quality component should be used in this position. **D.S.**

JVC AV28WFR1EK (JK chassis)

I've had problems with two of these widescreen sets, both less than two weeks old. One had much reduced width and would trip after a few seconds, the other had slightly reduced width but ran happily. In both cases the cause was the line output stage tuning capacitor C521 (3·5nF, 1·5kV). The replacement supplied by JVC appeared to be of better quality than the original. Slight adjustment of the EW setting in the service menu completed the repairs. **C.D.**

Grundig ST95-775 (CUC7890 chassis)

This 37in. monster had very poor focus. A check on the focus voltage at the tube base panel showed that it was low – only 2·5kV. Its path from the focus control to the tube base is via the dynamic focus panel, where C07 (680pF, 12kV) was leaky. A replacement from Grundig restored good focus. **C.D.**

Hitachi C2121T (Daewoo chassis)

There was no sound or picture, only a squealing noise and a burning smell that came from somewhere. I was about to accuse the line output transformer, but found that the smell actually came from the TDA8356 field output chip IC301. A replacement restored normal operation. **C.D.**

Wharfedale 350

This 20in. set is fitted with the same chassis you find in many Alba 14in. sets. The chopper FET was short-circuit and the 270kΩ resistor associated with the control chip was open-circuit. I fitted a 120kΩ and 150kΩ resistor in series, as I've had some repeated failures with this component. It must be the high voltage that kills this resistor. **R.F.W.**

Goodmans GD2880 (Ferguson TX92 chassis)

The customer who brought this dead set in thought that the switch was faulty. On investigation I found one bad joint at the 1·5nF capacitor (CP13) beside the chopper transistor. Resoldering it cured the fault. **R.F.W.**

Panasonic TX14S3T

This dead set had been to another repairer, which is always bad news. I made several attempts to get the power supply to run, even trying a new chopper transformer. Then I noticed that the STR chopper chip is shown in the circuit diagram with an A after it. The one in the set didn't have the A. I ordered the more expensive but correct device from SEME, not expecting it to make any difference. But it did. The set then worked fine. **R.F.W.**

Sony KV32DS60U (GE1A chassis)

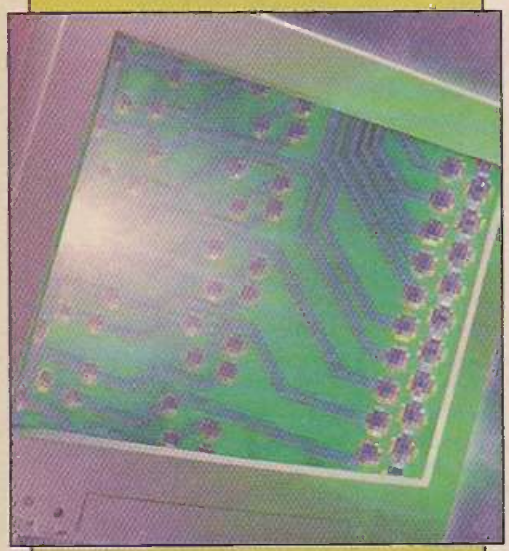
This huge, heavy monster decided to fail a few hours after being installed. There was a plain white raster, with the on-screen graphics all present and the menus working correctly, but no sound or picture. The fault was present in all modes, including digital and input via the scart sockets.

The DC voltages around the tuner seemed to be OK, and in the analogue mode there was video at the relevant output pin. I followed this through the circuit and found that it was still present at the rear PCB, called J, and at the AV input/output chip IC4203. It was obvious that this chip wasn't switching properly, with the video getting lost somewhere within it.

Data was present at pin 32 of IC4203, but there were no clock pulses at pin 31. In addition the DC voltage at this pin was only 0·1V. The clock and data pulses come from the main microcontroller chip IC1116, which had no clock pulses at pin 20. I carefully desoldered and lifted this pin and checked whether pulses were then present. As they were missing it seemed likely that IC1116 was faulty rather than that the clock pulses were being lost because of a short somewhere. A replacement microcontroller chip proved the point – thank goodness! **M.L.**

Hitachi C32WF810N-311

This flat, widescreen set suffered from what looked like tuning drift after several hours' use. The tuner was suspect but proved to be OK. I eventually found the cause of the trouble by the good old heat and freezer treatment. The culprit was the TDA9320H chip IC1200, which is a surface-mounted device. It was upsetting the tuner's AGC line. **M.L.** ■



MONITORS

Fault reports from Ian Field Gerry Mumford Tony Mathews and Duncan Robinson

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

Reports can be sent by post to:

Television, Fault Reports,
Anne Boleyn House,
9-13 Ewell Road,
Cheam,
Surrey SM3 8BZ

or e-mailed to:
tessa2@btinternet.com

Hitachi CM2188

This 21in. monitor was dead. While removing the back cover I noticed a label that specified the power lead type and mains supply details, which were given as 120/200V AC, 50/60Hz, 2·8/1·5A. The power supply was a normal 'universal' type with an STR84145 auto line switch. There were two fuses, one each for the 120V and 200V sections of the auto-switching circuit. The 200V one was open-circuit.

The monitor worked perfectly with a new fuse and the STR84145 chip removed. So I phoned the customer and was relieved when he agreed to have the auto line switch permanently removed. If the customer wants the auto line switch to be retained, it's best to replace as many as possible of the small, high-voltage electrolytics with Mylar or polycarbonate types. These switcher chips have an internal 15kHz oscillator to drive the triac gate. The high ESR of a small, high-voltage electrolytic can easily result in failure of the latch-timing circuit that prevents inadvertent switching to 110V during a 'brownout' supply disruption. **I.F.**

Gateway 2000 Crystalscan (CS1024N12)

"Wobbly picture" it said on the ticket. I have to admit that I don't like this chassis. In view of the damage I've seen as a result of power supply regulation failure, I always carry out a careful inspection before powering up. The first check should be on the precision power resistors R325/335 (33·2kΩ, 1%, 3W). Then check the soldering in general, and particularly at L101. Arcing here often melts the cabinet so badly that it gets welded to the stand.

The soldering had a dull-grey, crystalline appearance. So I inspected it almost joint by joint. Preset SUR101's pins were a mess. A considerable amount of solder had to be removed before fresh solder could be applied. By the time I considered the chassis to be safe, then tested it under power, there was no symptom matching that written on the ticket.

After a short time the display began to twitch and, at random intervals, shift horizontally by a few millimetres in either direction. Presets SUR101 and SUR702 were extremely 'tetchy'. The later had a very sharp effect on the line frequency. The situation was remedied by cleaning and exercising these two presets

When they have been disturbed you have to go through all the modes – the three basic VGA ones need to be checked as well as 1,024 x 768 and 800 x 600. Verify both interlaced and non-interlaced in each case. There is some interaction between the two controls, and both are very abrupt, so two or three passes may be needed to ensure that later adjustments have not affected previously synchronised modes.

In all the severely damaged examples of this chassis I've come across the plastic-encapsulated rectifiers on the secondary side of the power supply have been BY29X series devices. When regulation failure occurs they break in two, allowing the power supply to continue and leave a trail of destruction. This particular monitor was fitted with 30DFX type rectifiers. It's possible that the manufacturer became aware of the problem and made changes to avoid further trouble. **I.F.**

Ilssan ISP120ISY (PC SWPSU box)

Requests for PC switch-mode power supply repairs are rare nowadays because of the very low cost of pattern spares, but some of the more recent ATX power supplies are not stocked as pattern replacements – or people just don't know where to find the right one. As this box had a very low profile, a pattern replacement probably doesn't exist. So the customer was happy to pay my fee to repair it.

The mains rectifier's reservoir electrolytics had both bulged and leaked. It was hard to guess whether the mains selector switch had been inadvertently (or mischievously) been set to 110V or whether the original capacitors simply weren't up to the job – they were of the wire-ended radial-lead type rather than the high ripple-current type with riveted tags. The two were rated at 220µF, 200V, and were much smaller than 'proper' ones, so there wasn't enough room to mount suitable replacements. A couple of phone calls later I had established that the end user was never likely to need the facility to set the power supply for 110V operation, and was entirely happy to eliminate the possibility of incorrect-voltage setting. It was then possible to fit a single 220µF, 385V high ripple-current replacement in the space vacated by the previous two.

To avoid fouling other components, I had to drill two new holes. Both came through the centre print land for the junction of the two previous capacitors, so it was necessary to carve an isolation barrier through the middle of the print land and add wire links from the new capacitor lands to the bridge rectifier's output terminals. The wires to the 110/220V switch can simply be cut off, after unsoldering from the PCB.

The previous pair of 220µF capacitors, connected in series, added up to a total value of 110µF. The inrush NTC

thermistors at the mains input appeared to be adequate to cope with the increased current – the power supply has now been back in service for some months, and there have been no complaints. **I.F.**

Daytec Model DT1730 (Daewoo)

This unit came back because, following repair, the degaussing and adj-up buttons had become intermittent. Originally I'd had to repair the PCB tracks around the frame output chip because the swivel base had flexed the PCB and pulled off some tracks around the over-long frame output heatsink. The new fault was not as unrelated to the previous one as I at first thought. The tact switches had been affected by the solvent I'd used during the original repair, to remove solder residue to check for more PCB cracks.

From now on it's a steel wire brush every time. Although extra care is needed when surface-mounted components are present, most are sufficiently resilient to stand up to this. The main danger is with ceramic chip capacitors, where metal can transfer from the bristles on to the ceramic, affecting the capacitance, and with glass diodes whose markings rub off. **I.F.**

CTX 1765D

There was a problem in the EHT generator circuit, which in this chassis is separate from the line output stage and is fed from an unregulated source. The bipolar EHT output transistor is arranged as a blocking oscillator and is in series, to chassis, with a buck-type B+ PWM. L402 is the B+ inductor, and there's a B+ catch diode and an EHT efficiency diode.

The following semiconductors were short-circuit: Q335 (2SC4769), Q338 (IRF840F1) and D327 (BYV26E). Fusible resistor R460 (1Ω, 1W) was open-circuit. Once these items had been replaced there was more life in the monitor than before – but not as much as there should be. There didn't seem to be any output from the series-connected rectifiers D113/4 (type BYM26E) on the secondary side of the power supply, though there was a normal AC waveform at the anode of the first rectifier. Both diodes checked OK out of circuit, but replacements restored the DC output.

The EHT section then worked, but the vertical line that appeared on the screen showed that there was trouble in the line output stage. As there were no visible signs of anything being faulty, I set about unsoldering components and checking them one by one. After a considerable amount of time had been spent doing this I decided to switch on and take measurements. When I powered the monitor it produced a full, fault-free display. One of the solder joints disconnected for component testing must have been an invisible dry-joint. **I.F.**

RM G7127, Model C5DZR DT-E07

When it powered up this monitor made all the right noises – but there wasn't any light. The screening around the CRT PCB made it difficult to see whether or not the heater was glowing. As I was cupping my hands around the assembly to exclude the workshop light the display slowly appeared. Once I had removed the screening I could see the state of the soldering, and decided to resolder every single joint.

The hole/print land registration isn't good either – especially around the RGB output chip, which has fine-pitch pins. A scalpel with a fresh blade is indispensable to clean between the pins and eliminate any shorts. Close inspection is advisable to ensure that all the pins actually make contact where they are supposed to do. **I.F.**

Zenith ZCM-1750-H2-00

The symptoms with this monitor were screen flooding, flashing and random shut down. The customer feared that the line output transformer was in its "death throws"! It was an ordeal to dismantle the chassis to work on it, but the repair made this all worthwhile. After wire-brushing the flux residue off the PCB it was easy to see that the monitor needed nothing more than an extensive solder rework. **I.F.**

Compaq V50, Model 610 (Philips chassis)

This monitor displayed a peak green raster with the red and blue parts of the display overlayed on it. Obviously something was wrong with the CRT's green drive. Inspection of the base panel revealed a dry-joint at the open-wound ferrite choke L5721. **G.M.**

Acer 7276e

There was excessive width and EW bowing. While using an oscilloscope to check the path of the EW parabola I came across a virtually invisible dry-joint at the HV coupling capacitor C312. **G.M.**

Compaq 140 series 473E

This monitor was completely dead. A quick power supply inspection revealed that the 3·15AT mains fuse F801 was ruptured along with capacitor C827 (1µF, 450V) which had vented. This capacitor is in the start-up supply, for which D813 (1N4006) is the rectifier. It was short-circuit and undoubtedly the cause of the destruction. Replacement of these items restored power and the display.

This monitor is fitted with the **Tatung CM-14UHR-E28 chassis. G.M.**

Tiny A1770NSL

There was power but no display. When the setting of the first anode control on the line output transformer was advanced a bright white raster appeared, with no video. Checks showed that the 80V supply was missing at connector PS02. I then found that the LM2407 video output chip I901 was short-circuit and had taken out the fusible feed resistor R812 (1Ω, 1/4W), which is on the main board. **G.M.**

Viglen AX1595

There was EW bowing but the width was normal. I found that the TDA9103 scanning processor chip U101 was not generating the required EW parabola. A replacement chip cured the fault. **G.M.**

Mitsubishi Diamond Pro 920

The fault report said "no picture", and for a change this was correct. These monitors are not the easiest to dismantle. If you've not repaired one before, it pays to make a careful note of where all the screws go.

While checking some of the usual suspects I found that the 3·6V zener diode D961 was short-circuit. You will find it near the optocoupler in the power supply. A replacement restored normal operation. **T.M.**

Mitsubishi Diamond Pro 720

The complaint with this monitor was poor focus. While checking the components in the focus circuit I found that R743 (33kΩ) was open-circuit. A replacement resistor and a tweak on the focus adjustments completed the repair. **T.M.**

Gateway EV700A

The symptoms with this 17in. monitor were power but no display. The green power LED was illuminated, and a whistling noise (similar to that produced by a grasshopper!) could be heard. There were no obvious dry-joints or burn marks on the PCB, and all the components seemed to be intact. It seemed that the most likely cause of the fault was a failure in the line output stage. So I desoldered the BU2527AX output transistor Q706 and unscrewed it from the large metal heatsink. A continuity test with the DMM showed that it was short-circuit. When a replacement had been fitted the monitor worked normally.

Another of these monitors had the same symptoms, but in this case the Darlington pair transistor Q709 was also short-circuit. **D.R.** ■

VCR CLINIC

Reports from
Eugene Trundle
David Gough
Chris Avis
Ronnie Boag
John Coombes
Bob Flynn
Gary Laidler and
Graham Boor

We welcome fault reports from readers – payment for each fault is made after publication. See page 106 for details of where and how to send reports.

Sony SLVE720

There was no trouble with the RF-through path but the E-E and record pictures would intermittently become grainy. At the same time the sound disappeared, being replaced by a low-level buzz. The cause was bad soldered joints inside the tuner module, where the earth print is connected to the metal frame.

To ensure a good bond in cases like this we now bypass the original joint with a short wire link between the print and the wall of the tuner can, using lots of liquid flux before the soldering. **E.T.**

JVC HRJ670

On rare occasions a loop of tape would be left hanging from the flap when the cassette was ejected. The problem was solved (we assume, as we've not heard anything since!) by replacing the idler-arm assembly and idler lever B. The part numbers are LP40114-008A and LP30236-002B respectively. **E.T.**

Daewoo V50

This VCR came in dead with no display. I suspected electrolytic capacitor problems in the power supply, and some ESR meter checks soon confirmed this. The following were all faulty: C53 (1µF, 100V); C66 (33µF, 6·3V); C63 and C65 (both 22µF, 50V). It's also worthwhile removing the power supply can and resoldering all the dry-joints. Replacement capacitors and some resoldering restored normal operation. **D.G.**

Panasonic NV-A3

The customer complained that this palmcorder wouldn't zoom. When I operated the zoom control with the machine on the bench I got what seemed to be a momentary movement from the lens motor . My suspicions about the cause were confirmed when I stripped the camera down: one of the three wires to the zoom control had broken away from its solder pad. Full operation was restored once the connection had been remade. **D.G.**

Matsui VX820

This VCR was dead with no display. Checks on the outputs at the secondary side of the power supply showed that everything was OK up to this point. I then carried out a visual inspection of the power connection area on the main PCB. There was an area that appeared to be quite badly affected by heat. Cold checks here showed that Q02 (2SD1207) was open-circuit. This little transistor runs very hot. When it was removed some solder pads came off with it, so a certain amount of making good was required. I decided to fit a more robust TIP31C as the replacement. Once this had been done the machine worked perfectly. **D.G.**

Sanyo VHR789, 899 etc

The customer's complaint was "no eject", but by the time the machine reached my bench it did eject the tape. When the tape was reloaded it played and wound all right initially, then the deck shut down. Eject was tried but there was no response – and the display dimmed.

I looked for the infamous PR512 in the power supply, but it measured OK and a replacement made no difference. Eventually I checked the loading motor, which produced resistance readings between 15Ω and zero! A replacement was ordered from CHS (order code 11935WM) and was quick to arrive. When checked it provided a resistance reading of 40Ω, and my meter's internal battery was enough to produce shaft rotation. Fortunately there had been no damage to the supply, and the easy clip-in replacement motor cured the fault.

A colleague has had this problem with a similar model, so it may be becoming a stock fault. **C.A.**

Philips VR676

This machine came in with a "dead" report. The cure was to replace capacitors C2361 (47µF, 100V) and C2356 (1µF, 50V) in the power supply. **R.B.**

Sanyo VHR778

The complaint was intermittent failure to record Nicam sound. I traced the cause to dry-joints at X6701. **R.B.**

Goodmans VN6000

No results can be caused by a number of things, from an open-circuit input fuse to a short-circuit power regulator transistor. In this case however the cause was a faulty capacitor, C822 (330µF, 10V). When it was checked with a capacitance meter its value was found to be low at 286µF. **J.C.**

LG PW904I

If you find that all the symbols in the display are lit, check the value of CP19 (1,000µF, 10V) in the power supply. In one case recently I found that its value had fallen to 750µF. **J.C.**

Ferguson FV42L

There was no operation – the display didn't light and none of the mechanical functions worked. The cause turned out to be dry-joints at transistors TT64 (BD435) and TT71 (BD676), which are in the servo section of the signals/servo PCB. **J.C.**

Aiwa HVFX1500X

The complaint with this machine was very intermittent tape chewing. I replaced the obvious items (the pinch roller and the mode switch) but the problem persisted. It was cured by replacing the sub-brake lever. **J.C.**

Akai VSG745

Intermittent stopping while in play, or even switching off, was the complaint with this machine. It didn't sound like the usual mode-switch problems, and in fact the cause turned out to be poor connections to L203 in the power-supply section of the main board. Resoldering cured the fault. **B.F.**

Toshiba V854

There was no take-up spool rotation because the idler didn't get over to it. When I removed the mechanism I found that the idle kick lever, item K440 in the exploded view diagram in the manual, had come loose. Refitting it was all that was needed. **B.F.**

Hitachi VTM610E

If there is no power with R3357 burnt out, check/replace the following items: IC7354 (MC44603P); T7350 (STP3NA60); D6351 (BAT185); D6352/3 (both BYD33D); R3357 (4·7kΩ, 0·1W); and R3361 (47Ω, 0·33W). **B.F.**

Sharp VCMH67

There were no signs of life with this machine. I checked the various supplies and found that the regulated 5V output was missing. The cause was Q961 (2SC2001LK). A replacement restored normal operation. **B.F.**

Philips VR170-05

The customer said that this machine didn't come back on after being unplugged from the mains supply. It was totally dead when I checked it. Power supply capacitors I thought, but the cause of the trouble was that R3369 and R3370 (both 39kΩ) were open-circuit. R3369 had a clearly visible burn mark on it. **G.L.**

Mitsubishi HS750

The job sheet said that this machine took a long time to come back on after doing a timed recording. I found that the display didn't light up. Once C9A3 and C9A4 in the power supply had been replaced the display was back and, after a long soak test, the timer circuit was also given the OK. **G.B.**

Crown CV93V

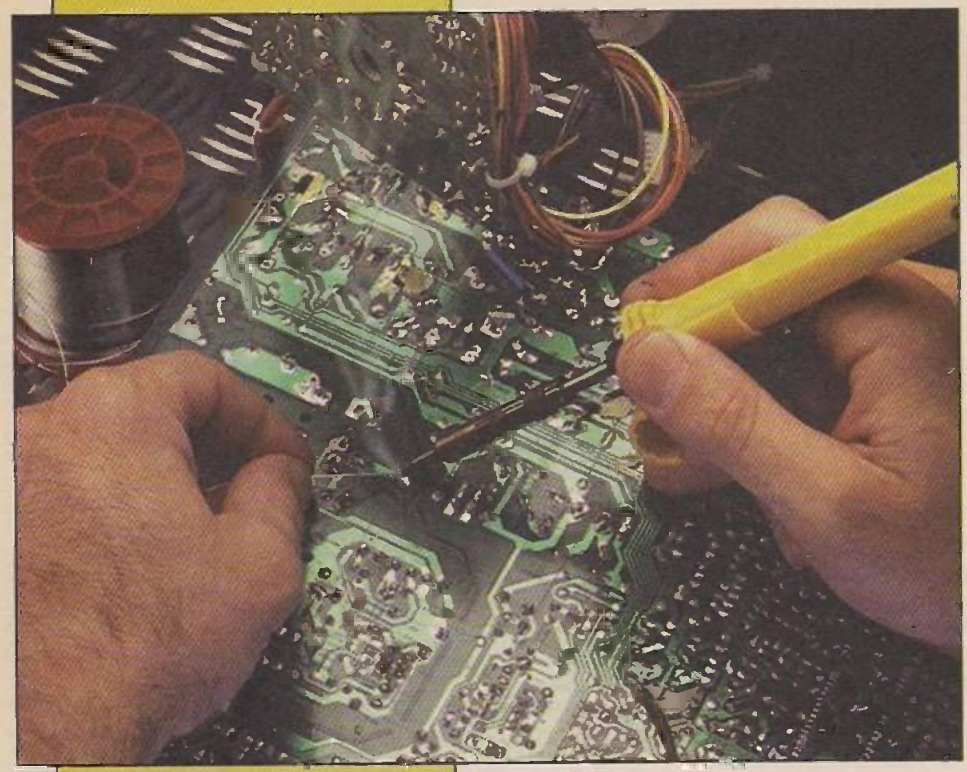
The owner of this budget-priced machine said it was reluctant to eject tapes. The fault was intermittent. It was cured by replacing the mode switch and the loading belt. **G.B.**

Philips VR502

The complaint with this machine was no playback colour. So out with the scope and the service manual. I eventually found that there was no waveform at pin 1 of IC7151. Tracing back from this point I came to T7109 which was open-circuit. A replacement restored normal playback. **G.B.**

GoldStar T161

This machine was dead and the owner didn't want to spend too much on the repair. It was up and running once the optocoupler ICP02 and capacitors CP19, CP21 and CP25 had been replaced. **G.B.** ■



JACK'S WORKSHOP

Jack Armstrong

The Sky+ PTR digibox

As I write this on October 19th the Pace 3000 Sky+ digibox (the one with the hard disk drive) is "out of stock". So is the matching remote-control handset. Demand for the box outstripped supply, and apparently no one had thought about the fact that many buyers would have a TV Link system and would want a second remote-control unit for the bedroom. The corporate planners had failed again!

The Sky+ digibox package includes a quad-output LNB which, as the name suggests, has four outputs. Adaptors are included to enable it to be fitted to any of the Minidish variants. You can feed two of the outputs to the Sky+ digibox's tuner inputs and the other two to one or two more digiboxes – BSkyB will charge you an extra £12 a month for a duplicate smart card.

An interesting point is that the quad LNB's feedhorn is shaped to match the Minidish, which is wider than its height. See Photo 1. This Philips LNB is labelled SC519QS/S – the extra S indicates that it's special. Don't use the standard Philips LNB with the Sky Minidish: it's designed to work with the standard oval offset-focus dish. If you use either type of LNB with the wrong type of dish it will work but the performance will be very poor, because it's not focusing on all the dish area.

A very young man came into the workshop and asked for a service manual and service information for the Sky+ box. I told him that they are not available, and that previous experience suggests they will continue to be unavailable until the warranty on the first ones sold expires.

He then asked about fitting a larger hard drive in the Sky+ box. Such a modification would invalidate the guarantee of course, and I told him I had no information on this. But he was very persistent. "You're an engineer" he said, "so you ought to know – engineers know everything about PCs."

I took him into the back room and pointed to my Apple Mac G3. He departed without another word.

Website problems

I have a little internet website. Recently it spent more time off-line than on. The Internet Service Provider (ISP) blamed the frequent problems on everything from power failure to virus attacks.

In the end I got fed up with the difficulties and searched the World Wide Web for "Macintosh ISP". I expected to find lots in the US but, amazingly, only one (http://www.phage.com) showed up during an extensive search using over twenty search engines.

I contacted the owner, a 42-year old fellow called Paul, who agreed to move my web site to his server for a nominal fee. The server is an Apple Mac G4 that runs with Webstar software. This is renowned for being unhackable – no, that's not a challenge! The server is 'mirrored' by two computers in the UK and one in Vancouver. They are linked so that if one stops working the other two take on the workload. I now feel a lot safer.

Digibox in Europe

Abdul runs the local betting shop. It all stemmed from his youth, when his father taught him to ride one of those Arabian thoroughbreds. His father is apparently a sheikh, but they are no longer on speaking terms. This probably explains why Abdul lives in a two-bedroom flat above the shop.

"My brother tells me I can watch al-Jazeera on Sky Digital" he said, "how do I do that?"

"Sorry?"

"Al-Jazeera – it's from Qatar."

"Gosh, yes, I get that when I have hay fever."

"Arabic TV programme."

"Oh, right. You want to watch an Arabic programme." I looked at the programme listings in *What Satellite TV* magazine. Al-Jazeera was listed as being transmitted from 28·2°E. I thought I might have to add it using the Add Channels system in my digibox but, when we looked in the electronic programme guide, there it was – number 674.

Abdul was delighted and said so, in Arabic. Or he might have said "I need to go to the toilet". I'm not sure.

"Ah, I go buy a Sky Digital box then,

Photo 1: The Philips SC519QS/S LNB. The red arrow points to the oval scalar rings, which match the shape of the Sky Minidish.

Photo 2: The SatCure RF modulator, which accepts baseband video and sound from a digibox's scart socket and provides an output on any selectable UHF TV channel.

OK?" he asked.

"Yes, OK. But you can get a second-hand one, because this programme doesn't need a card. In fact you could use a 'Free to Air' digital receiver, but you wouldn't be able to see many English programmes because most of them are broadcast by BSkyB."

"My brother also tells me that I need to use a scart connection, otherwise I get no sound from the box" Abdul continued.

"He must be using a TV set with PAL B/G audio" I said, "your TV set will be OK. The Sky digibox is designed to work with UK TV sets."

"So how can my brother get sound in the bedroom?" Abdul asked. "He says not possible."

I explained to him about RF modulators, keeping it as simple as I could. Fortunately I was able to show him one I'd bought from SatCure (http://www.satcure.com). See Photo 2. It accepts audio and video inputs from the digibox's scart socket and provides an RF output on any UHF channel from 21 to 69, which you can select using the little switches at the back. You can also select either PAL-I (for UK TV sets) or PAL-G (for continental European sets).■

If you have any questions about Apple Macs you can e-mail Jack from the internet web site at: http://www.ukstay.com/jack

You can also contact Mac Users and ask questions at the Yorkshire Mac User Group web site (YMUG): http://www.ymug.york.co.uk

Information about Sky Digital Satellite receivers can be found at: http://www.satcure.co.uk

You can order Apple Mac cables, connectors, batteries and other accessories from the SatCure web site at: http://www.satcure.com

Test Case 468

Doc Colin was running late. It was 5.20pm, and he was about to start his last field call for the day. Hopefully the problem would be an easy one. It involved a rental Hitachi set, the complaint being no sound. Maybe they'd done something silly and he would be out in ten minutes. But it was not to be!

Colin was ushered into the lounge, where he found a six-year old Model C2546TN. It certainly had no sound, even with the volume control fully advanced. At that level however there was enough background mush from the loudspeakers to indicate that the audio amplifiers were operational. The picture was fine, so the receiver section must have been working correctly. What would you have done, with dinner about to go on the table at home? Colin loaded the set into the van, installed a loan set and was away.

The next morning our rental customer came on the phone. He was unhappy with the loan set. So Real Technician set to work on the Hitachi, in the hope of getting it back that day. He soon established that the audio amplifiers (in IC4450) were working, with the correct 28V from the chopper power supply. The output from a VCR, connected to the scart socket, produced pictures and stereo sound, so attention was focused on the SAA7283ZP sound processor chip IC4201.

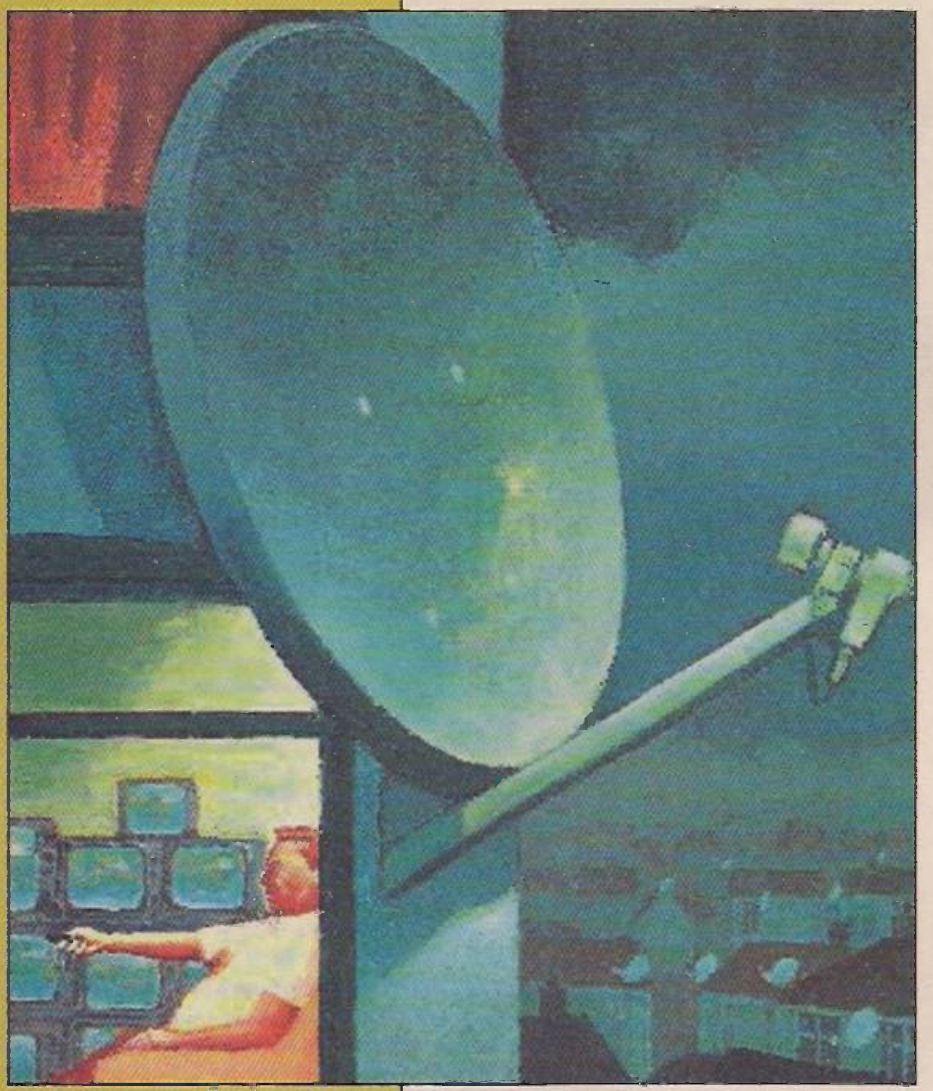
With the aid of an oscilloscope, RT found that there were no right and left audio outputs from pins 15 and 8 of this chip when the set was receiving a broadcast transmission. On then to pin 29, where the Nicam IF signal enters the chip. It was present and correct. At pins 7 and 16 there should be an intercarrier input with mono sound at 6MHz. This was also OK. It was hard to see what could prevent both types of sound signal from producing any output, but RT went through the motions of checking that X4201 (8·1MHz) was oscillating and that the voltages at the various pins of IC4201 were about right. Many pins, including that for muting, are not used or are left disconnected in this chassis. There was nothing obviously wrong.

Nothing for it, RT decided: the sound processor chip had to be replaced. There was no hope of this set going back today! The chip was ordered, and Cathode Ray was despatched with a more respectable loan set. RT got on with the Tatung telly he'd been repairing.

A couple of days later the replacement IC arrived and was soon fitted. But there was still no sound, except when a VCR was connected to the scart socket. Things were in fact exactly the same as before.

Plainly the sound processor chip was not the cause of the problem. Maybe there was something wrong with the control system? Oscilloscope checks at IC4201's I^2C bus lines, pins 49 (SCL) and 50 (SDA), showed that there was activity whenever the keys of the remote-control unit were pressed.

So, should the microcontroller chip IC001 be replaced? It's a sort of hybrid device, type TMP47C1637N, with both an I^2C control system and separate outputs for sharpness, contrast, brightness and colour control. Not wishing to replace another possibly perfectly good IC, RT decided to consult Television Ted. He thought it odd that the microcontroller chip should fail in only this respect, and came to a different conclusion which proved to be correct. What did TT suggest? For the solution to the problem, see page 118.



SATELLITE NOTEBOOK

Reports from Christopher Holland and Gordon McCrea, B.Sc

Solar outrage

We have just been through the twice-yearly satellite 'eclipse' period (solar outrage) when the sun's elevation in the sky is the same as the geostationary satellite arc. There's degraded reception from the Astra 2 slot (28·2°E) for a short mid-morning period during a few days in early March and October, caused by RF energy from the sun. Dishes see this as wideband noise.

The spectrum-analyser display pictures below show the effects as the sun passes behind the satellites. In Photo 1 the left-hand marker is at 11·693GHz (1,093MHz displayed on screen, being the IF obtained using a universal LNB with a standard 10·6MHz local oscillator). This is just below the Astra 2A transponder 1 (BBC) frequency, and shows a noise 'floor' from the LNB of 43dBµV. The right-hand marker is at the centre of the transponder 1 band, i.e. 11,719GHz (1,119MHz IF), and shows a signal level of about 64dBµV. So the carrier-to-noise ratio is just over 21dB. The display at the lower right of the picture shows a marker separation of 26MHz, above the carrier-to-noise indication.

Photo 2 shows the noise floor having risen about 7dB to 50dBµV, degrading the carrier-to-noise ratio to about 13·5dB.

Photo 3 shows an off-screen picture produced by a Panasonic TU-DSB30 receiver on a different day when the sun was more precisely behind the satellite. It illustrates clearly the pixellation effect produced by a reduced carrier-to-noise ratio, which at the time the photograph was taken would have been between 4-5dB. With other makes of receiver, particularly Pace ones, there tend to be larger broken-up picture blocks when the signal is at the digital threshold – this doesn't look so good in a photo! **C.H.**

Digital channel update

The latest channel changes between multiplexes and channel additions at 28·2°E are listed in Table 1 – the EPG number is shown in brackets after the channel name.

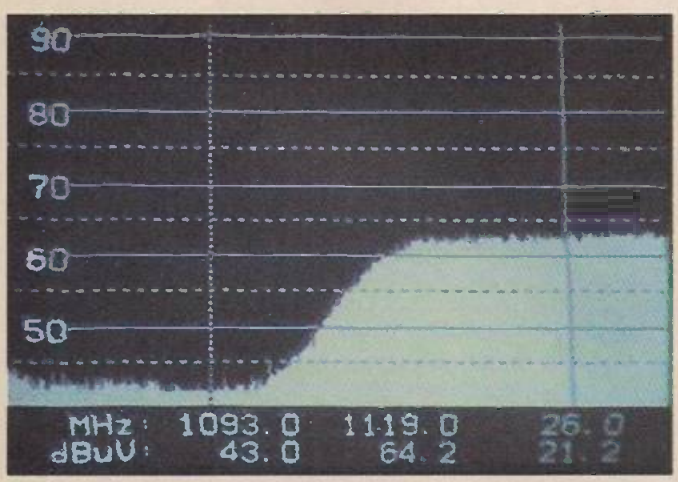


Photo 1: Spectrum-analyser display with the markers at the Astra 2A transponder 1 IF (right) and 26MHz below (left), showing the carrier-to-noise ratio under normal conditions (just over 21dB).

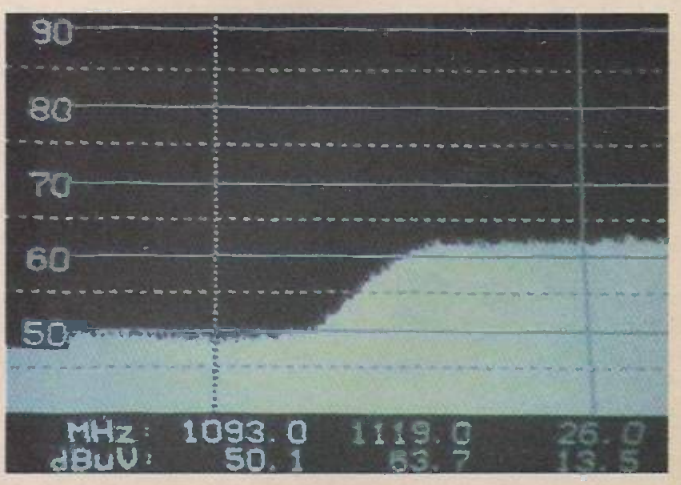


Photo 2: Spectrum-analyser display with the markers as in Photo 1, showing the carrier-to-noise ratio reduced to about 13·5dB.

Note that all the transponder 21 channels have been moved to transponder 33: at the time of writing transponder 21 is empty of channels but is still switched on.

The US Fox News channel has no EPG number at present and has to be added as an 'extra channel' using the 'add channels' menu. It's also available at 19·2°E (Astra 1) in unencrypted analogue form. Tune to 11·435GHz V (the old Sky MovieMax analogue transponder). A channel identification card is used to block US advertisement breaks, see Photo 4.

BBC World Service Extra Radio (EPG no. 902) does not have the on-screen programme information usual with all the other stations and appears to be mainly in Arabic. **C.H.**

Pace 2400 etc

A problem I've had with these digiboxes is good pictures but the audio low and distorted or missing. In this event check for –8V at pin 11 of U905. If this supply is low or missing check C567 (1µF), which can develop leakage. Also check R551 (10Ω) which may have suffered as a result. The problem occurs with Pace digiboxes that have one large PCB. **G.McC.** ■

Photo 3: Pixellation effect produced when the carrier-to-noise ratio falls to 4-5dB.

Photo 4: Channel identification card used to block US advertisement breaks with Fox News.

Table 1: Latest digital channel changes.

Channel and EPG	*Sat*	*TP now*	*Frequency (GHz)/pol*
Artsworld (199)	2A	4	11·778/V
BBC World Service Extra (902)*	2A	3	11·798/H
Channel Health (193)	2B	33	12·344/H
Chelsea TV (427)	2A	4	11·778/V
Cross Rhythms (876)	2B	33	12·344/H
Dating (656)	EB	D7S	11·585/H
Fox News*†	EB	D3S	11·508/H
Home Shopping Europe (649)*	2B	37	12·422/H
Inspiration (653)	EB	D7S	11·585/H
Kerrang (454)	EB	D3S	11·508/H
Magic (452)	EB	D3S	11·508/H
Premiership Plus (433)	2B	32	12·324/V
Shop America (641)	2B	33	12·344/H
Simply Jewellery (646)*	2B	37	12·422/H
Simply Jewellery Plus (648)*	2B	37	12·422/H
Simply Shopping (642)*	2B	37	12·422/H
Simply Shopping Plus (645)*	2B	37	12·422/H
UCB Bible (890)	2B	33	12·344/H
UCB Europe (875)	2B	33	12·344/H
UCB Inspirational (886)	2B	33	12·344/H
UCB Talk (891)	2B	33	12·344/H

* New channel. † See text and Photo 4.
TP = transponder, 2A = Astra 2A, 2B = Astra 2B, EB = Eurobird.

Digital tuner repairs

John Glenton of MCES comments as follows on this subject. Having seen some DIY 'repaired' tuners I would seriously question the feasibility of attempting this sort of work without the sophisticated equipment required. Bear in mind that if a repair fails a replacement tuner is not always readily available at a 'sensible' price – in fact some types of tuner are not available at all.

We often find that a capacitor or resistor has been replaced with one of a different value. If the workmanship is OK and the tuner appears to work initially, it is often the case that the RF circuitry operates incorrectly, i.e. there may be dead spots, instability, drifting etc. Without the appropriate test and measurement equipment it may be impossible to know about this until a customer complains that channel X freezes or channel Y disappears after so many hours.

At the other end of the scale some 'repaired' tuners don't work at all. There may be damaged print (remember that print is often an inductive component at RF) because incorrect or poor soldering equipment has been used. The tuner may, as a result, be beyond repair.

It's best to send a faulty tuner to a specialist company that can carry out an effective repair and guarantee the work.

MCES has been providing a high-quality repair service for tuners and RF modules for over thirty years. Our company has invested heavily in specialist technology and equipment to enable units to be serviced and repaired to a high standard. Our equipment, obtained from Hewlett-Packard, Wavetek, Telonic and other manufacturers, includes spectrum analysers, scalar network analysers, noise-figure meters, sweep generators, crystal-controlled marker generators, scopes, frequency meters and so on, also a range of expensive SMT rework and reflow equipment.

When we receive a tuner we test it then replace any suspect or faulty components. After that any upgrade modifications to improve performance are carried out. The tuner is then subjected to a range of tests to check for such things as drift, stability, tuning range and bandpass response. The alignment is optimised to ensure maximum gain and correct operation on all channels within the tuner's range. We also carry out a temperature-cycling test to check on oscillator stability, using crystal-controlled markers, and check the AGC and AFC operation.

We can usually supply a repaired and tested unit on the same day as receipt of a faulty one. For further information see our web site at www.mces.co.uk

WEB SERVICE

To reserve your web site space contact Pat Bunce

Tel: 020 8722 6028 Fax: 020 8770 2016

E-MAILS p.bunce@cumulusmedia.co.uk

AcquiVision

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Acquivision solutions, including XY-Plotting, Oscilloscope (with FFT), Data Logging and Custom Software, have been getting the most from computers since 1994, Download software. Telephone (01903) 830502

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Full e-commerce site with over 1500 products with in-stock quantities!! We supply everything associated with Digital/Analogue Terrestrial & DTH/Motorised Satellite reception. All Antennas. All Brackets. All Cables. All Connectors. All Amplifiers. We provide a free MATV/SMATV planning service as well.

A.R.D. Electronics Plc

http:/www.ardelectronics.com

A.R.D.'s Website details all the information you need to know about this new and exciting electronic component distributor. It shows how to: open an account (credit or cash), obtain a trade catalogue and place orders (both online and direct)

Baird 30 Line Recordings

http://www.dfm.dircon.co.uk

For history buffs and the curious here's a fascinating site containing early TV recordings and their background.

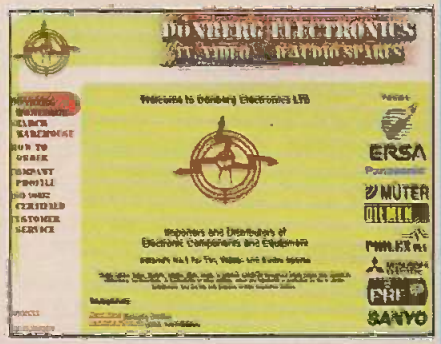
BBC

http://www.bbc.co.uk/enginfo

If you need any help with your reception go to this site – both of the addresses point here. There's special advice for people with loft installations, and caravaners and boating enthusiasts.

Dönberg Electronics

http://www.donberg.ie



As the leading distributor for the TV, Video and Audio trade in Ireland, we supply over 2000 shops & service dept with Audio-Video and TV spares, Semiconductors, Test Equipment, Service Manuals, Remote Controls etc. At present we stock over 30,000 different lines

EURAS International Ltd

http://www.euras.com/english

"The definitive fault index... based on feedback from manufacturers, technicians and workshops throughout Europe" IER Magazine. Available on CD-ROM including ECA vrt-disk 2000. Subscription includes free Internet access for update downloading, access to pin board, discussion forums and classified ad section. Monitor database also available.

Goot Products

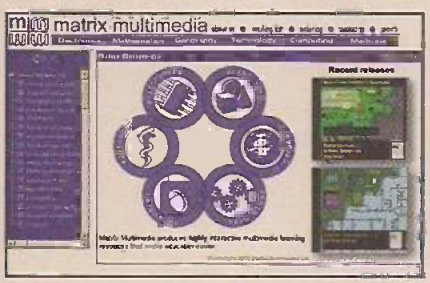
http://www.kieagoot.co.uk

Kiea Trading Company is the sole agent of Goot products, We specialise in supplying the soldering and desoldering product range manufactured by Goot Japan for the UK market. Goot uses advanced production technology to manufacture

high quality soldering iron products for industrial, professional and general purpose use.

Matrix Multimedia Ltd

http://www.matrixmultimedia.co.uk



Matrix Multimedia publishes a number of highly interactive CD ROMs for learning electronics including: Complete electronics course, Analogue filter design, and PICmicro(R) microcontroller programming (C and assembly).

M.C.E.S.

http://www.mces.co.uk

The MCES site gives details of our range of service including Tuners, Video Heads, RF & IF Modules plus latest prices and special offers.

MMWafercards

http://www.mmwafercards.com

Smartcards and programmers for all access-controlled applications. Incorporating www.satstore.co.uk

The Enthusiasts Satellite Store.
Tel 01386 48731
Fax 01386 765875

Mauritron Technical Services

http://www.mauritron.co.uk

The UK's leading independent supplier of Service Manuals and Operating Guides from valve to video. Also available on CD Rom or download direct from the internet.

PC Universe

http://www.pc-universe.net

PC Universe supplies core computer components at "WORLD-beating" prices. Our range of reliable brand name products is available to order online 24-7.
Nationwide delivery. Free Tech support at all levels. Call LO Call 0845 4585817

Sky digital repairs

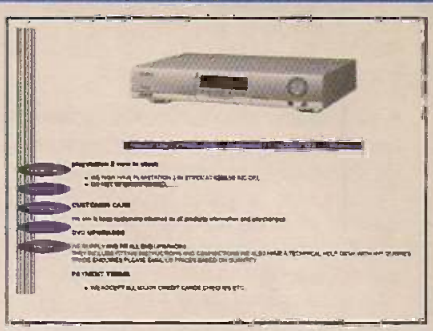
http://www.horizonsatellites.co.uk

The Horizon site gives details of our range of products and services including Sky Digital Receiver Repairs.

Servicing Advice

http://www.repairfaq.org/REPAIR/F_Repair.html

Here are some frequently asked questions about servicing consumer electronic equipment, with a US bias. But there's some good material on monitors and CD players and CD-ROM drives. (thanks to David Edwards for this information)



Switch-it-on

http://www.switch-it-on.co.uk

We sell multi-region dvd players to trade and public, also tv, videos, hifi and playstation 2. We design our own upgrades on dvd and we sell all spare parts. All makes and most models stocked.

Service Engineers Forum

http://www.E-repair.co.uk

The forum is now visited by Thousands of engineers every week, over 3000 pages of content including new repair tips, servicing articles, circuits, help, for sale, wanted & industry news sections, open access to the site is free to all engineers.
Our product mailing list is also available free of charge for engineers without net access, ring Mike on 0151 522 0053 with your address details.

Televes

http://www.televes.com/ingles/ingles.htm

Televes website was launched as an easier way to keep in contact with our World-wide Network of Subsidiaries and Clients. This site is constantly updated with useful information/news plus you can download info on our range: TV Aerials & accessories, Domestic and Distribution amplifiers, Systems Equipment for DTT and Analogue TV, Meters and much more.

The Service Engineers Forum

http://www.E-repair.co uk.

A brand new site dedicated to the needs of service engineers containing detailed servicing articles, circuits & repair tips. The site also includes for sale, wanted & special offer sections, industry news & much more. An impressive site well worth visiting.

For customers without net access, servicing product details are also available by ringing Mike on 0151 522 0053

Transworld Satellite

http://www.transworldsatellites.co.uk

Fifteen years experience serving enthusiast hobbyist, broadcasters, trade, complete range receivers, cams, programmers, cars, dishes, motors. with excellent technical support and friendly service. Telephone 01947 820999

UK Mailing List Group

http://www.egroups.com/list/uktvrepair

Following on from the newsgroup discussion last month there is a UK Email group for TV technicians where you can send an Email to everyone in the group.

There's just over 30 people in the group at present. For more details and how to register look at the egroup home page. Just a general comment though - you do have to be careful who you give your Email address to so that you can avoid "spamming" - that is getting lots of unwanted Email about dubious Russian site (amongst others).

PSA

http://www.psaparts.com

This web site gives details of various specialist parts for repairers, from rare semiconductors to compute batteries and printer parts. The vast majority of items are in stock, and can be purchased on-line via this sites shopping facility.

Radio Restoration Company

Edinburgh

Specialist repairs to Hacker & Roberts radios, postal service if required. All valve and transistor radios & rebuilds undertaken. Free estimates – trade welcome, large selection of radios large & small Etc, from 1920s on always available.
Contact:- Jamie Gillan 0131 2251475

Vintage Wireless Co London

http://www.vintagewirelesslondon.co.uk

Phone 0207 2583448 Fax 0207 2583449

Supplies of vintage hi-fi, wireless, sales & service, spare parts, valves, components, transformers, knobs, ceramic cartridges, stylus and more. Vintage hi-fi litreture, magazines, circuits. Wanted tannoys & early hi-fi audio valves for cash.

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Television **acknowledges your company's need to promote its web site, which is why we are now dedicating pages in every issue to announce your WEB ADDRESS.**
This gives other readers the opportunity to look up your company's name, to find your web address and to browse the magazine page to find new sites.

We understand that cost is an important factor, as web sites are an added drain on budgets. But we are sure you will agree that the following rates make all the difference:

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Lineage only will cost £150 for a full year, just £12.50 per month.
This includes your company's name, web address and a 25-word description.
Lineage with colour screen shot costs £350 for a full year, which equates to just £29.17 per month.
This price includes the above mentioned information, plus a 3cm screen shot of your site, which we can produce if required.

To take up this offer or for more information ring:

Company name	Web address

Answer to Test Case 468

– see page 111 –

It's always difficult to know exactly what is happening in the control system of equipment that has an I^2C or similar bus arrangement: few ordinary workshops have a means of analysing the pulse trains that come from a microcontroller chip.

Not all the commands are actually generated by the microcontroller chip however. Many are stored in an EEPROM memory, having been programmed into this device at the factory or by the installation technician or the user when setting up the receiver. They are called up and passed on to the microcontroller chip when the channel is changed, the brightness level is altered or whatever. With this particular fault, Television Ted suggested that the EEPROM chip could be corrupted. He urged RT to replace it before trying a new microcontroller chip. This was done. A new ST24C04 memory chip (IC002) cleared the problem, restoring normal sound from the Hitachi set.

In this and similar Hitachi models it's worth checking R718 and R719, which are near the line output transformer, whenever the EEPROM chip is damaged or corrupted. They are also vulnerable to the effects of flashovers and static electricity at large. To minimise such problems, check that the HT (and hence the EHT) is correctly set and such things as the tube bowl's earthing strip.

NEXT MONTH IN TELEVISION

Guide to the Thomson TX807 chassis

The Thomson Multimedia TX807 chassis is used in a wide range of models with tube sizes from 10 to 21in. It's designed for sets that sell at the economy end of the market. Mark Paul describes the technology it employs.

Fitting a satellite dish to a motor home

Tom Baker on the tricky business of installing a dish on a vehicle, and various other problems.

Optocoupler go/no-go checker

Optocouplers are commouly used to provide regulation feedback or standby/on switching in chopper power supplies that incorporate mains isolation. They tend to be troublesome. Ian Field presents a simple go/no-go tester

DVD player servicing

The concluding instalment in K.F. Ibrahim's series on DVD player technology concentrates on fault-finding procedures.

Test report: satellite installation meter

Nick Beer reviews a new meter for digital satellite TV installation and fault-finding, the Swires 2001 Digi-Sat.

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£1 BARGAIN PACKS
Selected Items

We have nearly 1,000 items of £1 Bargains. A comprehensive list will be available early November. You will get one if we are dispatching goods to you. If not, send us an SAE for this.

UNDER SCALE KNOB, engraved 0-10 for fitting under control knob, 3in. dia., pack of 2. Order Ref: 1074.

TV REMOTE CONTROLS. If it does not suit your TV, you could use it for other projects. FM bug, etc., pack of 2. Order Ref: 1068.

MES BATTEN HOLDERS, pack of 4. Order Ref: 126.

PAX TUBING, ¼in. internal dia., pack of 2, 12in. lengths. Order Ref: 1056.

2M MAINS LEAD, 3-core, black, pack of 3. Order Ref: 1021.

FERRITE SLAB AERIAL with coils, pack of 2. Order Ref: 1027.

WHITE TOGGLE SWITCH, push-in spring retain type, pack of 4. Order Ref: 1029.

HIGH CURRENT RELAY, 24V AC or 12V DC, 3 sets 8A changeover contacts. Order Ref: 1016.

FIGURES 8 MAINS FLEX, also makes good speaker lead, 15m. Order Ref: 1014.

6V SOLENOID with good strong pull, pack of 2. Order Ref: 1012.

IN-LINE FUSEHOLDERS, takes 20mm fuse, just cut the flex and insert, pack of 4. Order Ref: 969.

3.5mm JACK PLUGS, pack of 10. Order Ref: 975.

8µF 359V ELECTROLYTICS, pack of 2. Order Ref: 987.

MAINS PSU, 15V 350mA AC. Order Ref: 934.

15V+ 15V 1.5VA POTTED PCB MAINS TRANSFORMER. Order Ref: 937.

12V-0V-12V 6VA MAINS TRANSFORMER, p.c.b. mounting. Order Ref: 938.

EX-GPO TELEPHONE DIAL, rotary type. Order Ref: 904.

QUARTZ LINEAR HEATING TUBES, 306W but 110V so would have to be joined in series, pack of 2. Order Ref: 907.

REELS INSULATION TAPE, pack of 5, several colours. Order Ref: 911.

D.C. VOLTAGE REDUCER, 12V-6V, plugs into car socket. Order Ref: 916.

CAR SOCKET PLUG with p.c.b. compartment. Order Ref: 917.

SOLENOID, 12V to 24V, will push or pull, pack of 2. Order Ref: 877.

MICROPHONE, dynamic with normal body for hand holding. Order Ref: 885.

LIGHTWEIGHT STEREO HEADPHONES. Order Ref: 989.

3M 2-CORE CURLY LEAD, 5A. Order Ref: 846.

DELAY SWITCH on B7G base. Order Ref: 854.

THERMOSTAT for ovens with ½in. spindle to take control knob. Order Ref: 857.

MINI STEREO 1W AMP. Order Ref: 870.

13A ADAPTORS to each take 2 plugs, pack of 2. Order Ref: 820.

C/O MICROSWITCHES, operated by a wire control to spindle through side, pack of 4. Order Ref: 786.

REED SWITCH, flat instead of round so many more can be stacked in a small area. Order Ref: 796.

MAINS CIRCUIT BREAKER, 7A push-button operated. Order Ref: 802.

½ MEG POTS, each fitted with double-pole switch, pack of 2. Order Ref: 780.

SLIGHTEST TOUCH CHANGEOVER MICRO-SWITCHES, main voltage, pack of 2. Order Ref: 748.

1920 VINTAGE RESISTORS, you've probably never seen any quite like these, pack of 2. Order Ref: 695.

REED RELAY KITS, you get 8 reed switches and 2 coil sets. Order Ref: 148.

NEON INDICATORS, in panel mounting holders with lens, pack of 6. Order Ref: 180.

12V SOLENOID, has good ½in. pull or could push if modified. Order Ref: 232.

IN HANDLE MAINS ON/OFF SWITCHES, sometimes known as pistol grip switches, pack of 2. Order Ref: 839.

PROJECT BOX, size approx. 100mm x 75mm x 24mm, it's lid is a metal heatsink. Order Ref: 759.

TWO CIRCUIT MICROSWITCH. Order Ref: 825.

£50 WORTH OF VERY USEFUL COMPONENTS FOR ONLY £2.50

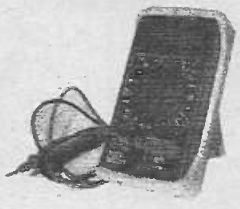
For the next two months we are offering three additional buy-one-get-one-free parcels.

The first and most wonderful value offer is the **ASTEC POWER SUPPLY UNIT,** Ref. BM51052, our Order Ref: 5P188. This contains about £50 worth of very useful components, some of which are a 250V bridge rectifier, 2 other full-wave rectifiers mounted on a heatsink, a power transistor mounted on its own heatsink, a 12V two changeover relay, a thermal safety cut-out, at least ten electrolytics of varying voltages and capacities, a normal mains transformer, a ferrite-cored transformer and, of course, dozens of other components which you will buy at about one tenth of the real value. Now 2 for £5.

The second item is the ever useful QUICK HOOK-UPS. These have been 10 for £2, but for the next two months you get 20 for £2. Order Ref: 2P459.

The third one is a very useful **POWER SUPPLY UNIT,** our Ref: 6P23. This is officially rated at 13½V, just under 2A but on test we find that it works quite well giving 12V at 2A. It would also charge 12V batteries. Normal price £6, but you get 2 for £6.

SELLING WELL BUT STILL AVAILABLE



IT IS A DIGITAL MULTITESTER, complete with backrest to stand it and hands-free test prod holder. This tester measures d.c. volts up to 1,000 and a.c. volts up to 750; d.c. current up to 10A and resistance up to 2 megs. Also tests transistors and diodes and has an internal buzzer for continuity tests. Comes complete with test prods, battery and instructions. Price £6.99. Order Ref: 7P29.

INSULATION TESTER WITH MULTIMETER. Internally generates voltages which enable you to read insulation directly in megohms. The multi-meter has four ranges. AC/DC volts, 3 ranges DC milliamps, 3 ranges resistance and 5 amp range. These instruments are ex-British Telecom but in very good condition, tested and guaranteed OK, probably cost at least £50 each, yours for only £7.50 with leads, carrying case £2 extra. Order Ref: 7.5P4.

REPAIRABLE METERS. We have some of the above testers but slightly faulty, not working on all ranges, should be repairable, we supply diagram, £3. Order Ref: 3P176.

1mA PANEL METER. Approximately 80mm x 55mm, front engraved 0-100. Price £1.50 each. Order Ref: 1/16R2.

VERY THIN DRILLS. 12 assorted sizes vary between 0.6mm and 1.6mm. Price £1. Order Ref: 128.

EVEN THINNER DRILLS. 12 that vary between 0.1mm and 0.5mm. Price £1. Order Ref: 129.

D.C. MOTOR WITH GEARBOX. Size 60mm long, 30mm diameter. Very powerful, operates off any voltage between 6V and 24V D.C. Speed at 6V is 200 rpm, speed controller available. Special price £3 each. Order Ref: 3P108.

FLASHING BEACON. Ideal for putting on a van, a tractor or any vehicle that should always be seen. Uses a Xenon tube and has an amber coloured dome. Separate fixing base is included so unit can be put away if desirable. Price £5. Order Ref: 5P267.

MOST USEFUL POWER SUPPLY. Rated at 9V 1A, this plus into a 13A socket, is really nicely boxed. £2. Order Ref: 2P733.

MOTOR SPEED CONTROLLER. These are suitable for D.C. motors for voltages up to 12V and any power up to 1/6h.p. They reduce the speed by intermittent full voltage pulses so there should be no loss of power. In kit form these are £12. Order Ref: 12P34. Or made up and tested, £20. Order Ref: 20P39.

LARGE TYPE MICROSWITCH with 2in. lever, changeover contracts rated at 15A at 250V, 2 for £1. Order Ref: 1/2R7.

BALANCE ASSEMBLY KITS. Japanese made, when assembled ideal for chemical experiments, complete with tweezers and 6 weights 0.5 to 5 grams. Price £2. Order Ref: 2P44.

CYCLE LAMP BARGAIN. You can have 100 6V 0-5A MES bulbs for just £2.50 or 1,000 for £20. They are beautifully made, slightly larger than the standard 6.3V pilot bulb so they would be ideal for making displays for night lights and similar applications.

SOLDERING IRON, super mains powered with long-life ceramic element, heavy duty 40W for the extra special job, complete with plated wire stand and 245mm lead. £3. Order Ref: 3P221.

TWO MORE POST OFFICE INSTRUMENTS. Both instruments contain lots of useful parts, including sub-min toggle switch sold by many at £1 each. They are both in extremely nice cases, with battery compartment and flexible carrying handles, so if you don't need the instruments themselves, the case may be just right for a project you have in mind.

The first is **Oscillator 87F.** This has an output, continuous or interrupted, of 1kHz. It is in a plastic box size 115mm wide, 145mm high and 50mm deep. Price only £1. Order Ref: 7R1.

The other is **Amplifier Ref. No. 109G.** This is in a case size 80mm wide, 130mm high and 35mm deep. Price £1. Order Ref: 7R2.

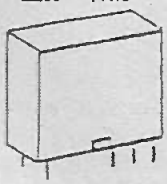
HEAVY DUTY POT. Rated at 25W, this is 20 ohm resistance so it could be just right for speed controlling a d.c. motor or device or to control the output of a high current amplifier. Price £1. Order Ref: 1/33L1.

RELAYS

We have thousands of relays of various sorts in stock, so if you need anything special give us a ring. A few new ones that have just arrived are special in that they are plug-in and come complete with a special base which enables you to check voltages of connections of it without having to go underneath. We have 6 different types with varying coil voltages and contact arrangements. All contacts are rated at 10A 250V AC.

Coil Voltage	Contacts	Price	Order Ref:
12V DC	4-pole changeover	£2.00	FR10
24V DC	2-pole changeover	£1.50	FR12
24V DC	4-pole changeover	£2.00	FR13
240V AC	1-pole changeover	£1.50	FR14
240V AC	4-pole changeover	£2.00	FR15

Prices include base



MINI POWER RELAYS. For p.c.b. mounting, size 28mm x 25mm x 12mm, all have 16A changeover contacts for up to 250V. Four versions available, they all look the same but have different coils:

6V Order Ref: FR17
12V Order Ref: FR18
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Price £1 each less 10% if ordered in quantities of 10, same or mixed values.

NOT MUCH BIGGER THAN AN OXO CUBE. Another relay just arrived is extra small with a 12V coil and 6A changeover contacts. It is sealed so it can be mounted in any position or on a p.c.b. Price 75p each, 10 for £6 or 100 for £50. Order Ref: FR16.

RECHARGEABLE NICAD BATTERIES. AA size, 25p each, which is a real bargain considering many firms charge as much as £2 each. These are in packs of 10, coupled together with an output lead so are a 12V unit but easily dividable into 2 x 6V or 10 x 1.2V. £2.50 per pack, 10 packs for £25 including carriage. Order Ref: 2.5P34.

BIG POWER RELAY. These are open type fixed by screws into the threaded base. Made by Omron, their ref: MM4. These have 4 sets of 25A changeover contacts. The coil is operated by 50V AC or 24V DC, price £6. Order Ref: 6P.

SIMILAR RELAY but smaller and with only 2 sets of 25A changeover contacts. Coil voltage 24V DC, 50V AC, £4. Order Ref: 4P.

BIG POWER LATCHING RELAY. Again by Omron, their ref: MM2K. This looks like a double relay, one on top of the other. The bottom one has double-pole 20A changeover contacts. The top one has no contacts but when energised it will lock the lower relay either on or off depending on how it is set. Price £6. Order Ref: 6P.

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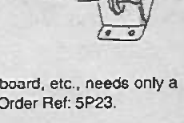

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- Display of picture of selected synthesized channel.
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- Possibility of 32 programs memorized per frequency band.
- Display (2 Lines of 16 characters).
- Range of measurement of signal strength from 20 to 120 dBµV, manual or automatic attenuator.
- Battery life about 1 hour 20 minutes, weight 5,8 Kg.
- Display of full-band and 4 possible expanded spectrums.
- Channels and frequency plans of cable and TV standards memorized.
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The panoramic field strength meter MC30A combines in one instrument all the functions necessary for installing and checking TV or satellite reception, both analogue and digital. The visualization of the spectrum and the picture allows the carrying out of all the necessary adjustments with this one instrument. The high technology used in the MC30A allows a range of possibilities unheard of in a instrument in this price category.

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- Frequency indication with 4 digit LCD display.
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TC-402 A/D

TC 80 A/D

The TC 80 A/D has been designed for the reception of TV Satellite systems.

- Analogue and digital measurement.
- Full Band Frequency Sweep.
- Switchable 14 v or 18 v LNB power supply + 22 KHz tone switching
- Rechargeable 12 v / 2,6 Ah Battery.
- Weight including batteries: 3,3 Kg.

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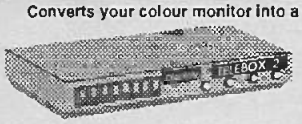

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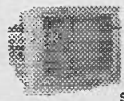

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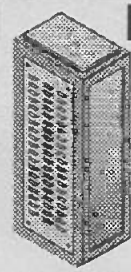

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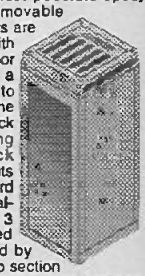

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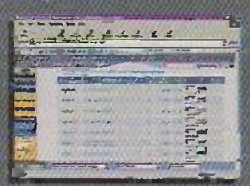

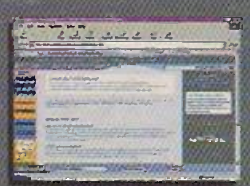

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