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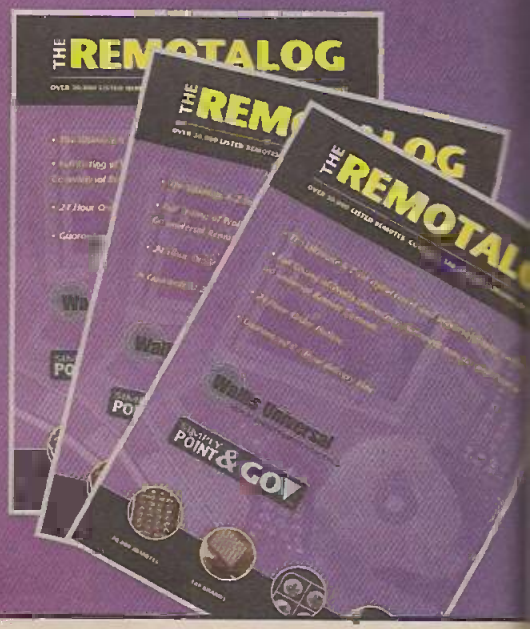

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Service registration

A lot of people put a lot of effort into trying to get the Retra-sponsored scheme for registering consumer-electronics service providers, along similar lines to the CORGI scheme for gas fitters, off the ground. Sadly, it failed to do so. It may be relevant that our trade has always been highly fragmented, with numerous small firms and individuals providing service for the public. However that may be, it would be difficult to get everyone involved to agree to and implement a registration scheme, despite the advantages it would provide for both the public and the trade. There are at least two major problems: cost, and the time and effort required. Retra did its best. During last summer it ran a pilot scheme, but by the date the 91 participating dealers should have returned their self-assessment forms, in early September, only 21 had done so. As a result, the Retra Council decided to drop the idea. It had become clear that there was insufficient commitment.

All has not been lost however: the Association has used the work put into the scheme to update its code of practice. But this is not the same thing, and falls far short of what some feel strongly is required – that some form of regulation, possibly backed by legislation, should be introduced to protect the public against those notorious cowboys and establish high service standards that the public knows about and is prepared to pay for.

It would indeed be nice to have mandatory standards, compulsory registration and a licensing system that the public recognised, but isn't it all, especially with the current state of the trade, rather pie in the sky? We all know that basic servicing costs and the current low prices of most consumer electronics products make the repair trade a difficult, barely economic business. How can those scraping a bare living be expected to fork out the not negligible sums that would be required to make the system work? It would require administration, a way of setting standards, and inspection to ensure that they are being observed. Who has the time and the resources, even if they have the will? There are clearly some well-established and well-run companies that could cope with all this without too much difficulty. Equally there are far more that would find it an extra burden they are unable to take on. Whether you could or couldn't manage, i.e. your economic and trade situation, can vary greatly with local conditions. It is clear that over much of the UK it is, today, extremely difficult to provide the public with a brown goods servicing facility and at the same time make a decent living. Some evidently believe that, if sufficient effort was put into regulation, it would eventually pay for itself as a result of the public confidence and esteem created. But that could take a long time – and time is against us at present.

Do I sound unduly pessimistic? My feeling is that the cowboy problem has always tended to be over emphasised. Cowboys exist and are a nuisance, true. But cowboys can't continue to con the public indefinitely – unless they get some help from those who are technically proficient. The worst cowboys soon give up and try something else, especially in today's trading conditions. Apart from the economics involved, there is the fact that equipment is becoming far too sophisticated for the cowboy to be able to handle. The public also has some protection in the form of the local trading standards officers.

There are those who feel that the public should be free to get whoever they want to service their domestic electronic equipment, despite the fact that there are safety risks. It is not easy to establish a fair balance between freedom and regulation. Those who are competent and capable of providing a good service will soon become known locally and establish a good reputation, which is half the battle. Appalling things can be done by the incompetent, but you could never eliminate this entirely – and the most dangerous botching is perpetrated by the public itself.

In an ideal world you could legislate and drive up standards. The public would appreciate and happily pay for the high standards. But we don't live in an ideal world. What CORGI has achieved may not be practical in the consumer electronics field. People are, sensibly, scared of gas. TV sets may catch fire, but they don't explode and demolish your front room. For many years fail-safe design has been a feature of consumer electronics goods. There is not quite the degree of public concern that there is with gas.

Good engineers and service companies should be able to establish a reputation for fairness and competence, which will provide a firm foundation for their business, but the main problem today is to generate sufficient work. The Retra scheme failed to get off the ground, but there are two other organisations that are committed to good service standards, DASA and Descoe. DASA (the Domestic Appliance Service Association) never really caught on in the consumer electronics field, but Desco (the Domestic Electronic Service Centres of Excellence scheme), which is run by Retra Council member Chris Keeble, is doing the right sorts of things in the present difficult conditions. They are both deserving of support. You can contact DASA at 71 The Maltings, Stanstead Abbotts, Herts SG12 8JG (phone 01920 872 464) and Descoe at Sound and Vision Electronics, 26 The Triangle Shopping Centre, Frinton-on-Sea, Essex CO13 0AU (phone 01255 673 766).

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INDEXES AND BINDERS

Indexes for Vols. 38 to 49 are available at £3.50 each from SoftCopy Ltd., who can also supply an eleven-year consolidated index on computer disc. For further details see page 184.

Binders that hold twelve issues of *Television* are available for £6.50 each from Television Binders, 78 Whalley Road, Wilpshire, Blackburn BB1 9LF. Make cheques payable to "Television Binders".

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REED BUSINESS INFORMATION

TELETOPICS

DVD developments

Warner Home Video has developed an extension to the DVD Regional Coding system. Called Regional Coding Enhancement (RCE), the extension is designed to stop so-called Region Zero players playing Region 1 discs from the USA. RCE works by asking a player whether it's a Region 1 player and then if it's a Region 2 (European) player. If the answer to both questions is yes, the player is assumed to be a Region Zero machine and the disc can't be played. Instead an on-screen message is displayed telling the viewer that there is no fault with the disc but that it may be necessary to consult the retailer from whom the machine was bought or the manufacturer.

The first DVD title to use RCE is Columbia's *The Patriot*. Initial reports suggest that RCE is effective with some Region Zero players but not with others.

Sony, Philips and Pioneer have developed a prototype high-density DVD system known as DVD-Blue. It uses a blue laser (wavelength 405nm) and can store up to 22·5Gbytes of data on the single side of a 12cm disc. This is sufficient for up to eight hours of standard-definition TV pictures or two hours of high-definition TV recording. The problem with blue lasers at present is their limited life span.

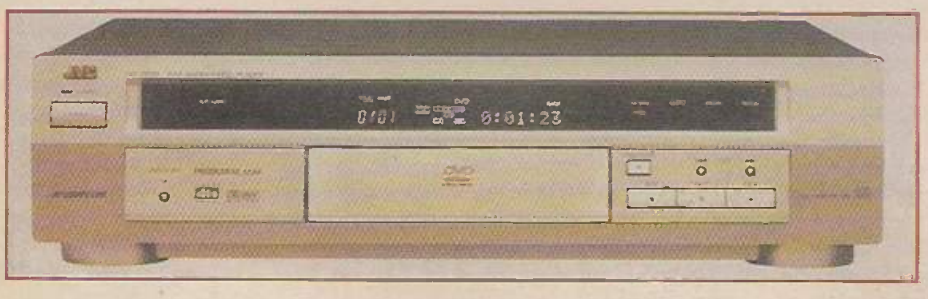
Toshiba has launched, in Japan, a combined DVD-RAM and hard-disk recorder. The machine, Model RD2000, went on sale in December. It has a 30Gbyte hard-disk drive and a 4·7Gbyte DVD-RAM drive, enabling up to 33·5 hours of video images to be stored on the hard disk and 4·5 hours on the DVD-RAM at a data transfer rate of 4·5Mbits/sec.

Editing between the hard-disk drive and the DVD-RAM is possible, and the viewer can select either of four recording modes. These are standard play (4·5Mbits/sec), long play (2·2Mbits/sec), manual (manually selectable between 2·9·8Mbits/sec in 0·2Mbits/sec steps) and 'just' (the transfer rate is determined by the capacity remaining on the DVD-RAM disk, regardless of the hard-disk drive capacity). Live TV programmes can be paused and recorded simultaneously, and the RD2000 has a number of library functions.

The combi recorder can also read DVD-Video, Video CD and audio CD discs. There are S-video and composite video input terminals, while the output terminals include DI1 (digital), component video, S-video and composite video. Weight is 8·9kg and the price in Japan the equivalent of about £1,765. There are at present no details of a UK launch.

Toshiba has launched two DVD-Audio players, Models SD500 E and SD900E, which can also play DVD-Video, audio CD, CD-R and CD/RW discs and incorporate Dolby Digital and DTS decoders, with six channel outputs at the rear. Model SD900E is equipped with 3D-DNR, which is designed to suppress noise that enters the software at the time of mastering and noise on the original film.

JVC's first DVD-Audio player for the European market, Model XV-D723GD, (see picture left) has built-in Dolby Digital, DTS and MPEG decoders which are compatible with MLP (Meridian Lossless Packing – see page 152 for more on this). On the video side there's an MPEG decoder, a graphics chip and a 10bit/54MHz DA converter. The graphics chip includes VFP, a JVC exclusive, which enables the user to set up the quality of the display according to personal preference. There are variable zoom ratios: 14 steps from x1/16 up to x1,024.



New TV/Video chips from Philips

The Nexperia chip set has been introduced by Philips Semiconductors for use in next-generation consumer set-top boxes. The aim is facilitate change in the way TV is used by combining digital video, audio, graphics and internet operation with interactive facilities. The pnx8320 chip integrates the functions assumed for low- to mid-range STBs, including video recording, internet browsing and digital audio. The higher-specification pnx8500 provides high-definition video and 3D graphics. The chips incorporate a 133MHz processor and unified memory architecture. They can be used with terrestrial, satellite or cable TV systems. Audio decoding includes MPEG-2, Dolby Digital, MP3 and G.729. There are seven versions of the pnx8320 to give STB designers optimum flexibility. Acer, the world's third largest PC manufacturer, is developing an advanced interactive STB with hard-disk recording based on the pnx8500. Software-based operation enables new features, applications and services to be added remotely without the need for hardware upgrades.

Philips Semiconductors has also launched a second-generation 'GreenChip', the TEA1507, for use in TV set, monitor and VCR chopper power supplies. It provides a further ten per cent power saving in the standby mode compared to the first-generation GreenChip, and is already being used by three leading international TV manufacturers in their 2001 designs.

The TEA1507 has a high level of integration, its very low peripheral component count providing a cost-effective power supply. The chip enables a product to operate with optimal efficiency at all power levels, including quasi-resonant operation at high power, fixed frequency at medium power, and reduced frequency in the low-power (standby) mode. Valley switching is enabled in all modes for maximum efficiency. With burst-mode operation, the standby power consumption can be reduced below 1W. By combining the chip with Philips' STARplug system, standby levels of 100mW can be achieved.

The chip has comprehensive protection features, such as safe-mode restart under fault conditions; continuous-mode protection by means of demagnetisation detection (zero switch-on current); accurate, adjustable overvoltage protection; short-circuit winding protection; under and over input voltage protection; and low, adjustable excess current protection. To improve overall system protection, a novel mains-independent 'over power protection' has been added.

While the first-generation GreenChip used a 14-pin DIP package, the TEA1507 is encapsulated in a simple 8-pin DIP package.

Philips/LG to merge CRT interests

Philips and LG Electronics are to form a 50:50 joint venture that will combine their CRT manufacturing interests. The new company will be the largest CRT manufacturer in the world. At present Philips is the leading supplier of TV CRTs worldwide while LG has the number three position in CRTs for monitors. Combined sales will run at some £3·75bn a year, and the company will have about 36,000 employees.

Last year the two companies formed a joint LCD venture called LG Philips. In addition to CRTs the new venture will, following valuations, include the plasma display activities of the two companies. The new company will be legally established in The Netherlands with its operational headquarters in Hong Kong. Arrangements for the venture should be completed in the first half of 2001. The aim is to establish a clear cost leadership in a fiercely competitive, mature world market. Philippe Combes, chief executive of Philips Display Components, will head the new company.

Digital TV

According to the *Pace Report 2001* the number of digital TV subscribers in the UK more than doubled between 1999 and 2000, from 13 per cent to 28 per cent. Pace is working with Philips Remote Control Systems and HighPoint Systems to develop Shopping Mate, a hand-held device designed for networked homes. Use of Shopping Mate will enable consumers to order goods by scanning them whilst shopping and sending the data to their digital set-top box at home. From there, the orders will be sent to the retailer.

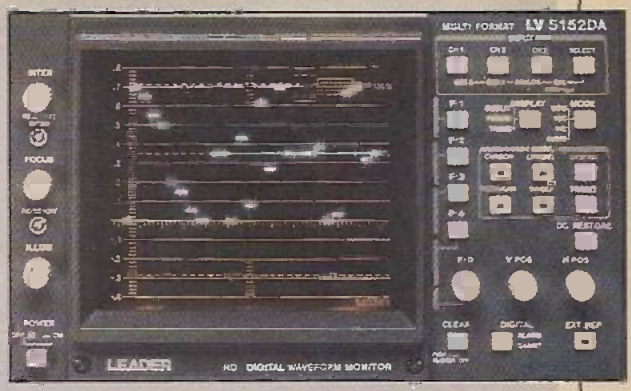
Microsoft and Two Way TV, the UK interactive TV company, have signed a letter of intent with the prospect of incorporating Two Way TV's technology in the Microsoft digital TV system in Europe and North America.

Satellite news

Astra 2B is now in operation at 28·2°E. It has up to thirty Ku-band transponders, with 109W travelling-wave tube output amplifiers, operating in the range 11·70-12·75GHz. Astra 2A and 2B enable SES to deploy up to forty transponders in the BSS frequency band (11·70-12·50GHz). With its steerable aerials 2B can also activate up to sixteen transponders for operation outside Europe in the band 12·50-12·75GHz. Astra 2D should by now be in orbit at the same position, with 2C due to follow in June. 1D is being kept in operation at 28·2°E until 2D is brought into full service.

SES has signed an agreement with Deutsche Telekom for a new satellite, Astra 3A, which will be positioned at 23·5°E to provide TV and data services for German-language markets.

Eutelsat has signed an agreement with the Russian Satellite Communications Company (RSCC) to purchase twelve of the eighteen Ku-band transponders aboard the Express AM1 satellite, which is due to be positioned in orbit at 40°E in early 2003. The transponders will increase Eutelsat's coverage of southern Europe, North Africa, the Arab peninsula and the Indian sub-continent.



Leader Instruments Corporation has announced a new, upgraded HDTV digital/analogue waveform monitor, Model LV5152DA. Several important operating features have been added, including the ability to handle 14 HDTV formats including 30 (29·97) Hz progressive, 30Hz sF and others. Selection is automatic, and includes colourimetry to match the selected system. Detection and logging of colour gamut errors is provided, and a powerful addition is the separation of embedded AES/EBU digital from the signal being processed, with eight output channels in four pairs. In addition a readout in hex of all data points on a selected raster line is provided, with the choice of manual line selection or line capture as a result of a detected TRS error. There are extensive monitoring functions, including waveform, vector, picture and stereo.

The error detection system spots CRC errors in video (Y and C), audio and ANC data. The time of the first error is shown along with total error count and time elapsed to facilitate BER determinations.

The LV5152DA is available in the UK exclusively from Thurlby Thandar Instruments Ltd., 2 Glebe Road, Huntingdon, Cambs PE18 7DX. Phone 01480 412 451, fax 01480 450 409.

Labgear buyout

Labgear, a leading manufacturer of TV, radio and satellite reception equipment (aerials, amplifiers, distribution equipment etc.) with a history that goes back nearly seventy years, has been bought by its management. Previous owner Teleste Corporation of Finland announced its intention to sell the company at the beginning of 2000. Labgear employs about 100 staff at Cambridge and Ely. Its main work at present is the development of products for the digital TV market in the UK.

Vann Draper Electronics, world-wide distributor for Grundig Test Instruments, has introduced a range of three new automatic LCR meters. Model RLC300 is an automatic/manual instrument for professional applications, with eight measuring parameters, tolerance and relative results, level and phase, four test frequencies and two voltages for electrolytics and polarisation. Model RLC200 has a reduced specification and a basic resolution of 0·2%. With Model RLC100 the resolution is 0·5%.

For further details apply to Vann Draper Electronics Ltd., Stenson House, Stenson, Derby DE73 1HL. Phone 01283 704 706, fax 01283 704 707 or e-mail sales@vanndraper.co.uk

WHAT A LIFE

TV problems: strange customers and strange faults. Some moans, including modern audio equipment and current BBC programming. Donald Bullock's TV/video commentary

I was first to get to the workshop the other morning, except for three odd-looking fellows who were waiting at the door. Two had television sets with them. They trooped in after me.

Early birds

"By the way, I was recommended to come here by Snoddy's – that tall, thin chap it was" said the long and greasy-haired fellow, who was untidily dressed in a black leather outfit and carried a Pye portable set.

"Oh dear" I muttered, as I gave him a quick glance up and down. "Er, unusual outfit, that."

"Ah, I'm a biker, see" he replied.

I looked about but couldn't see a motorcycle. "Where's your bike then?" I asked.

"Haven't got one yet, by the way" he replied. "Oh, and by the way, I'd like you to repair this telly."

I pulled up a job card. "Name, please?" I asked.

"Carruthers-Smythe" he replied.

Obviously immature I thought, noting the name down. Then I waved him out and looked at the next fellow.

He grinned and pointed to a van across the street. "I've brought our Mitsubishi TV for repair, so to speak" he said. "It's a big 'un, so to speak. Can you help me with it?"

I breathed in ten pints of air and followed him to the van. The set was a monster Mitsubishi job, with 29in. tube. I contemplated running away, but decided to face up to it.

As we waltzed it across the road and into the shop there was a chorus of tooting motor horns while a blue-haired woman hollered that we were a pair of louts who deserved the birch.

Having put the set down and recovered my breath, I drew up another job card and glanced up at him.

"Mainwaring-Chapman" he said. "and incidentally the picture's a mass of patterns, so to speak."

I nodded grimly and waved him out too. Mr. Loony I wrote on the card and tucked it into the back of the set. Then I turned to the other chap, who was sitting on the set he'd brought in.

"Before we go any further" I said, "could you tell me your name?"

"Mr Harmsworth-Jukes" he replied, "does that seem a good idea?"

"It fits" I said, "what's wrong with the set? Nervous breakdown?"

The chap doubled up and broke into a peculiar laugh. "Cyuk, cyuk, cyuk, harrrr . . . cyuk, cyuk, cyuk, harrrr . . ." Eventually he stopped and pulled himself together.

"It's a Philips set" he said. "Went dead yesterday, so I thought I'd better get it repaired. Does that seem a good idea?"

"As good as any I've heard so far today" I said.

As he left I wondered whether I should consult one of those counselling people, as the Reverende Goode did when an overhead pigeon chose him. But I decided to soldier on.

A Philips GR1-AX

The Pye set was a 37KV1242/05B 14in. portable, which uses the Philips GR1-AX chassis. Steven took it on. The pre-tuned pictures were hazy with severe flickering at the top of the screen. He tried tuning other programmes and found that the tuning bar skipped through each channel and stopped just after it.

We'd had this problem before with the chassis and had found that slightly retuning the AFC tank coil L5045, which is just to the left of the TDA8305 IF/time-base generator chip IC7020, did the trick. Steven found that the same action cured this set.

The Monster Mitsubishi

When we switched on the monster Mitsubishi set, which was fitted with the Euro 4 chassis, it displayed severe hori-

zontal patterning. This improved a bit as the set warmed up.

It seemed to me that the cause of the trouble was radiation from the chopper power supply, so we decided to check the electrolytics on the secondary side. We found three that were virtually open-circuit, two in the 5V supply and one in the 12V supply. The latter was C920 (470µF, 25V), which is the reservoir capacitor at the input to the 12V regulator IC901. The two in the 5V supply were at either side of the 5V regulator IC903 – C922 (100µF, 25V) and C923 (100µF, 10V). We decided to upgrade them to 105°C types.

Once the replacements had been fitted the set produced an excellent picture.

A Philips AA5

The Philips set, which was fitted with the AA5 chassis, was dead and tripping. Paul was handling this one. He soon found that there was a short in the line output stage, and was relieved to find that the line output transistor had substantial base-to-collector leakage. A replacement made no difference however. After some further checking, he suspected the line output transformer. We had a new one in stock, so this was installed. Again there was no difference, and we found that the original one worked all right in a similar set. So it seemed a good idea to return it to Harmsworth-Jukes' set.

Paul continued with his checks and eventually alighted upon C2450 (680nF, 250V), which is the scan coupling/S-correction capacitor. When he took it out he noticed that there was a hairline crack around its case. It read dead short when checked.

A replacement cleared the fault, and we noticed that the set produced a particularly good picture. A number of similar Philips small-screen (14-20in.) chassis, such as the Anubis A, use a similar line scan circuit with a coupling capacitor of similar value – the value fitted depends on tube size and type.

Flashing lines

"Mr Bullock, I have been on a wild duck hunt trying to find you. I am all at sixes and sevens, for I am in agony with my wife."

I gave Mr Kostonoski my full attention. His cap was almost two feet across: I decided not to take him up on that but concentrate on his misery.

"Now look. Together we can crack this, I'm sure" I said, "please tell me more."

"All the time flashing lines" he continued, "any more I cannot stand and I am taking the cow by the horns."

He spun round, ran to his old car and returned with a 20in. Ferguson set, Model T51F. It's fitted with the TX91 chassis. We pulled it on to a bench and switched it on. Sure enough the picture it produced was covered with flashing, horizontal lines. Mr Kostonoski began to jump about. "It's agony" he cried.

We told him it would probably be OK if he called later and then concentrated on the set itself. Steven suggested that we try it out with a signal fed in via a scart lead. When he plugged one in there was a perfect picture.

"We'll have a look at the IF circuitry" he said, "the BC858C surface-mounted transistors there can cause this sort of trouble – TH02, TH03 and TH04." It didn't take him long to replace them. He then plugged the aerial in again and switched on. A normal picture then appeared.

When Mr Kostonoski returned later that day he was all smiles. "How pleased to see it I am" he declared, "I am delightful."

Moans and groans

My first moan this month is about a fairly expensive Aiwa audio system I took from England to Spain so that I could enjoy the high technical quality of the BBC's radio programmes via satellite and play my carefully remastered CD Bing and Bix records. The unit, which is full of irritating and superfluous gimmicks, is designated the "NSX999 System with CX-N999 Centre Unit and SX-N999 Speaker System". My main complaint is about the built-in reverberation circuit that distorts the sound. I can't adjust it out. The best results I have been able to manage are muzzy and lacking in HF response.

Son James tells me that in a recent television programme a similar modern Japanese product was compared and examined side by side with an older British sound system. The older system produced consistently high-quality sound and the programme's expert demonstrated that, while the modern system was capable of such quality, it took him a lengthy time, adjusting and manipulating the controls, to achieve it. Once the system was switched off, the high quality was lost – the lengthy adjustment procedure had to be repeated.

Since the remedy for the Aiwa's poor results completely eluded me, I put it aside and brought back into use the twelve-year old Sony system I'd previously decided to retire. Early in October I wrote to Aiwa asking for help. As yet there has been no reply.

BBC TV

My second moan is about the deterioration of BBC television. We older fellahs always knew it would happen once commercial television was let loose in Britain, but few of us imagined how low it would sink. Today's programmes don't compare with those of ten years ago, or even of five years ago. Anything regarded as being even faintly intellectual is pushed towards midnight or beyond. Normally when you switch on you are confronted with 'comedy' programmes that feature sub-standard bores, dirty-mouthed yobbos or both. Entertainment today just doesn't have the quality of Morcambe and Wise, Tommy Cooper and the Two Ronnies.

This is not the only trouble. The BBC's airwaves are now crammed with aggravating and time-consuming gimmicks and fake 'commercial' adverts, there presumably to lull some into thinking that they are actually watching ITV. More often than not previously straight programmes, such as the news, are accompanied by a curious and intrusively discordant pumping noise – something copied from Sky News. It's time that adults were once again put in the charge of BBC programming.

A while ago Greeneyes and I spent some hours at the Spanish home of Edmundo Ros and his wife. They are a charming couple. When we were told that a programme called the Edmundo Ros story was to be transmitted one evening we wanted to see it. An examination of the evening's programme list on digital television revealed no mention of Edmundo Ros however. So we switched about in the hope that the programme list was faulty and that we'd stumble across it. We did, though not until it was half over. And the reason we failed to find it in time was that it was entitled not the Edmundo Ros story but I sold my Cadillac to Diana Dors. It subsequently went out more than once on the BBC Knowledge channel – as The Edmundo Ros Story of course.

BBC Radio is now little better. The old Light Programme, now pushed as Radio Two, used to present each morning a programme of varied popular music aimed at housewives but enjoyed by all, with a new and well-known presenter each week. It's now a wearisome presentation with commentary that seems to go on for ever. The records played are excruciating. And if you should switch on in the afternoon, prepare to suffer the awful and continuous self-congratulatory nasal whining of an odd Australian.

I feel better now.

The with-it Bullocks

Incidentally we now have a web site: www.bullock-bros.com

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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
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F16 CHASSIS	LINE	GOODKIT1
F16	PSU	GOODKIT1
F16	VIDEO	GOODKIT1
GRUNDIG		
CUC 7350		GRUNDIGKIT1

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AV29SX1EN1F	FIELD O/P KIT	JVCKIT1
AV29SX1PF	FIELD O/P KIT	JVCKIT1
AV29TSIE1	FIELD O/P KIT	JVCKIT1
C14E1EK	PSU	ONWAKIT
C14T1EK	PSU	ONWAKIT
C21ET1EK	PSU	ONWAKIT
CS21M3EK	PSU	ONWAKIT
MATSUI		
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1498	PSU	ONWAKIT
2086	PSU	ONWAKIT
2098	PSU	ONWAKIT
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21V1T		GRUNDIGKIT1
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AV1 SERIES	PSU	MITSKIT3
CT1M5B	PSU	MITSKIT3
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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
CT25AV1B	PSU	MITSKIT3
CT25AV1BS	PSU	MITSKIT3
CT25AV1BD	PSU	MITSKIT3
CT25AV1BDS	PSU	MITSKIT3
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CT28AX1BD	PSU	MITSKIT3
CT28AV1BDS	PSU	MITSKIT3

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CT29A4	TDA 8178S	MITSKIT2
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CT29B2	TDA 8178S	MITSKIT2
CT29B3	TDA 8178S	MITSKIT2
CT29B6	TDA 8178S	MITSKIT2
CT33B3	TDA 8178S	MITSKIT2
M5 SERIES	PSU	MITSKIT3
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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
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GR2.1 CHASSIS	SOPS	PHILKIT1

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59CS05H	POWER / LINE	SHARPKIT2
59CSD8H	POWER / LINE	SHARPKIT2
66CS03H	POWER / LINE	SHARPKIT2
66CS05H	POWER / LINE	SHARPKIT2
66CSD8H	POWER / LINE	SHARPKIT2
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35065920		THORNKIT1
FV70	PSU	THORNKIT1
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ICC7 CHASSIS	FRAME KIT	THOMKIT3
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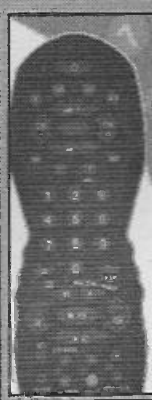

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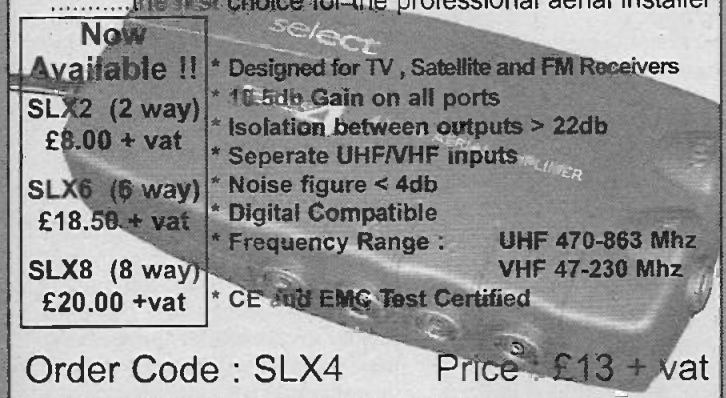

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Might WAP

You've probably heard a lot about WAP recently. Firstly the hype and then the criticism. But is it really of any use? Can it benefit your business? Peter Marlow investigates, and explains how you can build your own WAP site.

WAP stands for 'wireless application protocol'. Mobile phones that are 'WAP-enabled' can access the internet. Not quite all the internet though because of small screen size, limited keyboard and narrow bandwidth. So special WAP sites have been built that are optimised for access by mobile phones. And there are lots of them around already.

Getting connected

A number of WAP-enabled mobile phone models are available. Among them are the Motorola Timeport, Nokia's 7110, Mitsubishi's Trium, Siemens' C35 and the Ericsson R320S. They are available by monthly subscription or pay-as-you-go.

To get on the internet, you select from a menu and wait while the connection is made to your WAP gateway. This is like dialling up an ISP as the number and password are pre-programmed.

Note that if you have problems making the connection then your phone may not be data-enabled. Cellphone providers don't seem to do this automatically. However, only a free phone call to the help line is needed to get you up and running.

Once the connection is established you will see a menu provided by your WAP gateway with news, weather, stocks and shares, horoscopes, directories and a search engine on offer.

On most phones you can type in web addresses of WAP sites you wish to visit and bookmark these sites for later. It is expensive and impracticable to surf the web with a mobile phone, so the bookmark feature is invaluable.

Remember that you are connected at only 9600bits/second so it can be slow going. BT has introduced a much faster GPRS connection but it is expensive and geographically limited at present.

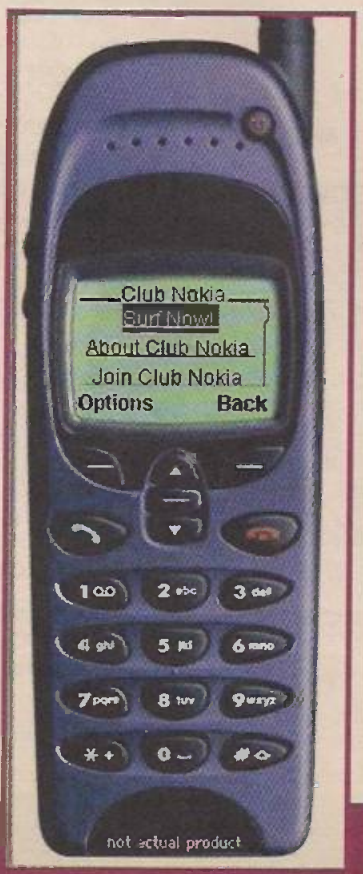
E-mail can also be set up by a phone call to your WAP gateway or through their internet site. You can receive e-mails, even with attachments in some cases, and you can also send e-mails. But the mobile phone keyboard is a big disincentive. A small fold-up portable keyboard will be the answer but we will have to wait for that.

You are not tied in to your WAP gateway. You can change it by entering new setup codes. Some phones allow up to four different gateways. A number of large companies have their own WAP gateway, where employees on the move can access corporate information such as sales figures and product information. There is a facility to nominate a fax number to have pages of information downloaded.

WAP sites

The big players such as Amazon.com and Lastminute.com already have WAP sites for 'M-commerce' and many are following. But imitating the internet is not necessarily the best use of WAP's forte for time sensitive and location-dependent data.

Railtrack, for example, has just started a WAP site that will tell you when your next train home is. You register on the company's internet site http://www.railtrack.co.uk, where you click on 'Timetable' and then click the mobile phone logo on the left. You type in you details, your home station and work station,



The main menu screen at Club Nokia.

Motorola Timeport showing a typical menu at the Phone.com WAP developer site.

benefit your business?

how far it is to your place of work and the time you are at work. When you dial up the WAP site it 'knows' where you are and can tell you the time of the next suitable train with the minimum of keying.

Other useful applications include take-away menus, cinema listing and booking service and a video library listing – there are many more. Plumbing was one of the first trades to take advantage of mobile phones when they were introduced. Now, Caradon Ideal Boilers, the UK gas boiler manufacturers. BT Cellnet and Improveline.com have teamed up and developed a mobile internet service for plumbers and heating engineers.

The service offers access to technical and diagnostic support. Once it goes live, up to 8000 installers of Caradon boilers will be provided with Siemens C35 WAP-enabled mobile phones connected to BT Cellnet's network. This initiative surely paves the way for other parts of the servicing industry.

Building a WAP site

WAP sites are not programmed in the familiar HTML but in Wireless Markup Language, or WML, which is similar. WML gets away from the 'point-and-click' interface and optimises the data for display and interactivity using the buttons on the phone. WAP pages are simply menus, text with simple graphical pictures, and data input areas.

There's a shareware package called WAP Wizard Lite on the cover CD-ROM that was supplied free with the November issue. You can also download it from www.wap-soft.com. This software enables you to build a basic WAP site without needing to know anything about WML.

The package runs on any PC with Windows 95 or higher. It allows you to write simple menus with links to text pages. A selection of graphics is included.

To install the software, run setup.exe in the folder /WAP on the CDROM. After installation, start up the program Start|Programs|WapWizLite|WapWiz. It opens with a blank home page configured as a menu. First type in a page title and type in a menu item on the left and the link, either a page or internet URL which you want the phone to go to if selected.

To create a new page click on the page icon on the far left of the toolbar. This will be configured as a text page, but you can make it into a menu by clicking the menu radio button at the top right. The text page has a title and one graphic, selectable from a library (courtesy of Phone.com). Remember that the phone screen is quite small.

You can view your page by clicking on the magnifying class icon on the toolbar. Note that mobile phones can display pages differently.

To move between pages click on the tab strip.

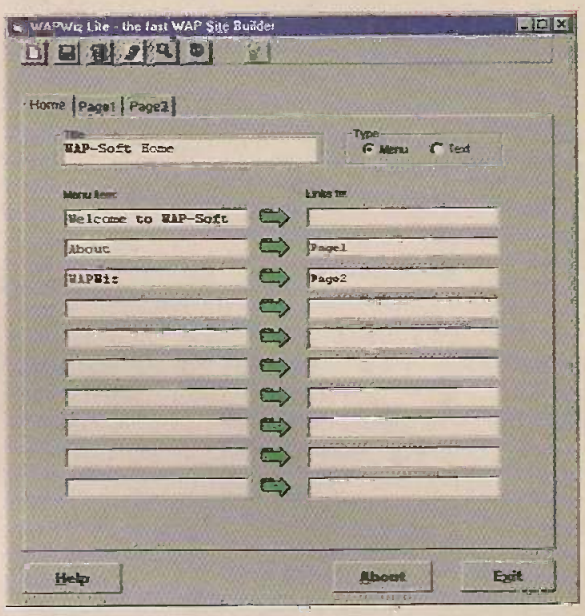
To compile your WAP site into WML click on the disk icon. This builds a file called index.wml in your 'Program Files\WAPWizLite\Web' folder.

Before you publish, you should add a WAP folder to your present web site as below: http://www.mycompany.co.uk/wap/index.wml

You should also check that your ISP can support WAP files of the WML and WBMP variety. Most will be able to.

Next, upload the contents of the folder 'Program Files\WAPWizLite\Web' to the WAP folder on your web site. This will consist of Index.wml and any graphical files. Click the Mobile Phone icon on the toolbar to launch Microsoft Web Publisher, or alternatively use your ISP's FTP standard software.

Now try your site out on a mobile phone. The best phones at present are the Nokia 7110 or the Mitsibushi Truim. These allow you to directly enter a URL. Motorola's Timeport inexplicably does not allow you to do this, but there are other ways of viewing URLs with it (talk to Genie).



Producing a WAP menu page is as easy as filling in the boxes. To produce text for a page, simply select 'Text' in the 'Type' panel.

For more details, print out the help file on the cover CD-ROM with Internet Explorer: d:\wap\WapWizLite Help.htm.

In summary

There is no doubt that WAP has a future. As phones get more like personal organisers, WAP will get easier to use. The thing that I like about WAP is that it gives information almost instantly. You don't have to wait for the PC to boot up and dial your ISP.

Accessing information on the move should improve people's working lives across a large variety of professions. ■

Need more information?

Peter Marlow BSc(Hons), ACGI, CEng MIEE is Technical Director of SoftCopy Limited, a multimedia publishing house, which has recently started a new division called WAP-soft to design WAP sites for customers and develop tools for the Wireless Internet. You can contact him at peter.marlow@softcopy.co.uk.

Repair and install CCTV

An obvious extension to a TV repair business is CCTV installation and maintenance. The growth in surveillance-camera systems is huge in both domestic and commercial markets. But where do you start? In this, the first of a set of articles, Joe Cieszynski explains.

The term 'closed circuit television' encompasses a wide range of technologies and levels of sophistication. On the one hand a system may comprise nothing more than a single 12V monochrome camera connected directly to a small monitor. At the other extreme, a system may have many dozens of cameras both indoors and outside, separated by a distance of many miles and controlled and monitored at a central control station.

Complex systems like this require telemetry to control the pan, tilt, zoom, wash/wipe, and heater facilities. They also need sophisticated multiplexers to allow all cameras to be switched quickly and without sync disturbance, and a considerable amount of civil engineering is involved to erect towers and lay underground cables.

Where do you start?

Anyone considering entering this rapidly expanding market must decide at what level they intend to start. It may be tempting to stay at the low-technology end of the market and install observation kits in homes and small retail units. But this is an area that is quickly becoming saturated because of the DIY kits now available. A growing number of 'installers' that are jumping on the bandwagon have no electrical or electronics knowledge whatsoever.

The next level of complexity is perhaps most suited for a qualified electronics engineer breaking into the market. Systems at this level comprise a number of cameras, both internal and external, a multiplexer, a time-lapse VCR, and of course at least one monitor.

The vast majority of installations are of this size. There is currently a demand for good engineers who can specify and install systems that deliver quality pictures.

The most complex installations are those installed at locations such as major city centres and along motorways. These are really out of reach of the small-time installer. Such contracts are usually secured by the major security equipment installers who have the manpower and range of expertise required.

Cameras

Selecting the right camera is important when surveying for a CCTV installation. There's a number of points to consider when choosing a camera. These include whether it is intended for indoor or outdoor use and whether it is monochrome or colour. The type of supply voltage has to be considered, as have resolution, physical size, overt or covert use, type of auto iris drive and format. There will be more on iris drives in a section on lenses that comes later.

If the camera is to be mounted outdoors, then it will need a housing. Even a fixed housing should have an integral heater, which will require a 230V supply. As it is necessary to run a mains supply to such housings, it is usual to employ a 230V camera. Most 230V cameras are suitable for both internal and external use.

For internal use, the choice camera is less restricted as there is a vast range of both low and high voltage colour and monochrome cameras available.

The decision to go for monochrome or colour is frequently governed by cost. However it is becoming increasingly common for a third

party, such as an insurance company or a local police authority, to insist on colour cameras.

Colour isn't always best

Although there are sound reasons for using colour cameras, I have encountered a few instances where this insistence has been based on the incorrect assumption that colour means greater resolution. I was able to save a customer a considerable amount of money by demonstrating to a third party that this is not the case.

CCTV cameras, both monochrome and colour, range in resolution typically between 330 and 570 TV lines or 'TVLs'. An expensive high-resolution monochrome camera may prove to be a better choice than an inexpensive low-resolution colour camera.

A coloured picture is more palatable for an operator to view over a long period of time. When located in premises such as a department store, a coloured image tends to give an improved depth of view.

Bear in mind though that colour cameras require a reasonably high lighting level in order to provide an acceptable picture. Also, they are not sensitive to infra-red (IR) light. This means that when considering their use internally, the lighting levels must be taken into account.

For external use, all but some very expensive cameras will require some form of artificial lighting at night. Careful consideration must be given to this factor when evaluating colour cameras for outside use. There is certainly no point in adding IR spotlights at a cost of over £300 each when the colour camera won't benefit from them.

The minimum operational light level of the camera is important. Measured in lux, this figure is generally quoted in suppliers' catalogues or manufacturers' technical information.

CCDs and light level

All but a few specialised CCTV cameras employ CCD image devices rather than vacuum tubes. This has brought the operational light level down considerably in recent years.

Beware that a simple comparison of figures in a catalogue will not always suffice. Lux figures are somewhat like power output figures for audio hi-fi equipment; they vary depending on how they are measured.

As a guide, if the room has average light levels then a camera with a lux value of around 1 will produce acceptable results. Once the area covered becomes dimly lit, then start to look for cameras with figures below 0.5 lux.

There is a vast range of relatively inexpensive monochrome cameras available that boast figures as low as 0.1 lux. These can provide remarkably clear, high-contrast pictures in very dark locations, albeit with some background grain caused by the AGC turning the gain up full, amplifying the front end noise.

Unless you are prepared to pay a lot of money, lux figures for colour cameras are rarely below 1. In many cases, they are in the order of 1.5-2 lux.

Lenses

Another factor attached to lighting levels is the type and format of lens fitted to the camera. I will be discussing lenses in detail in a later article, but it should be pointed out here that the lens has a direct bearing on the amount of light entering the camera.

A wide-angle lens allows far more light into the camera than a zoom lens. If the lens is a good quality one, this factor is usually of little consequence. But if the camera chosen for an application is already operating at its low light level limit, and a long range zoom lens is fitted, the resulting picture will be degraded.

Camera operating voltages

CCTV cameras are available for one of three supply voltages; 230V AC, 24V AC or 12V DC.

At first glance, the operating voltage may not appear to be too significant when surveying for a system. But the choice of camera supply will have a direct bearing on the material costs and labour involved. This is because some supply methods require more wiring than others.

In a 12V DC system, the supply is fed via a separate cable – usually four-core alarm cable. This means that every co-axial cable must be buddied with a dc cable. In some cases this is no problem for the installer. However, where there is a need for all cables to be hidden, losing that extra cable can sometimes prove difficult.

Another problem associated with 12V DC systems is that of voltage drop. A typical current consumption for a monochrome camera is 350 to 500mA. If the cable run exceeds 100m, then

Fig . 1. A phase meter offers a simpler approach to setting up the field sync phase adjustment between cameras. (Courtesy of NG Systems)

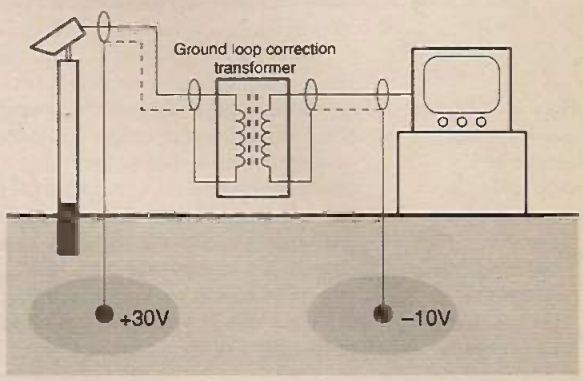


Fig. 2. Ground loops occur where there is a difference in the earth potential between two ends of the co-axial cable. They can be corrected by introducing an isolation transformer in the path of the video signal.

voltage drop can begin to impair camera operation.

The problem is made far worse if the lens to be employed has a motorised zoom. This is because the motor is supplied via the same cable.

The 12V is derived from a power supply, the rating of which must be suited to the number of cameras being installed. Working on a rule of thumb of two cameras per 1A supply, it becomes obvious that for even a modest system, a fairly large power supply will be needed.

There are two schools of thought on this subject. On the one hand you can install a single large capacity 12V power supply rated high enough to power all cameras. On the other hand you can opt for a number of smaller units.

Having multiple supplies has the advantage that if one unit fails, the whole system is not put out of action. In practice this option is not much more expensive. Additionally, the problem of voltage drop can be reduced by dispersing the power supplies around the site.

A 230V AC system will usually work very well. Installation is more difficult though because every camera location needs a fused spur.

Under current regulations, mains electrical work must be carried out by a competent person. Final

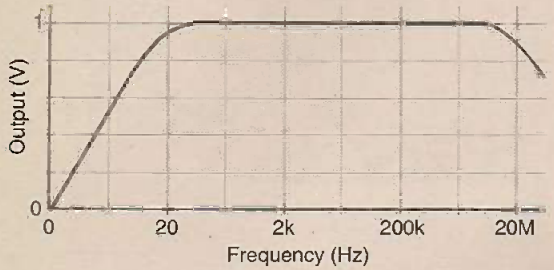


Fig . 3. A typical ground-loop corrector employing a transformer. Note the insulating bush around the 'Line' socket. This prevents the case of the unit from grounding the incoming cable. The second socket is labelled 'In/Out' because the unit may be installed either at the camera or in the control room.

inspection and testing of the circuit must be performed and a certificate of compliance issued to the customer by the inspector, in accordance with BS7671.

If you you carry out the work and you are not a qualified electrician, you will need to subcontract part of the work out. If you don't, you risk prosecution in the event of any mishap.

Having said that, where external cameras are being used, a 230V supply is by far the best. It is essential if a pan/tilt unit is employed as these require 230V to operate the motor.

Locking multiple cameras

Another advantage of having all cameras operating from a 230V supply is that many cameras have a switch to enable the internal sync generator to be locked to the 50Hz mains (line locked). This feature is not essential if an elaborate switcher or multiplexer is to be used, as the incoming signals will be aligned digitally, giving a form of genlocking.

If a simple budget switcher is to be used though, locking the cameras to the mains will overcome the problem of frame flip-over each time the switcher changes inputs. This assumes of course that all cameras are fed from the same 230V mains phase.

Many mains-fed cameras have a control marked 'PhaseAdj'. This has the effect of shifting the field sync pulse generated by the camera through a maximum of 120°. This angle is the difference between any two phases in a three-phase mains supply. Thus where the line lock facility is being used, correct vertical sync can be obtained by adjusting the control on each camera.

Phase adjustment is not always straightforward. Yes, you can simply turn each control until the frame bounce is eliminated at camera switch-over. However like many 'fly-by-wire' methods of this nature, be prepared for problems caused by mains fluctuations, changes in operating temperature, etc.

The correct way to adjust phase is to use an oscilloscope. One camera – usually camera 1 – is taken as a reference. Its video output is fed to the oscilloscope's channel 1. The scope is triggered to this field sync signal.

Output from each camera is then fed in turn to channel 2. The phase control for each camera is adjusted until the field-sync pulses are aligned.

This all sounds very simple until you come to realise that camera 1 is in the reception area while camera 2 is in the car park on a 15m tower. You sometimes need some very long co-axial leads running to your scope!

An alternative to using a scope on site for phase adjustment is to use a hand-held phase meter like that illustrated in **Fig 1**. This is a much better option to taking an oscilloscope up a tower, or trying to view it from a height of 10m in bright sunlight.

Ground loops

One problem sometimes encountered with mains-fed systems is ground loops causing hum bars and possible sync disturbance. This is more likely to occur in a premises that is fed via a three-phase mains supply.

Cameras located around the site may be fed from different phases. When the earths are connected together at the control desk, earth currents begin to flow, modulating the video signal.

The problem might be due to a fault in the electrical installation in the premises. This should be investigated by an electrician. Sometimes though, no fault can be found. In such cases ground-loop correctors may be employed to rectify the problem, **Fig 2**.

A ground-loop corrector is a 1:1 isolation transformer with an impedance of 75Ω. It is designed to pass the 0 to 5.5MHz bandwidth video signal.

The transformer breaks the earth connection between the camera and the switcher/monitor. The unit may be mounted at either end of the installation. However it is usually more convenient to locate it at the control room end. **Figure 3** illustrates a typical device.

As you might expect, the transformer will introduce a signal loss. In the case of a short cable run this should not pose a problem. However, where the signal has already travelled through a few hundred metres of co-axial cable, introducing a transformer may resolve the problem of a hum bar only to introduce a noisy picture. For situations such as this, ground-loop correctors with a built-in video amplifier circuit are available.

Also available are ground-loop correctors incorporating an opto-coupler to break the earth loop. However, because they need a power supply, such units tend to be more expensive.

For sites where ground loops are particularly troublesome, units containing a number of individual transformers or opto-couplers are available. The number of inputs can vary, typically from two to eight.

Vandalism issues

Where cameras are located in public places and there is a real possibility of the camera being pulled off the wall, for example in a pub or night club, mains-operated cameras may not be the best choice.

Once a camera has been torn down, its owner is left with the problem of live wires hanging out of the wall, and all of the potential legal implications attached.

For internal use, 24V AC cameras are very popular. Being defined as extra low voltage, 24V does not come under the same regulations as 230V. Alternating-current transmission largely overcomes the problems of voltage drop.

A separate ac supply is required for such cameras. However some switchers incorporate a limited ac supply, which is sufficient for a small system.

Some cameras are suitable for both 12V DC and 24V AC operation.

Camera ergonomics

The physical size of the camera is sometimes an important factor to consider when designing a system.

On the one hand, the customer might want the cameras to be obvious so that they act as a deterrent. On the other hand it may be more desirable for the cameras to be hidden, either for covert observation or perhaps for their own protection.

Covert cameras are currently available in numerous guises, and their performance is remarkable. A typical covert camera will operate from 12V DC, and comes with a

fixed lens and an electronic iris. It will probably use only four-core alarm cable to carry both the supply and video signals.

The idea of passing 1V pk-pk video signals along unscreened cables might appear rather crude to those of you who are familiar with video distribution. As long as the cable run is not too extensive though – most manufacturers quote 100m maximum – and the cables are kept away from sources of electrical noise, then these cameras perform very well. Co-axial cable is undesirable in such applications. Clearly, the camera will not be very covert with a large co-axial feed running to it.

Covert cameras come disguised as, for example, passive infra-red detectors, smoke detectors and clocks. New guises are appearing all the time. If you really want to enter the world of James Bond, then for around £60 you can buy a camera module and fit it into anything you wish.

Cameras for shops

Dome cameras are very popular in shops and department stores. There are two types.

The simpler type contains one real camera and four or five dummies. The idea is that potential criminals do no know which area is being monitored.

Additional operational cameras can be installed in the dome. However, as with any large multi-camera system, where a number of multiple camera domes are installed, the switching rate has to be quite rapid to cover all areas. A combination of automated patrols and manned monitoring is essential.

An alternative to the multiple camera dome is the speed dome. This has just one camera mounted on a turntable. The operator can control the rotation, tilt and zoom and is thus able to move the camera into any position.

The name 'speed dome' is not just cosmetic. The servo can move the camera into any position very quickly. Because all connections between camera and output cables are via slip rings on the turntable, the camera can rotate continuously in one direction.

A microprocessor controls the dome, enabling the operator to programme specific stopping points. It can then be left to follow a pre-programmed observation pattern – known as an automated camera patrol. The operator can interrupt this pattern if required.

Some speed-dome systems have the ability to train all the cameras onto one point at the command of the operator, or perhaps when a security tag detector triggers at an exit. The idea is that the potential culprit trying to steal from a department store is video recorded by numerous cameras.

When first implemented this worked well, until the criminal fraternity cottoned onto it. Then they devised a routine where one member of a gang would walk near to the exit holding a tagged garment causing the alarm to trip, and while he/she innocently apologised, the rest of the gang ransacked the store! It is now more common to program just one dome to zoom into the event.

In my next article, I will be looking at camera formats, irises and resolution. ■

Testing Digital TV Reception Systems

In this second, concluding instalment K.F. Ibrahim describes a typical ONdigital STB, the basic boot-up sequence and then provides fault-finding guidelines

Pace DTT STB

Fig. 2 is a block diagram of the Pace ONdigital terrestrial digital TV STB. The main difference between this and the satellite DTV STB described in Part 1 last month is the front-end, which includes a tuner, a down-converter (U100), an OFDM demodulator (U200) and an FEC processor (U300). Orthogonal frequency-division multiplexing is the modulation system used for DTT in Europe and other parts of the globe.

As with the satellite model, the output from the front-end is fed via a multiplexer system (U154-6) whose purpose is to enable data to be switched to the PCMCIA external input/output port. The

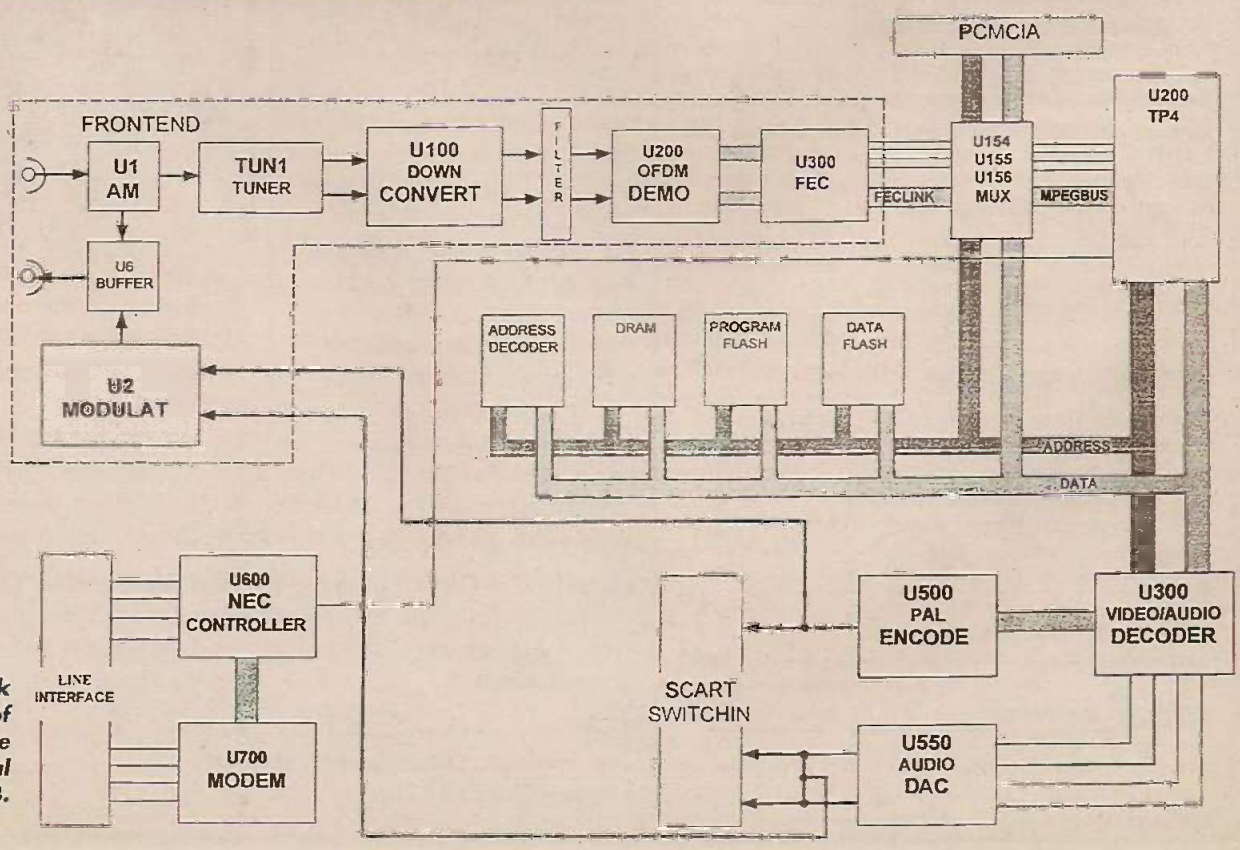


Fig. 2: Block diagram of the Pace ONdigital STB.

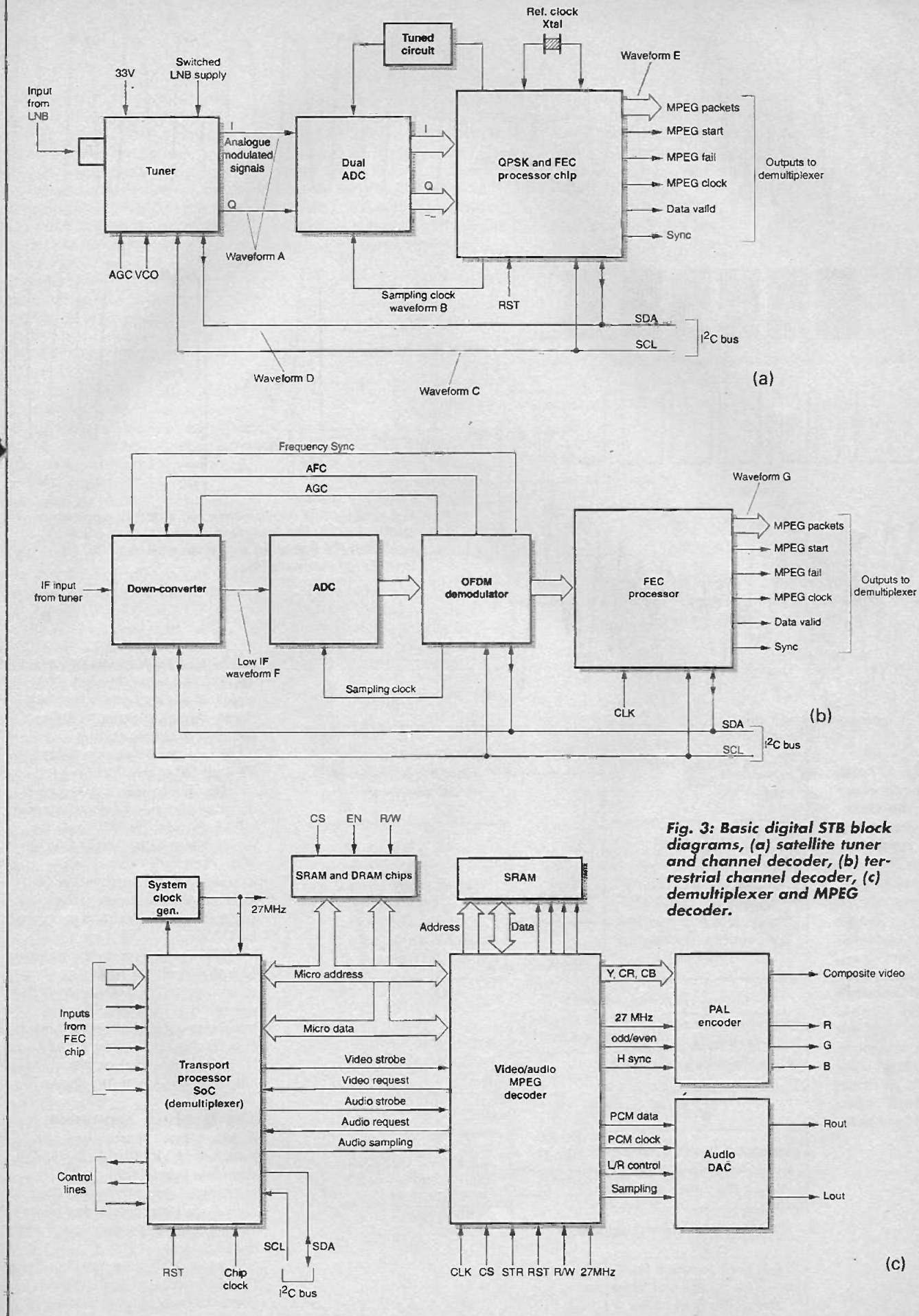


Fig. 3: Basic digital STB block diagrams, (a) satellite tuner and channel decoder, (b) terrestrial channel decoder, (c) demultiplexer and MPEG decoder.

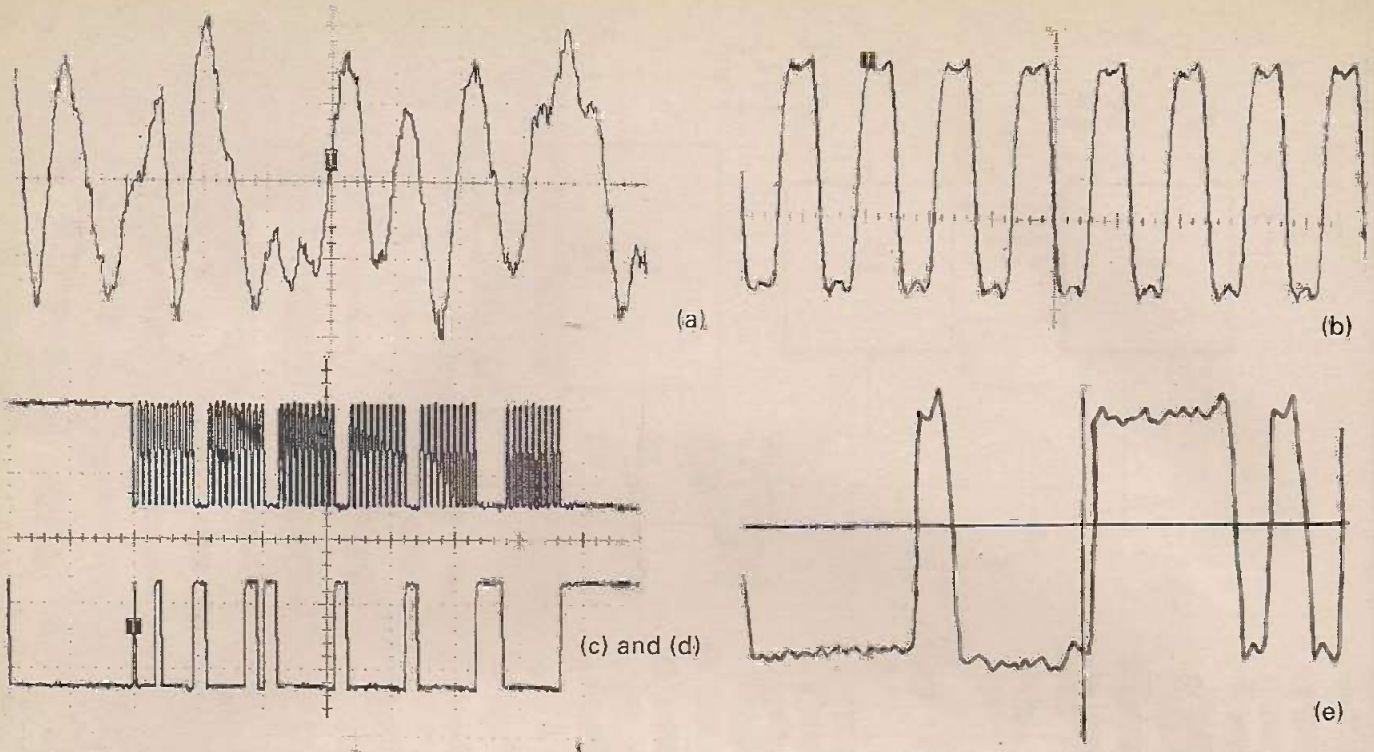


Fig. 4: Key STB waveforms, (a) satellite analogue QPSK, I or Q; (b) sampling clock; (c) and (d) SCL and SDA I²C lines; (e) one data line, typical; (f) low IF; (g) same as (e).

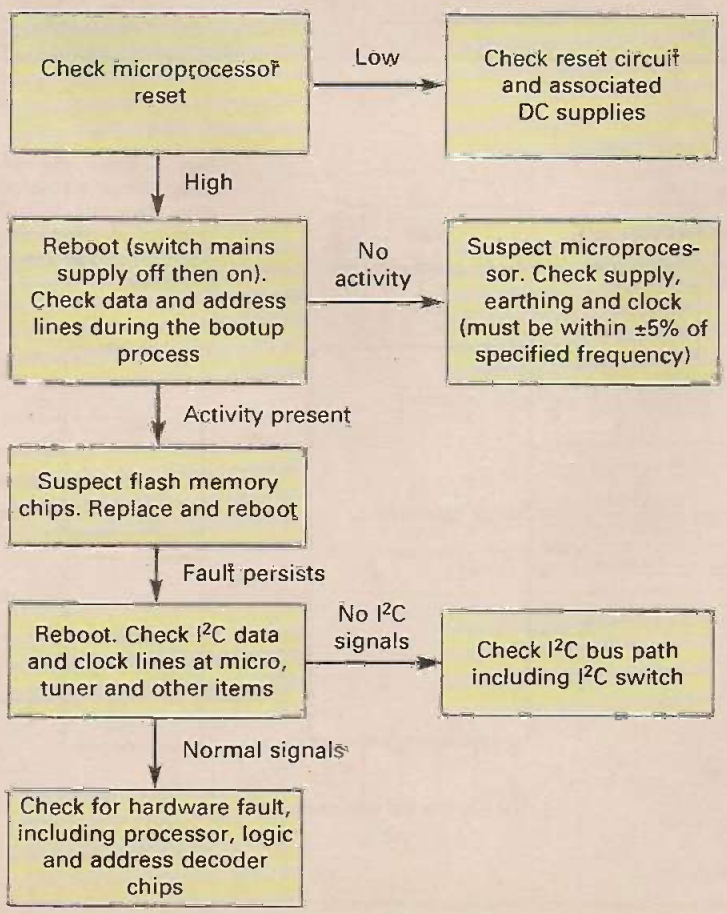


Fig. 5: Fault diagnosis chart for the stuck-in-standby symptom.

following transport data processor TP4 (U200) is another SoC chip which in this case combines data stream demultiplexing with the conditional access system.

The selected data packets from TP4 are fed to the MPEG video/audio decoder U300. Once decoded, the video data is passed to a PAL encoder (U500) while the audio data goes to the DAC U550. Video and audio outputs are available via the scart socket or UHF modulator. Teletext data packets are extracted and processed by U200.

U200 is actually a microprocessor chip that, with the NEC microcontroller U600, controls the operation of the STB. There is telephone connection via a modem (U700) and line interface, and RS232 communication via a UART chip and line driver (not shown).

The boot-up sequence

A set-top box is normally never switched off. It remains in standby when not in use, with its microprocessor, microcontroller and all the other processing chips set and ready to receive and process data.

When an STB is switched on from cold however it goes through a comparatively lengthy process of setting, initialising, configuring and

programming the processor and decoder chips. This involves the loading of the operating platform (also known as the start-up program) and other software routines from flash memory to the microprocessor's DRAM memory. The process is known as the start-up or boot-up sequence.

There are two parts to the boot-up sequence: boot-loader and initialisation. The boot-loader process involves reading and loading the start-up program and checking the applications. If the boot-loader finds any corrupt programs or applications, it will attempt to download new software off-air. This will succeed only if the box has been set up correctly so that connection to the provider can be made via satellite dish or terrestrial aerial.

An off-air software download is indicated by the LED display on the STB's front panel. The progress of the downloading process may also be observed on the screen of the associated TV set if the STB is connected to it via a scart cable.

If the boot-loader process is completed successfully, the on-board microprocessor carries out the next phase, STB initialisation. This involves the processor checking that it can communicate with all the other devices connected to it, including the memory chips, the video/audio decoders, the modem, the smart-card and conditional-access module, then initialising them by loading the appropriate data in their registers.

If the initialisation process fails, going no farther than the boot-loader, the STB will remain stuck in standby. This is the most common fault with a digital STB. The cause could be faulty or corrupt flash software or a hardware malfunction. In the first case, a forced upgrade should be attempted. As an alternative, flash memory chips can be reprogrammed by a PC via the RS232 port. If an upgrade fails, the flash memory that holds the boot-up software is suspect. Try fitting a new set of programmed flash memory chips. If a hardware malfunction is suspected, the faulty chip must be found and replaced. The procedure in this case depends on the chip. A first step however would be to check the I^2C bus for activity during the boot-up process, at all chips.

When the initialisation process has been completed successfully the channel decoder begins to search for the default channel, which is known as the home channel. If the signal is detected, the channel decoder locks to it and data is received, decoded and processed. The result is a picture and sound. If the home channel cannot be detected, the channel decoder looks for other channels. Failure to lock to any incoming signal produces the 'no signal' message on the screen.

Fault finding

Fig. 3 shows basic STB block diagrams and Fig. 4 key waveforms. Figs. 5-7 provide flow-

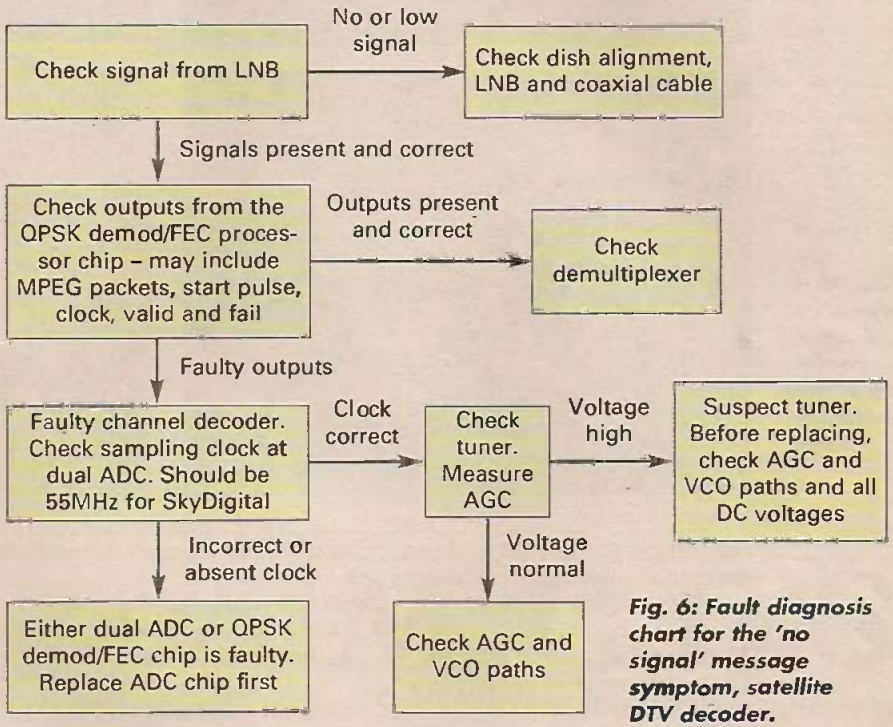


Fig. 6: Fault diagnosis chart for the 'no signal' message symptom, satellite DTV decoder.

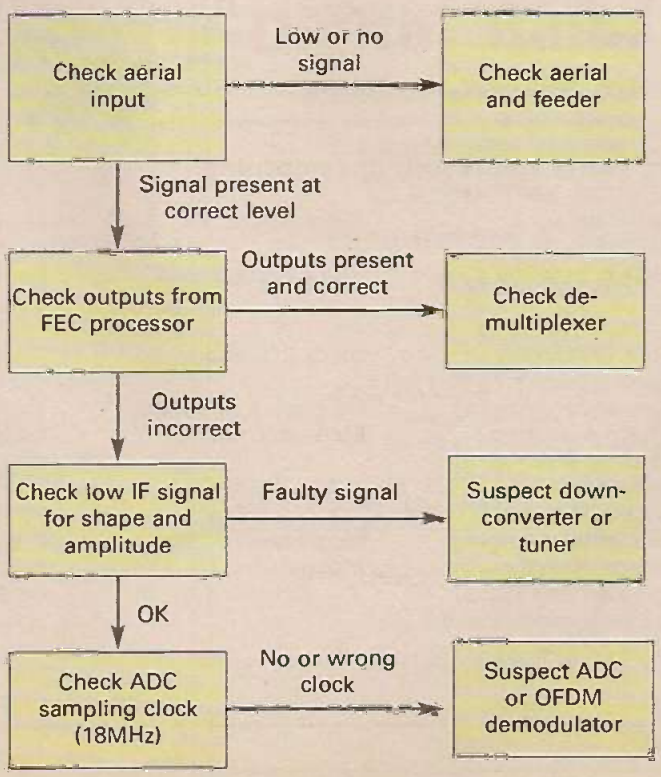


Fig. 7: Fault diagnosis chart for the 'no signal' message symptom, terrestrial DTV decoder. The outputs from the FEC processor may include MPEG packets, start pulse, clock valid and fail.

Fig. 8: Typical picture displays produced as a result of partial failure of the demultiplexing SRAM chip.

Fig. 9: Typical picture displays produced as a result of partial failure of the video SDRAM chip.

chart checks for the most common faults encountered, stuck in standby and the 'no signal' message.

Memories

The various types of memory in a digital STB are used for the following purposes:

DRAM: Microprocessor temporary store.

Flash: Microprocessor permanent store for boot-up and other routines.

SRAM (static RAM): Demultiplexing memory for storing packets of MPEG data.

SDRAM (synchronous DRAM): Video data store and audio delay.

Memory chips can fail either totally or partially. Partial failure can be caused by: the corruption of one or more cells; an address, data or control pin stuck at low or high; or shorted pins. Symptoms observed as a result of memory faults are listed in Table 1. ■

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Table 1: Memory faults and resulting symptoms.

Memory	*Partial failure*	*Total failure*	*Consequences*
DRAM	Stuck in standby	Stuck in standby	Boot-up and other routines will not be downloaded from flash memory
Flash	Stuck in standby	Stuck in standby	Absence of boot-up routine
SRAM	Constantly changing pattern of picture break up (see Fig. 8). Menu normal	No picture or sound. Menu normal	The picture breaks up in blocks rather than pixels, as wrong data packets are decoded
SDRAM	Constantly changing pattern of picture break-up (see Fig. 9) and sampled sound. Menu normal	No picture or sound. Menu normal	Picture break-up is in the form of pixelisation, as pixels are displayed in the wrong position on the screen

A visit to Dolby Labs

George Cole provides an update on the latest audio technology, including Dolby Digital for TV and discs, the DVD-Audio format and the MLP and AAC systems

The name Dolby is synonymous with noise-reduction systems used by audio cassette decks, surround-sound technology, and the digital audio format used by DVD-Video players and some TV broadcasting systems. The company is also involved in DVD-Audio and the electronic delivery of music. I recently visited the company's headquarters in San Fransisco to see and be briefed on the latest developments in these fields.

Dolby Laboratories was formed in London in May 1965 by Ray Dolby, who had been involved in the development of the Ampex Corporation's Quadruplex videotape recording system in the Fifties. When Dolby Laboratories was formed there were four employees: today there are over 550. The company's headquarters, in a converted warehouse, include a magnificent presentation theatre along with administration, engineering, testing and licensing facilities. The company's European headquarters are at Wootton-Bassett, Wiltshire.

Dolby gets its income from manufacturing encoders, providing a variety of services, and from licensing its decoder technology for use in hardware such as DVD players, games consoles, AV amplifiers and TV sets. The number of licensed Dolby products is now more than 853 million. There are no licence fees from Dolby chip-set production, the use of Dolby encoders, or inclusion of the technology with such software as DVD discs, games titles or audio tapes.

Surround-sound technology

Dolby has developed a number of surround-sound technologies. The original Dolby Stereo system was designed for cinema use, then came two domestic versions, Dolby Surround and Dolby Pro-Logic. They use a matrix system that adds extra channels (centre and surround) to a two-channel stereo recording. A decoder extracts and processes the extra information, which is fed to additional loudspeakers.

Dolby Surround decoders were quick to appear on the market, and in 1990 Toshiba was the first company to launch a Dolby Surround TV set. The Pro-Logic system is basically an enhanced version of Dolby Surround, providing improved directional sound. Recently an improved version, Pro-Logic II, has appeared. Developed by audio pioneer Jim Fosgate, Pro-Logic II provides discrete-like performance from a matrix-based system. We were able to com-

pare the two and I noticed a definite improvement to the sound field.

Virtual Dolby Surround was originally developed for the PC market, so that computer users with games and multimedia software could experience surround sound effects from a pair of PC speakers. But Virtual Dolby Surround is also aimed at the TV market. It uses a sound-cancellation process to create "phantom speakers".

Dolby Digital

With the audio world moving to digital technology, it was inevitable that Dolby Laboratories would develop a digital surround-sound system. Thus Dolby Digital appeared. It uses an algorithm known as AC-3, with data rates between 32-640kbits/sec. This can provide mono sound, stereo sound and six discrete channels – left, right, centre, left surround, right surround and low-frequency effects (also known as LFE or a sub-woofer). The Dolby Digital surround-sound channels have a frequency range of 20Hz-20kHz, which compares with the limited 100Hz-7kHz of Dolby Surround's surround channels.

AC-3 is a lossy compression (or, to be more accurate, data-reduction) system, which means that data is lost during the encoding process. Other data-reduction systems include MPEG, ATRAC (used for MiniDiscs), DTS (Digital Theatre Sound) and PASC (used by the now-defunct DCC – digital compact cassette – system). Data reduction is required because a PCM (pulse-code modulation) audio system generates comparatively large amounts of data. The audio CD system, with a sampling rate of 44·1kHz and 16-bit encoding, generates a huge amount of data that can be difficult to store or transmit. So data reduction is required with multi-channel audio.

AC-3 is a perceptual-coding system. The difference between the coded data and the original data is called quantisation noise. Perceptual coding systems work by exploiting the limitations of human hearing (the ear is less sensitive at very low and very high audio frequencies, while sound below the threshold of hearing is inaudible) to shape the quantisation noise characteristic so that the noise is inaudible. As a result, compression ratios of between 8:1 and 12:1 become acceptable.

AC-3 makes use of a phenomenon known as frequency-domain masking – a louder sound makes a quieter sound inaudible. This masking works both ways: quieter higher frequencies are masked by loud lower ones and vice versa. Another hearing characteristic, known as critical-band frequency resolution, is based on the fact that the human ear has finite frequency resolution and certain frequency-bands sound alike. Thus some bands can be removed without affecting the overall sound.

The key to successful perceptual coding is to develop algorithms that come close to matching the characteristics of the human ear. Dolby's algorithms are designed so that they can be adapted as the technology improves. A Dolby Digital encoder samples the initial audio signal to produce a series of data samples. These samples, which naturally vary with time, are converted to equivalent cosine functions by using a Modified Discrete Cosine Transform (MDCT). This is a version of the Fast Fourier Transform (FFT), which uses complex mathematical calculations to convert waveforms into a series of simple harmonic functions. A bit-allocator determines how many bits are used for each frequency sample. The samples are then arranged as a bit stream.

The Dolby Digital decoder unpacks the bit stream, analyses how many bits were used for each frequency sample, and then reconstructs the signal. An inverse MDC transform converts the frequency samples back to time samples.

As a result of all this, Dolby Digital can provide a mono signal with a data rate of just 96kbits/sec (a compression ratio of 8:1), a two-channel stereo signal with a data rate of 160kbits/sec (10:1 compression), or a 5.1-channel (left, centre, right, left surround, right surround and sub-woofer) signal with a data rate of just 384kbits/sec (12:1 compression).

Dolby Digital also has a decoder down-mixing facility. Whenever a 5.1-channel signal is fed to a decoder that's connected to fewer than six speakers, the down-mixing process combines channels. If there are more speakers than there are coded channels, the unused speakers are muted. This arrangement can also be used with Dolby Surround.

Dolby Digital was introduced for cinema use in 1992. More than 25,000 screens worldwide are now equipped with the system. In 1998 Dolby Labs introduced Dolby EX, which provides an additional surround-sound channel.

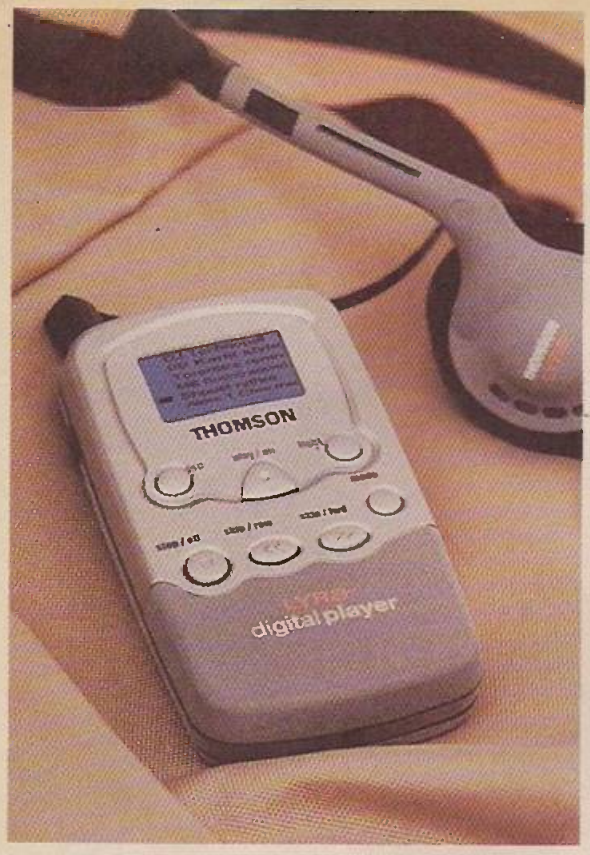
Dolby Digital and TV

Dolby Digital has also been adopted by many digital TV broadcasting systems around the world. In December 1996 the US Federal Communications Commission (FCC) announced that Dolby Digital would be used with US HDTV system proposed by the Advanced Television Systems Committee. ATSC broadcasting commenced in 1998, and there are now 153 stations on air.

In Europe the Digital Video Broadcasting (DVB) standard was adopted. This originally stipulated MPEG-2 video and MPEG audio. As a result of lobbying by Australia (which uses an HDTV version of DVB) and Singapore however the DVB standard was changed in July 1999 to allow Dolby Digital to be used for new and existing DVB transmissions. By July 2000 more than ten million digital set-top boxes incorporated Dolby Digital technology.

Dolby Digital is being used by some broadcasters in continental Europe,

Toshiba's twin-tray entry-level DVD-Audio player, Model SD500E, can also play DVD-Video, CD-R and CD audio discs.



The Lyra digital player from Thomson for use with music files downloaded from the internet.

notably ProSieben in Germany. STB manufacturers such as Nokia, Panasonic and Technsat have launched Dolby Digital products in Germany, and the specification for the new digital decoder from the German digital pay-TV company Premiere World will include Dolby Digital. The Scandinavian specification for DVB receivers is being modified to include Dolby Digital, and the French digital satellite broadcaster TPS has transmitted film trailers with 5.1-channel Dolby Digital via Hot Bird 4. Dolby Labs says that the BBC has expressed an interest in using digital surround sound.

Optical disc formats

Dolby Digital was used by the original LaserDisc format, but only the NTSC version which had room in the waveform to accommodate an AC-3 soundtrack. Early NTSC LaserDiscs carried analogue video, two FM sound channels and PCM audio – the latter for compatibility reasons. To add Dolby Digital, one of the FM channels was used to store the data. The result was a LaserDisc that had PCM audio, Dolby Digital and a mono FM channel. The first Dolby Digital LaserDiscs were launched in the USA in 1995. The LaserDisc has since been superseded by DVD-Video.

Dolby Digital is part of the DVD specification, though originally it was mandatory only for DVD discs intended for NTSC markets, being optional for PAL DVD discs (which must carry MPEG-2 audio). This PAL specification was called for by European manufacturers who wanted DVD to be backwards compatible with MPEG-1 audio (used by the Video CD and CDi formats). In December 1997 however Dolby Digital became mandatory for PAL/Secam DVD titles. Thus all DVD players and discs now have Dolby Digital audio – an increasing number also include DTS audio as an optional extra.

Incidentally the new Sony PlayStation 2 games consoles have built-in Dolby Digital decoders.

DVD-Audio

This year saw the launch of the first DVD-Audio players in the USA, Japan and Europe, produced by several companies including Panasonic, Technics, Pioneer, Toshiba, JVC and Onkyo. The players are designed for compatibility with a variety of discs, including audio CDs and DVD-Video discs.

DVD-Audio provides high-quality, multi-channel sound that far outstrips the audio CD – see Table 1 for a comparison. The discs can also store a range of multimedia content such as text, pictures, graphics and video clips. As with DVD-Video, DVD-Audio discs may be single- or dual-layered, but unlike DVD-Video there is no provision in the specification for dual-sided discs. Nor does DVD-Audio use the Regional Coding system. DVD-Audio discs can be bought anywhere in the world and used with any DVD-Audio player.

In November Warner Music Group launched the first seven DVD-Audio titles in the USA. They are playable by both DVD-Audio and DVD-Video machines and contain a six-channel (5.1) 96kHz/24-bit surround-sound mix, a stereo 96kHz/24-bit mix and a Dolby Digital surround mix, the latter being playable by all DVD-Video players as well.

A new term, 'advanced resolution', has been introduced to describe any DVD-Audio mix that uses at least twice the sampling rate of standard CDs (44·1kHz) and more than 16-bit quantisation (resolution).

The Smart (System Managed Audio Resource Technique) content function enables two-channel reproduction of a six-channel sound source to be controlled by the studio staff. This is done by placing mixdown coefficients as control information in a data channel on the DVD-Audio disc. As a result, when a multi-channel DVD-Audio recording is played back via a two-channel system the listener hears the sound in stereo form exactly as the producer or artist intended.

MLP technology

Although DVD-Audio has a greater data storage capacity than an audio CD (a single-layer DVD-Audio disc has a 4·7GB capacity while the capacity of an audio CD is 650MB) and a faster transfer rate than both CD and DVD-Video (9·6Mbits/sec compared with 1·4Mbits/sec and 6·1Mbits/sec respectively), the DVD-Audio format is hard pushed to store the data required to provide at least 74 minutes of high-quality, multi-channel audio (the standard DVD-Audio playback time). A five-channel PCM audio track with 20-bit quantisation and 96kHz sampling would provide a maximum playing time of a little over one hour. Furthermore the sampling and encoding process would require a transfer rate of 13·8Mbits/sec, which is well above DVD-Audio's maximum data rate of 9·6Mbits/sec (see Table 1).

The DVD-Audio working group (WG-4) considered a number of solutions. One was to use a perceptual-coding compression system such as ATRAC3, AAC (see later), MP3, Dolby Digital or DTS, but this would have been unacceptable for a high-end audio format. Another possibility was to encode the audio channels using a mixture of sampling rates and quantisations. This was considered to be too complex, though it's an option for DVD-Audio production.

The solution was to adopt a technology developed by the small UK audio

The Pioneer DV-828A DVD-Audio player can handle a recorded bandwidth greater than 20kHz.

company Meridian. Meridian Lossless Packing (MLP) is a lossless data compression system that's used for all six-channel mixes. It works like a PC ZIP file, which packs in the data in a more efficient manner.

MLP uses several techniques to achieve this, including lossless processing and lossless matrixing, which reduces the correlation between channels: lossless prediction to reduce inter-sample correlation (waveform prediction), using a large palette of filters; and Huffman coding. These processes provide a disc capacity saving of about 58 per cent, making it possible to put both a stereo and multi-channel, 96kHz mix on the same disc plus multimedia content (see Fig. 1).

MLP is a mandatory part of the DVD-Audio specification, but content developers have the option to use it or not. Dolby Laboratories is the exclusive worldwide licensee for MLP. Dolby Labs has not carried out any development work on MLP and doesn't sell the encoders (Meridian does this – the encoders cost about $7,500 each). Royalties are paid by MLP encoder users and by manufacturers that include MLP decoders in their products, such as DVD players. No royalties are payable by the software industry for use of the technology.

Disc zones

DVD-Audio discs all have two zones, audio and video – the latter can be used for video clips, text, graphics and other information. The video clips conform with the standard DVD-Video specification and can be played by any DVD-Video player (with Dolby Digital audio). Incidentally the text, pictures and graphics on DVD-Audio discs can be viewed on a TV screen while listening to advanced-resolution music.

The Warner Music Group (and BMG) also uses the video zone for the entire album encoded as a Dolby Digital audio mix. This makes DVD-Audio discs compatible with DVD-Video players and means that those who own a DVD-Video player can play DVD-Audio discs, though with lower sound quality.

Dual-layer technology

So far none of the music companies that support DVD-Audio have expressed interest in using the dual-layer technology for hybrid discs, as used by the Sony/Philips SACD (Super Audio CD) format. These hybrid discs have one layer devoted to high-quality audio and another for Red Book audio, which can be read by a standard CD player. There are no plans for DVD-Audio compatibility with audio CD players.

Table 1: Comparison of CD, DVD-Video (single-layer) and DVD-Audio (single-layer) discs.

Parameter	*CD*	*DVD-Video*	*DVD-Audio*
Capacity	650MB	4·7GB	4·7GB
Channels	2	8 max	6 max
Frequency response	5Hz-20kHz	DC-48kHz	DC-96kHz
Dynamic range	96dB	144dB	144dB
Recording time	74 mins	133 mins average	74 minutes or more*
Max data rate	1·4Mbits/sec	6·1Mbits/sec	9·6Mbits/sec
Audio signal	PCM	Dolby Digital, MPEG, PCM	PCM
Options	–	DTS, SDDS etc.	Dolby Digital, DTS. MPEG etc.
Sampling rate	44·1kHz	48 or 96kHz	**
Quantisation	16 bits	16, 20 or 24 bits	16, 20 or 24 bits

*In all modes including 96kHz/24-bits/6 channels and 192kHz/24-bits/2 channels.
** 44·1/88·2/176·4kHz or 48/96/192kHz for two-channel sound, 44·1/88·2kHz or 48/96kHz for multi-channel sound.

Electronic music delivery

The music and electronics industries have had to cope with the advent of music downloaded from the internet and stored on a PC or portable internet music player. The most popular music file is the MP3 (MPEG-1 Layer III) format, but a newer one, AAC (Advanced Audio Coding), offers better sound quality and greater security. AAC also has a thirty per cent lower data transfer rate than MP3 and can handle up to 48 audio channels. It was developed by Dolby Laboratories, AT&T, the Fraunhofer Research Laboratory in Germany and Sony, and is recognised by the International Standards Organisation (it is part of the MPEG-2 audio specification ISO 13818-7). The Japanese ISDB digital TV system uses the AAC format.

AAC has three data rates, 64kbits/sec, 96kbits/sec and 128kbits/sec. The 64kbits/sec rate provides "excellent" sound quality, the 96kbits/sec rate sound quality that's indistinguishable from a stereo source while the 128kbits/sec rate is claimed to be indistinguishable from a 5.1-channel source. The various settings were demonstrated, and I was very impressed with the sound quality at even the slowest.

The future

During a final question-and-answer session Ray Dolby was asked whether audio technology was suffering from the law of diminishing returns – in this case becoming harder to develop new audio formats that offer a demonstrable improvement compared with existing audio hardware or systems. He agreed, but added that the challenge now is to make the best sound more affordable.

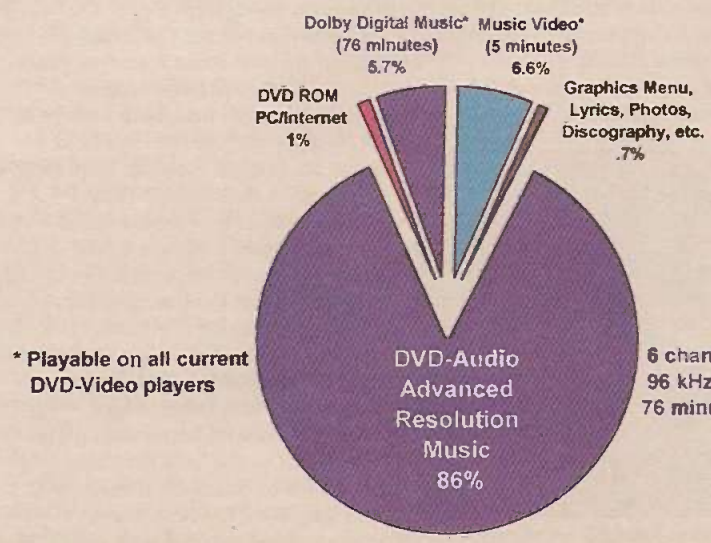


Fig. 1: Use proportions of a typical DVD-Audio disc (single-layer, one-sided with Smart content). Percentages are approximate. Smart content fold-down instructions use less than 0·1 per cent of disc capacity to deliver advanced resolution stereo.

Servicing the Sharp CS chassis

This is an unusual chassis that can easily confuse those not familiar with its operation. The following article (Part 1) by Alex Towers has been designed to make servicing easier by means of a step-by-step approach to fault finding

At first glance the CS chassis, with its densely-packed surface-mounted components on both sides of the PCB, looks as if it would be very difficult for fault-finding and repair. With a logical approach and some care and attention however the chassis, in its various versions, can be serviced at little cost to either your pocket or your sanity.

Several problems can be experienced with the chassis. They are not too difficult to fix. The main requirements are an understanding of the way in which the chassis works, and confidence in replacing surface-mounted components. The aim of this article is to assist with fault diagnosis and, hopefully, enable you to avoid unnecessary component replacement and time-consuming searches for the cause of faults.

Note that, unless otherwise stated, all the circuit diagrams and pictures are based on Model 51CS05H.

Fault finding

To save time and stress it's best to tackle faults logically rather than to jump in and follow hunches. Try to ensure that a component is actually faulty before replacing it.

One thing that can catch out the unsuspecting engineer is the operation of the receiver in the standby mode. A processor chip on the primary side of the chopper power supply circuit, IC1010, disables the power supply for standby. To turn the set on, either press one of the four buttons at the front or use the standby button on the remote control unit. It's not unusual for the receiver to take up to ten seconds to come out of standby as the start-up procedure is carried out.

The chassis does not get particularly hot, and the heatsinks and output transistors should be only warm to touch. It is rare for the major ICs to fail, though the video processor IC201 is probably the most common device to fail in a set.

There are several ways in which the large, flat-pack ICs can be replaced. We can't describe them all here. If you are happy with the method you usually employ, use it. Otherwise it's best to call upon someone who has experience of replacing such devices without damage to repair the set. The ICs are of two types, gull-wing and J-legged. Both are simple to replace when you know how.

As sets that use the CS series chassis are now some four-five years old, dry-joints are beginning to appear. You will find them mainly in the chopper and the line and field output stages, but they can be present anywhere in the chassis. They normally occur at standard radial-lead components, but it's worth reflowing the solder at surface-mounted output devices as well.

When looking for dry-joints, especially in the field output stage, don't be surprised to find that an intermittent fault is caused by component failure rather than a dry-joint. Refer to the field timebase section for an example of this.

It's important to check the connections to the line scan coils wherever a set comes in for repair. The scan coils all have a small PCB to which the drive cable is connected. Occasionally the socket becomes dry-jointed, the result being either erratic turn on or failure of the line output transistor (Q601). Resoldering the connections will usually remedy this but in some cases, where a dry-joint has arced, the scanning leads will have to be connected to the coil tags directly.

Receiver and chassis identification

The first two digits of the model number indicate the CRT screen size – 51, 59 or 66cm. The next two letters indicate chassis CS. The last three digits indicate features, as follows:

**CS03H Basic Fastext and Nicam receiver.
**CS05H Fastext, Nicam and SRS receiver.
**CSD8H Dolby Pro-Logic models (59 and 66cm only).

Although the sets may be fitted with different versions of the chassis, they are all basically the same. The major differences between 51 and 59/66cm models are in the power supply and the audio, field and line output stages.

Table 1 lists the main ICs used in the CS chassis. The type and part number remains the same with most screen sizes and chassis versions. Only the NVM and EPROM have different part numbers depending on model. NVM and EPROM part numbers are listed in Table 2.

Dolby Pro-Logic models incorporate another NVM (IC1011) that contains the extra data required for Dolby Pro-Logic processing. Its part number is RH-IX1603BMZZ.

These chassis were produced in

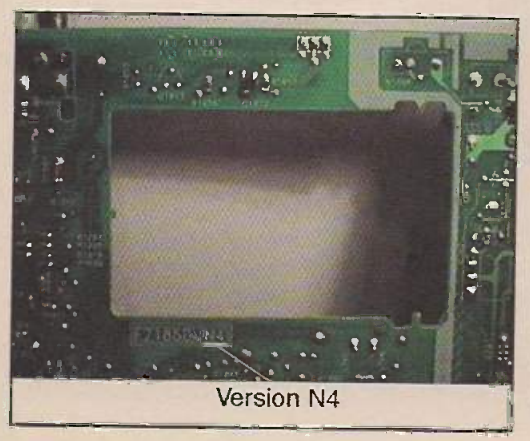


Fig. 1: Location of the chassis version number.

Table 1: Main ICs used in the CS chassis.

IC	*Function*	*Type*	*Part number*
IC1001	Microcontroller	SAB-C502	RH-IX1598BMZZ
IC1002	NV memory	24C16	Depends on model
IC1004	EPROM	–	Depends on model
IC1005	Port controller	SN74ALS573	RH-IX1485BMZZ
IC1006	Port expander (input to IC1001)	HEF4021BT	RH-IX1474BMZZ
IC1007	Port expander (output from IC1001)	HEF4094BT	RH-IX1475BMZZ
IC1008	Optocoupler (data to IC1010)	MOC8105SR2	RH-FX0103BMZZ
IC1009	Optocoupler (data from IC1010)	MOC8105SR2	RH-FX0103BMZZ
IC1010	Primary-side processor	ST6210BM	RH-IX1559BMZZ
IC1012	Reset pulse gen (secondary side)	PST529	VHIPST529C2-1
IC1013	Reset pulse gen (primary side)	PST529	VHIPST529C2-1
IC201	Video processor (51cm models)	TDA8374B	RH-IX1611BMZZ
	Video processor (59/66cm models)	TDA8375A	RH-IX1582BMZZ
IC301	Multiple sound processor	MSP3410B-TS-F7	RH-IX1592BMZZ
IC302	Headphone amplifier	M5218L	VHIM5218L//-1
IC303	Op amp, audio PWM	BA10393	RH-IX1556BMZZ
IC401	Mega Text	SDA5273C26	RH-IX1584BMZZ
IC501	Op amp, field PWM*	BA10393	RH-IX1556BMZZ
IC701	Optocoupler (power supply regulation)	MOC8105SR2	RH-FX0103BMZZ
IC802	Delay line	TDA4665T	RH-IX1583BMZZ

*Also EW amplifier in 59/66cm models.

various versions that differ in minor ways – normally small layout changes or alternative 40/45V generator circuits. The chassis version can be identified by examining the edge of the main PCB around the CRT base-panel cutout – see Fig. 1.

It's important to know the chassis version, as this will enable the correct circuit diagram to be used. All early chassis used in **CS03H receivers were either versions N2, N3 or N4: later models were fitted with the N5, N6 or N7 versions. These latter were the base chassis for **CS05H and **CSD8H models. So, when servicing an N5 or higher number chassis, it's advisable to use a **CS05H or **CSD8H service manual.

Table 2: NVM and EPROM details for different models.

Model	*NVM (IC1002)*	*EPROM (IC1004)*
51CS03H	CH-IX1588CJH3	CH-IX1507CJH8
51CS05H	CH-IX1588BMZZ	CH-IX1507CJHB
59CS03H	CH-IX1588BMZZ	CH-IX1507CJH7
59CS05H	CH-IX1588BMZZ	CH-IX1507CJHA
59CSD8H	CH-IX1588BMZZ	CH-IX1600CJH0
66CS03H	CH-IX1588BMZZ	CH-IX1507CJH7
66CS05H	CH-IX1588BMZZ	CH-IX1507CJH6
66CSD8H	CH-IX1588BMZZ	CH-IX1600CJH0

First steps

The first thing to note is that the chopper power supply is switched off in standby, so there will be no voltages on the secondary side of the supply. When you look at the front of the set all that's visible is a red light. This doesn't mean that the power supply is running: the neon is connected across the output from the mains switch, so it's a mains-on indicator only.

When a set comes into the workshop for repair, check that it's not in standby either by pressing any of the four buttons at the front for a couple of seconds or by using the standby button on the remote control unit. If the power supply then starts up, this normally means that it's all right – even if it shuts down again a few seconds later.

Before proceeding further, check the resistances across the various supply lines. They vary slightly (by a few hundred ohms) from set to set, but the following figures provide a guide:

+18V supply (cathode of D719) greater than 1kΩ.

–18V supply (anode of D710) greater than 500Ω.

HT supply (cathode of D708) greater than 1kΩ with the line output transistor disconnected. The HT is 112V for 51cm sets, 150V for 59/66cm sets.

+7·1V supply (cathode of D712) greater than 10kΩ.

The two +5V supplies are derived from the +7·1V supply via Q704 and Q707. We will consider these later.

Fig. 2 shows the circuitry on the primary side of the chopper power supply. For standby operation, Q702 is switched on thus connecting the gate of the chopper MOSFET Q701 to the earthy side of the supply produced by the mains bridge rectifier D701-4. Pin 10 of IC1010 controls Q702 – the voltage here is high for standby – via R734 and D721. IC1010 is powered by a separate full-wave rectifier circuit (D724-5 and C723) whenever the set is connected to the mains supply. Note that the voltage at its supply pin (1) can be anywhere between 3·5V and 5·1V – zener diode D1101 is included to set the maximum voltage. If the voltage is lower than 3·5V there's a fault in either the rectifier circuit or IC1010.

You can check whether the power supply is operational by disconnecting one end of D721. Be careful when doing this: if the set is shutting down because of a protection fault, further damage may occur. It is important to reconnect D721 after completing a repair. Otherwise, when the set

returns to standby the sound and picture will be muted by the microcontroller chip IC1001 but the chopper circuit will not be turned off. The result can be intermittent popping sounds from the loudspeakers or other erratic conditions while in standby.

Fig. 3 shows the location of IC1010 and associated components – D724 and D725 are behind the posistor. Fig. 4 shows the location of R734 and D721 on the print side of the PCB.

IC1010 generates a synchronisation signal so that communication with the main microcontroller chip IC1001 can be maintained via the optocouplers

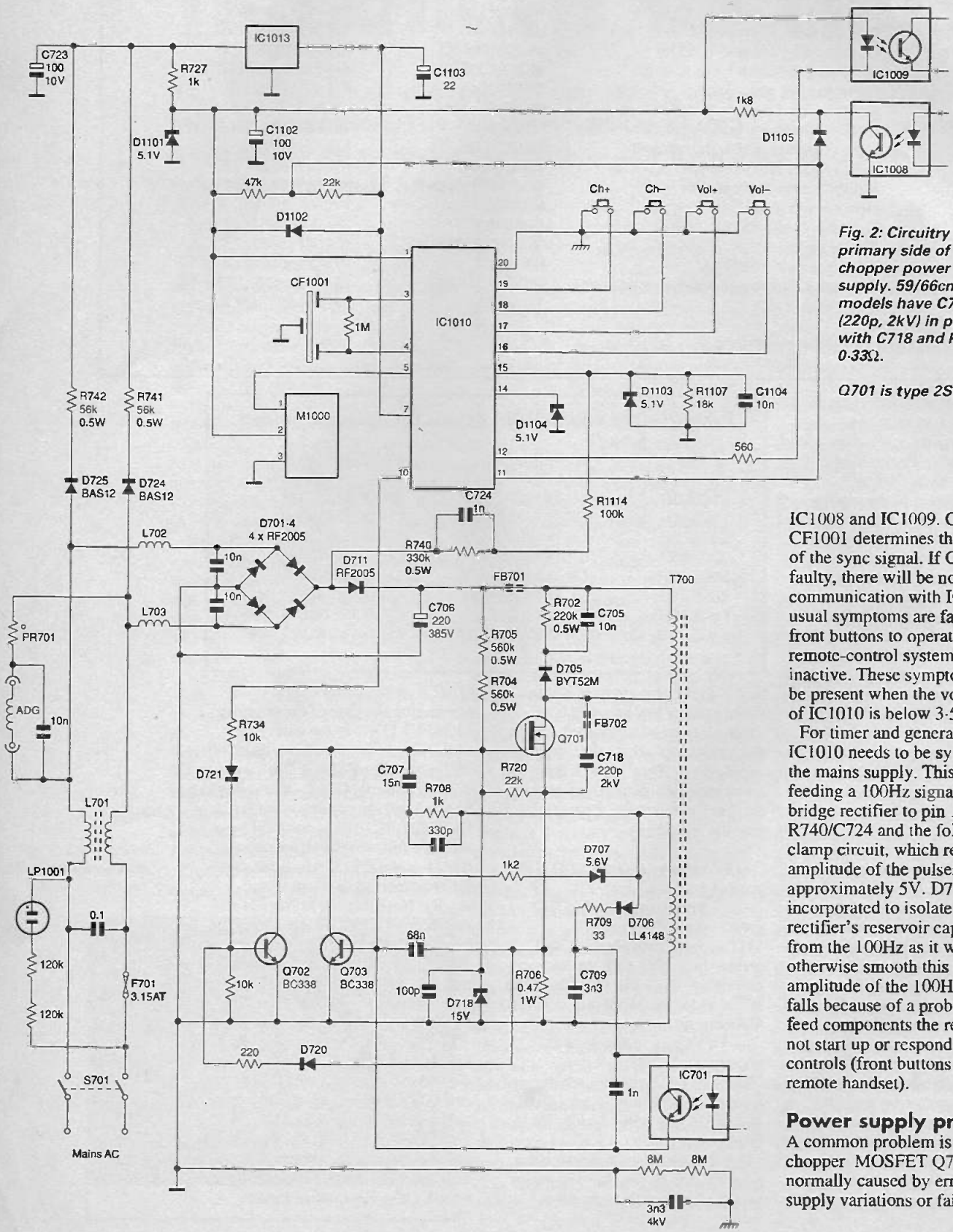


Fig. 2: Circuitry on the primary side of the chopper power supply. 59/66cm models have C733 (220p, 2kV) in parallel with C718 and R706 is 0·33Ω.

Q701 is type 2SK2605.

IC1008 and IC1009. Ceramic filter CF1001 determines the frequency of the sync signal. If CF1001 is faulty, there will be no communication with IC1001. The usual symptoms are failure of the front buttons to operate and the remote-control system being inactive. These symptoms will also be present when the voltage at pin 1 of IC1010 is below 3·5V.

For timer and general operations IC1010 needs to be synchronised to the mains supply. This is done by feeding a 100Hz signal from the bridge rectifier to pin 15 via R740/C724 and the following clamp circuit, which restricts the amplitude of the pulses to approximately 5V. D711 is incorporated to isolate the bridge rectifier's reservoir capacitor C706 from the 100Hz as it would otherwise smooth this signal. If the amplitude of the 100Hz, 5V signal falls because of a problem with the feed components the receiver may not start up or respond to the controls (front buttons and the remote handset).

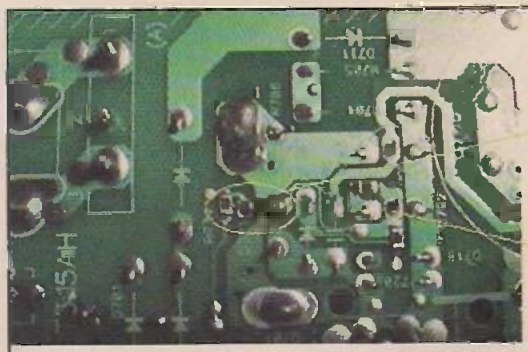
Power supply problems

A common problem is failure of the chopper MOSFET Q701. This is normally caused by erratic mains supply variations or failure of C706

D724 and D725 provide the supply to IC1010

Pin 1 of IC1010 can be between 3.5V and 5.0V

Fig. 3: Location of IC1010 and associated components (Q724/5 are behind the posistor).



Disconnect either R734 or D721 to disable the standby operation of the power supply

When the base of Q702 is high, the power supply is turned off

Fig. 4: Location of R734 and D721 on the print side of the PCB.

(rivets loose). In most cases you will also find that D718 and Q702 are faulty. Sometimes R720 (22kΩ) also fails. It is worth checking the value of R720: if it goes high there will be intermittent failure of Q701.

In normal operation the voltage at the gate of Q701 rises to 4·5V. Q701 then switches on. The voltage at its gate continues to rise until it reaches about 9V, when Q703 switches on, returning Q701's gate to 0V. Thus Q701 switches off. The charging circuit at Q701's gate consists of R704/5 and C707, which is returned to earth via R708 and the winding on T700. R704/5 can go high in value. In this event the power supply normally fails to start up. Alternatively its operation may be erratic.

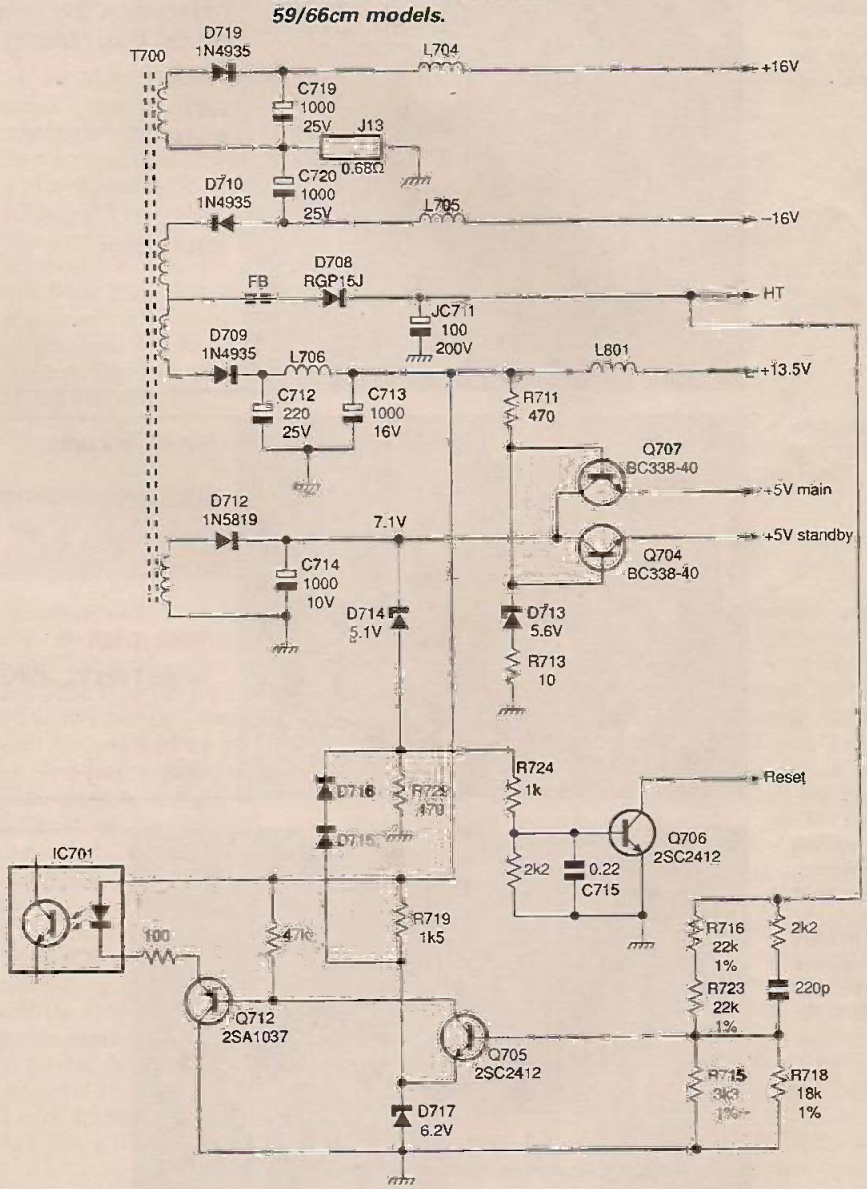
IC701, Q703 or R709 can be the cause of poor regulation. If R709 goes high in value all the outputs from T700 will rise. As a result the reservoir capacitors may fail prematurely. In a few rare cases other parts of the circuitry may be damaged.

Fig. 5 shows the circuitry on the secondary side of the power supply. Q704 and Q707 provide 5V supplies for the various processing ICs. Note that although the output from Q704 is labelled +5Vstby it is not present in standby as the chopper circuit is switched off. These 5V supplies can sometimes be low (less than 4·9V is considered to be low). This will lead to erratic or no operation of the various processing ICs or even failure of the output stages. Normally either Q704 or Q707 will be the cause of a low 5V supply.

Q707 has been known to cause intermittent failure of the field output stage supply fuses (R631 and R632), a black band at the bottom of the screen, the 'rainbow effect' at the top of the screen, line tripping and slowness in coming out of standby. If Q707 is faulty it's a good idea to replace C714 as well, even if it has been replaced before.

Q706 provides the reset pulse at pin 10 of the microcontroller chip IC1001. It's controlled by the charging of C715 via R724 and D714 from the 7·1V supply. If C714 is leaky, the 7·1V supply will develop slowly and the reset pulse will not reset IC1001 or will do so after a delay of minutes to hours.

Fig. 5: Circuitry on the secondary side of the chopper power supply. In 59/66cm models R716 and R723 are 49·9kΩ 1%, R715 is 4·7kΩ 1% and R718 is 180kΩ The HT is 112V in 51cm models, 150V in 59/66cm models.



If C714 has to be replaced, be sure to fit a component rated at 105°C.

The start-up procedure

Once you have established that the power supply will operate independently of any control from IC1010 the next step is to see if the start-up procedure is being completed. It's important to understand the start-up procedure, as this is the key to finding the cause of the majority of faults in the CS chassis. The basic start-up procedure is as follows – the Nicam LED is red during steps 1-16 and green during steps 17-19:

(1) IC1010 and IC1013 are fed with power derived from the mains supply via the rectifier circuit D724/5 and C723.

(2) IC1013 resets IC1010 at pin 7, which goes low.

(3) The power supply starts up when pin 10 of IC1010 goes low.

(4) The +5V supply is established.

(5) The microcontroller chip IC1001 is reset at pin 10, which goes high to reset and then returns to 0V.

(6) The clock oscillator at pins 20 and 21 of IC1001 starts.

(7) Data is read from the EPROM IC1004 via the parallel data bus (ALE is active).

(8) The I²C bus reads data from the NVM (non-volatile memory) IC1002.

(9) IC1001 produces a secondary reset pulse via pin 14 of IC1007.

(10) The secondary reset pulse resets IC305 and IC401 (via Q1001).

(11) Data is sent to IC305 via the I²C bus to check that it has been reset.

(12) Data is sent to IC201 via the I²C bus to check that it is operational.

(13) The secondary reset pulse occurs again.

(14) Line drive, at 31·250kHz, starts at pin 56 of IC201.

(15) IC401 is interrogated via the M3 bus to check that it is operational.

(16) The line output stage becomes active. A flyback pulse is sent to pin 57 of IC201.

(17) IC201 switches the line drive at pin 56 to the normal rate, 15·625kHz.

(18) The field and audio output stages become active.

(19) Audio and video mute released: the picture appears.

Note that if the set was in standby when the mains supply was last switched off it will revert to standby at step **(7)** via the action of IC1010. Also that during the start-up data is transferred to IC1010 via optocoupler IC1008. This enables IC1010 to interpret the various remote-control and key-scan commands.

By monitoring the ALE signal at pin 11 of IC1005 (see Fig. 8) you can check whether data communication is taking place between the EPROM (IC1004) and the microcontroller chip IC1001. Effectively, the ALE signal changes state each time data (an instruction) is read from the EPROM. This must therefore mean that the reset pulse

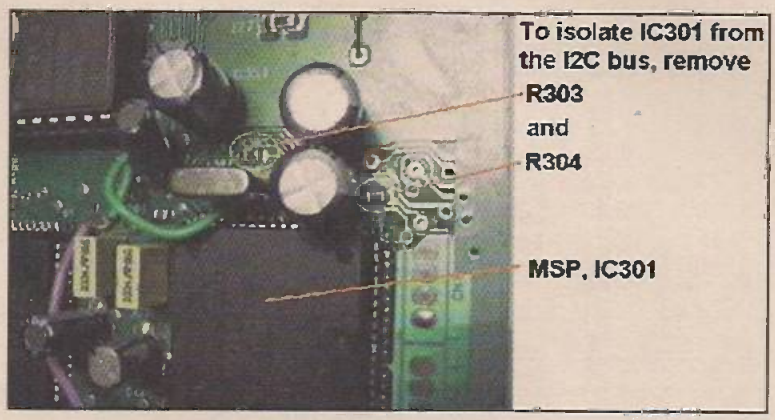


Fig. 6: Isolation of the MSP chip IC301 from the I²C bus.

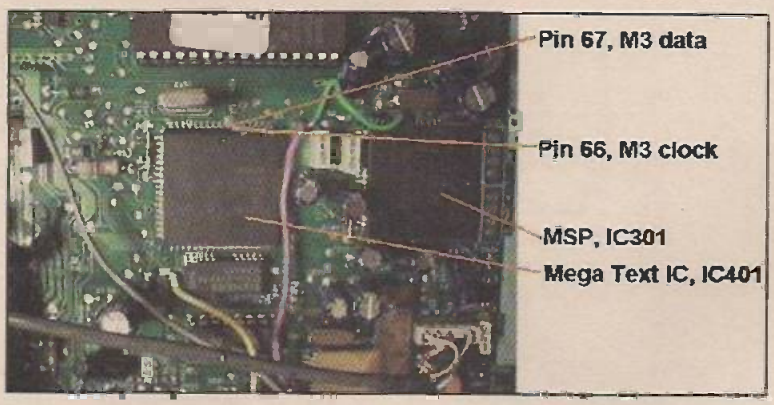


Fig. 7: Location of IC301 and IC401.

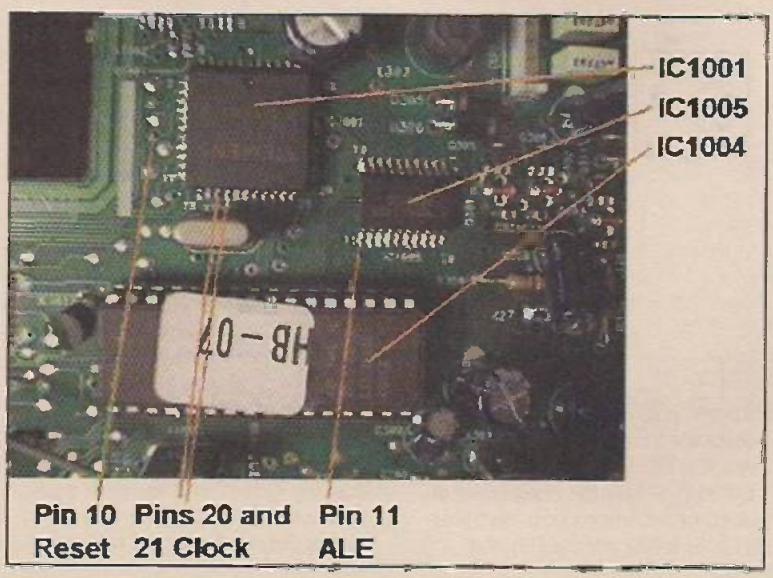


Fig. 8: Location of the microcontroller chip IC1001, the EPROM IC1004 and the port controller IC1005.

has been applied to IC1001 and that the system clock is working. The microcontroller chip reset is on the leading edge – when the reset has occurred the reset pin will be low at 0V. This does not, however, mean that the NVM is working correctly. If you suspect that the NVM is faulty it can be removed from the circuit. If it is faulty the set will then start up after about thirty seconds. However when this is done the line timebase will run at 31·250kHz and there will be no picture or sound. This technique will not work with the Dolby Pro-Logic Models 59CSD8H and 66CSD8H unless the Dolby Pro-Logic panel is disconnected and the software (NVM and EPROM) is replaced by **CS03H versions.

Once the microcontroller, EPROM and NVM chips have been ruled out as fault possibilities the next signals to check are those that control the processing ICs. The CS chassis has two system buses. The first is the I^2C bus that communicates with the signal processor chip IC201, the multiple-standards processor IC301, the NVM IC1002 and the tuner. The second bus is a dedicated M3, which is used for communication with the Mega Text chip IC401.

The CS chassis has a staged power start-up as follows: (1) The power supply starts. (2) The line output stage starts. (3) The field output stage starts. (4) The audio stage mute is released. This ensures that very little stress is placed on the power components in the chassis.

If you suspect that either IC301 or the tuner is faulty and is causing I^2C problems they can be disconnected. The result will be loss of sound with IC301 disconnected and no tuning with the tuner disconnected. To disconnect IC301 from the I^2C bus, remove R303 and R304. Fig. 6 shows the location of these items. This technique will not work if, within IC301, there's a short-circuit that affects the operation of other parts of the circuit (the likelihood of this is remote).

If the Mega Text chip IC401 doesn't respond to the secondary reset pulse, the line output stage will start up then shut down repeatedly in a two-second cycle. The Mega Text IC may not be faulty: it is more likely that the 20·48MHz crystal X451 is short-circuit or off-frequency. Note that if the Mega Text crystal is disconnected the receiver will start up but there will be no OSD or teletext. Fig. 7 shows the locations of IC301 and IC401.

If IC201 is disconnected from the I^2C bus the set will not come on and the Nicam LED will flash at two-second intervals as the secondary reset pulse is repeatedly applied. This applies with Dolby Pro-Logic and later software versions only – when the earlier EPROM is fitted the LED remains steady (on).

Fig. 8 shows the physical arrangement of IC1001, IC1004 and IC1005. The NVM can just be seen at the top of the picture. Note that there are several different types of EPROM, depending on the receiver and chassis type. It is important that the correct EPROM is fitted, otherwise the overall operation of the set may be adversely affected. If you are in any doubt as to which EPROM should be fitted, refer to the parts listing in the relevant service manual. Experience has shown that failure of the EPROM is very unlikely.

The NVM is also available in a number of different versions. Once again the correct type must be ordered, using the part number listed in the service manual.

To follow

In Part 2 next month we will deal with fault-finding in the various power output stages. ■

Test Case 457

Having been bombarded by letters and phone calls from Sky Television, Harry Smith had finally, though grudgingly, decided to go for the new digital satellite TV service. But he wanted to hang on to his old Pace analogue receiver for the channels, mainly German, that a digibox can't provide – never mind MTV and the Cartoon Network! He checked up and found that for £90 he could have a dual-feed installation, including a new 60cm dish, a shiny new digibox and a connection to the phone, provided by Test-Case Repairs and BSkyB between them. The offer was heavily subsidised of course.

It was the first dual-feed job to come the way of our young dish-devil Cathode Ray. Sage explained to him what was involved: he would need a special bracket to hold the additional LNB in position, and he would first have to align the dish with Astra 1 to get the best possible analogue signals, then align the second LNB for maximum signal strength and the best signal quality from Astra 2 to feed to the digibox. He had used both digital and analogue signal-strength meters before with other jobs, so he set off with confidence, armed with a new 60cm dish, a digital-ready LNB, a roll of cable, a two-way telephone adaptor, etc.

The old dish and its fixing bolts were rusty. With a mini-hacksaw and new clamps, Ray fixed and aligned the new dish and the old LNB, then got a good analogue signal – at the expense of a thumb dripping with blood. He bolted on the bracket and the new LNB, which was offset to catch the digital siguals from Astra 2 reflected by the dish. The reading he obtained from the meter was not as high as he had come to expect from recent digital-only installations, but he assumed this was because of the LNB's offset position. Anyway, a new length of CT100 cable was run down to the lounge, alongside the existing one, and the phone cable was tacked along the wall and round to the socket. The strength and quality indications provided by the Panasonic digibox were somewhat lower than normal, a bit under fifty per cent each, but the picture and sound were fine. Sky took but a few minutes to activate the new viewing card.

Ray made out the invoice, and had begun to pack his gear back in the van when the rain started. It brought with it bad news from Mr Smith: the digital pictures were now intermittently freezing and breaking up! When he called up the installation menu, Ray saw that the on-screen signal strength and quality bar-graphs had dropped back some more – to the point at which the Panasonic digibox's error-correction system could no longer cope. The analogue signals from the original LNB continued to provide excellent sparkly-free pictures however.

A new digital LNB was tried: no joy. Ray fitted the digital LNB at the focal point of the dish, which he then realigned with Astra 2. This produced excellent digital signals, pictures and sound. The system was then reassembled in the initial manner, but once again the digital signal strength and quality were borderline. Was the equipment faulty, or was it down to Cathode Ray, or maybe something before he arrived on site? For the answer, turn to page 184.

LETTERS

Send letters to "Television", Room L514, Quadrant House, The Quadrant, Sutton, Surrey, SM2 5AS or e-mail jackie.lowe@rbi.co.uk using subject heading 'Television Letters'.

European broadcasting

A previous correspondent (Letters, October) brought up the subject of broadcasting control imposed by digital technology. Sky Television might be quite correct, legally, in not allowing its TV transmissions to be received and decoded abroad because of copyright conditions. But there may be legitimate reasons for reversing this situation.

Like it or not, we are now part of the European Community. This means that border controls have been abandoned and there is free movement of goods and people within the Community. Why can't the same apply to broadcasting? For obvious technical reasons terrestrial transmission cannot be used for the purpose, but direct transmission via satellite provides the ideal way of doing it. This would make possible a whole new world of broadcasting which Sky, perhaps after negotiations with copyright owners as necessary, could use to everyone's advantage – including Sky itself.

People migrate from one country to another within the EC for a variety of reasons, which include work and retirement. They should be able to watch TV networks of their choice in their own language. SkyDigital could make this possible. Indeed the European Parliament might at some stage decide to make it mandatory. The Parliament might even rule that being barred from watching Sky's or any other broadcaster's programmes in another country is a breach of human rights!

I gather that many foreigners living in the UK can watch their mother country's satellite broadcasts by arranging to obtain a viewing card from their embassy. So why can't Sky arrange for UK viewers to receive its broadcasts when resident abroad by obtaining a viewing card through the local British Consul? Sky would suffer no loss of control over the system, and would be able to pass on collected revenues to the relevant copyright holders.

The future for Sky could be as a European broadcaster, with multi-sound channels. It's possible to use different subcarriers for extra sound channels with analogue transmissions. Provided too many channels are not expected of a digital multiplex, the same should be possible with digital transmissions. The decoder could be configured to select the appropriate sound track automatically.

At present digital TV can prevent those outside the UK watching British TV. But with some planning and initiative, Sky could achieve its potential to become a true European broadcaster. Why not?
Michael Maurice,
Wembley, Middx.

DVD Players

DVD players seem to have hit the ground running in this country. Lower-range models can be obtained for £230 (W.H. Smith) and, with higher-range models available at about £400, there's something for everyone. My estimate is that about one household in forty in the UK now has a DVD player of some sort.

One strange thing is that the cheapest models seem to be multi-region while some of the more expensive models are capable of playing only British discs. Service and repair of the cheaper imported players at a reasonable cost could be a problem. With some computer-based DVD players costing as little as £60 and labour charges levied by some of the larger companies costing as much as £46 plus VAT an hour, many customers will buy a replacement rather than pay for an out-of-guarantee repair.

One point that surprises me is that as far as I know no DVD player has an RF output. The reason for this could well be that as the picture quality is probably the best we have ever seen, why impair it by using an RF modulator? Well, the picture quality certainly is very good, but how do we feed the output from one DVD player through an amplifier to every TV set in the house? The more cynical observer might come to the conclusion that this costs the manufacturer less while the user may buy extra players. If I've got this all wrong, maybe a manufacturer will put me right.
John Hopkins,
Felixstowe, Suffolk.

RETRA membership

In his letter in your November issue Alan Tooke said he understood that you cannot become a member of Retra unless you trade from a shop. I would like to make it clear that for many years Retra has had a considerable number of service-only members, i.e. businesses that do not normally sell new products. While it is true that full-retail members of Retra must, at present, have a shop or showroom, there is no such requirement for service-only members.

The only relevant stipulation we have for such members is that they must operate from premises that are rated for business purposes. So anyone operating from a business-rated workshop could be eligible. We would be delighted to hear from service businesses that think they might benefit from membership of the Association.
Fred Round, Chief Executive,
Radio, Electrical and Television Retailer's Association (RETRA) Ltd.,
St John's Terrace, 1 Ampthill Street,
Bedford MK42 9EY.

Monitor test software

Having recently started a new business repairing computer monitors, based on many years' experience of domestic TV and computer repair, I found the two articles (October and November issues) on upgrading PCs interesting and useful. Unfortunately it appears that Nokia has sold its monitor business, so the monitor test software mentioned seems to be no longer available from the web site specified.

While searching the internet however I found an alternative site that makes monitor test software available free of charge. It's

www.csf.org.uk/home.html

To download the software, all you need to do is to complete a short questionnaire.
Andy Hood,
South West Monitor Repair Specialists.

Signal interference

Test Case 454 (October) dealt with a VCR that produced snowy pictures via its modulator. The cause was a strong DTTV signal from the roof-top aerial on the same

channel as the VCR's output. The solution was to retune the VCR to a quiet spot in the band.

I recently had the same problem with a satellite receiver. With the advent of DTTV, finding a quiet spot in the band is not easy without a UHF spectrum analyser – especially if you are within range of two transmitters each of which transmits five analogue and six digital channels! Once the channels were established however, by using the excellent BBC Engineering Information website, it was relatively easy to find a free one that didn't produce patterning.
Ian Penfold,
Cambridge.

Digital rip-off

For thirteen years I was an audio engineer for a one-shop outfit which, as a result of building problems (the front of the building collapsed) and the loss of an under-guarantee repair contract with a major manufacturer, closed in January 1998. I was thus out of work and, because of a lack of suitable jobs, I ended up as a fabric cutter in a local mill. The mill job paid a lot more than any electronics job I've been for in the past, but the hours were long, the work tedious and hard on the fingers, and holidays were poor. More recently redundancy again loomed. I decided to take it and am now studying CAD. But I feel that it's a waste not being able to make use of all the training and experience I have.

But enough of personal matters. The main point I wish to raise is whether viewers are going to be completely ripped off in the digital era? When I first heard about digital TV I thought we might at last get a system that can provide what we want when we want it. But the way in which digital providers organise channels into groups is just not satisfactory. I and my family watch a lot of discovery home and leisure and a lot of discovery channel, as well as quite a few of the others. To replicate out current viewing, we would have to pay for several packages in each of which we would want only one of the four-five channels it contains. On top of that the Sky Sports channels are extra, and as for films we couldn't replicate what we currently have at all. Another problem is that a lot of the channels we watch are viewed on only an occasional basis, but if we didn't have them there would be huge holes in our viewing.

The right way to give viewer satisfaction would be to give every channel a separate price, so that we could pick exactly what we want, or to have real pay per view, i.e. no total charge but just pay for what you watch when you watch it. But this will never happen, because digital TV as organised at present is about provider and advertiser profitability rather than viewer satisfaction.

The advent of chip/hard-drive videos could also misfire. When I first read about the TiVo and other systems in the States, I thought they would be really good if the packaging was right. It seems that this wasn't satisfactory in the States, where sales have been poor. European broadcasters should have learnt from this, but I am disappointed to find that the TiVo boxes will be sold through Sky. As a result, I feel that we are not going to get a device that offers us all the things of which it is capable.
Edward Dicker,
Bolton, Lancs.

Registration

Having just read Alan Tooke's letter (November, page 25), I would like to point out that there is a trade association which registers companies (and their engineers and technicians) involved in electrical and electronic servicing.

DASA (the Domestic Appliance Service Association) is the closest to a trade association I know of in his field. If you are interested, contact the association – the phone number is 01920 872 464. It may well benefit you, and you may be able to share your experiences with other like-minded individuals.
Michael R. Brett, I.Eng., FIIE(elec),
Watford, Herts.

Parking tickets

If you are called to a customer who lives in a restricted parking area, i.e. with residents-only parking, yellow lines, etc., ask whether he/she can provide you with off-street parking or a visitor's parking permit. If not, you might like to consider refusing to do the job. No one can ask you to break the law. This is particularly important if you are an employee and your boss refuses to pay parking fines. If you are unfortunate enough to be subjected to disciplinary action over refusal to park illegally, take the matter straight to a tribunal.

If you get a parking ticket which you think is unfair, try to contest it. I was given a parking ticket while delivering a TV set. I wrote to the Local Parking Control Authority explaining the circumstances and pointing out that the nearest legal parking space was a quarter of a mile away, and that surely one couldn't be expected to carry a large TV set that distance. I also suggested that to attempt to do so might infringe health and safety laws. I enclosed a copy of the job card and a letter from the customer. Result: the ticket was cancelled and I got an apology.

Do not risk your health by carrying a large TV set any farther than is absolutely necessary. If you can't park safely near a customer's premises, decline the job. In our business, a parking ticket turns a profitable job into one that makes a loss. None of us can afford that. So don't take a chance: the risk is not worth it.
David Belmont,
Wembley, Middx.

Qualified engineers

As a qualified engineer, also registered with the Engineering Council (again 1983) and a member of RETRA, I would like to support Alan Tooke, I.Eng. (letters November). All too frequently I find myself wincing when I hear dealers who campaign for quality service and a registration scheme refer to their service staff as "service engineers", knowing that they have no right to do so.

If it was made a requirement that there must be at least one qualified engineer at trading premises very few firms – independent shops, large retailers or national service companies – would be able to comply.

I supported the RETRA registration scheme up to the level of £300 a year for assessment. But there is very little evidence that the public will pay more for quality service. The proposed RETRA scheme is now defunct, through lack of support – no one seems to believe that the investment required to provide the quality of service to meet registration stipulations is financially viable.

A luxury metal and glass reception area and a stack of high-tech test equipment gathering dust, as required by at least one manufacturer, is only part of the equation. Another part is qualified engineers (this doesn't mean Not Very Qualified, i.e. NVQs). Quality of service should not be judged by location and a luxury reception area but by the state of the workshop; the level of equipment investment and expertise; record keeping and communications; willingness to train and keep up to date; and the technical ability to provide customer satisfaction.

The nature of new products coming on to the market, with their complex digital processing and interactions, will make it even more difficult for those engaged in servicing to meet consumer needs. This emphasises the need for properly qualified engineers.
Steve Beeching, I.Eng., AMIEE,
Newark, Notts.

Terrestrial DX and satellite TV reception. News about broadcasting and satellite belt changes. Does the future lie with cable transmission? An introduction to fibre-optic basics. Roger Bunney reports

DX and Satellite Reception

The peak of the present sunspot cycle is now close and the MUFs (maximum usable frequencies) are rising fast. In mid-October Cyril Willis (King's Lynn) noticed that the MUF had risen above 40MHz. By the morning of the 12th it had reached 41·15MHz, and by the 20th 44·6MHz was being reached. On the 24th, with the MUF to the south east at about 44·6MHz, the first video was seen on ch. E2 (48·25MHz) at 1050 hours BST. During the mid-late afternoon periods in late October US police and utilities were being regularly heard at above 37MHz – but it's difficult to establish a town or area when all you get is a query for "the sheriff" or something like that. On the 28th, a mobile checking the next call from base was told "tree across lines between poles 60 and 61".

Cyril also had some Sporadic E reception during October, as follows:

15/10/00 RAI (Italy) ch. IA; Video (Italy) ch. E2; TVA (Italy) ch. E3; TVE (Spain) chs. E2, 3 and 4; C+ (France) ch. L2.
21/10/00 TVE E2-4; RTP (Portugal) E3.

President Kostunica answers questions during a live phone-in programme on October 6th. Digital reception via the Express 3A satellite at 11°W.

Cyril mentions an interesting method of identifying signals. A scanner and a sound blaster card in a PC are used to measure TV carriers, shown by a spectral display. It's called the "Digipan". If your scanner can tune in 1Hz steps, it's possible to check down to 0·1Hz. Internet users can find information at http://stoli.one.net.au/~vk4cp/digipan.htm

During an early September 2m contest amateur station G8TIC (Lizard Point, Cornwall) noted that, despite the use of a directional aerial system (two 10-element Yagi arrays), received signals spread over 80° with no apparent fall in strength (RSGB report). This phenomenon was experienced with UK and French stations. There is uncertainty as to what have been the cause – two suggestions are FAI (field aligned irregularities) and multipath scatter.

For the first time, after erecting my own DX aerials over a period of 37 years, an installation has suffered severe damage. The cause was the +80mph gales across the south on October 29/30th. Morning light revealed that the Triax Unix 100, previously on the roof peak mast, was pointing skywards: the 10ft x 1·5in. mast had been modified to a banana profile before folding over on the upper TK wall brackets.

Satellite sightings

The overthrow of President Milosevic took place just after I'd finished last month's column. When I arrived home on October 5th Sky News was reporting the riots in Belgrade. Sky and CNN both seemed to be carrying recent footage of the riots, though live reporting was via mobile phones within the crowds and city centre. I quickly checked a few satellites, but there was not a glimpse of raw footage – Stateside outbound news video via NSS K at 21·5°W consisted of mainly rehashed pictures previously seen from Reuters.

I then recalled that Serbian TV (RTS) is carried as a three-channel package via the Russian Express 3A satellite at 11°W: the RTS-SAT channel is a general programme service while another channel is used for the feed to the RTS transmitters. I tried 11·518GHz (SR 16,000+, FEC 3/4) at 1700 hours and up came – nothing! A strong carrier was present, but there were no pictures. One channel produced a 'picture' that looked like a broken digital video freeze. Some minutes later the carrier cut out completely: the uplink was dead. Later that evening Sky News reported that the TV Centre had been torched.

When the new President, Vojislav Kostunica, took up residence on the 6th RTS was back via Express 3A.There was a prolonged phone-in programme that evening, with Vojislav answering questions. After a break with music, a newly-appointed government official continued the phone-in session.

The other major news during the month was the escalating conflict between the Palestinians and Israelis. On the 14th President Clinton was seen flying from Andrews airforce base for peace

talks by the Red Sea (see below). The Middle East summit was carried extensively via NSS K as news feeds for the main US networks: Reuters (11·462GHz V, SR 6,111, FEC 3/4) provided many live two-way reports. There were also many pan-Arabic reports via Arabsat 2B (30·5°E) at 4·08GHz RHC (C band).

At such times it's interesting to see how the Arabic TV networks report the situation. Most provide extended news. Al-Manar TV, which is part of the East Lebanese digital multiplex via Arabsat 3A at 26°E (11·785GHz V, SR 27,500, FEC 3/4), is perhaps the most anti-Israel. The technical quality is truly excellent, with the latest digital fx and video imaging. I've no idea who finances the operation – there are no commercials and few feature programmes. Syrian TV in the same digital multiplex is also very anti-Israel, with prolonged political footage between programmes. Stefan Hagendorn reports having seen Al-Manar TV via the NileSat 101/102 slot (7°W) – check at 11·823GHz V (SR 27,500, FEC 3/4).

I welcomed Roy Carman as a visitor on the 14th. While we were checking the Clarke Belt that afternoon we came across the Bill Clinton trip from the White House to Andrews airforce base carried in its entirety via NSS K. This was on-the-spot coverage, with the motorcade passing through the gardens and streets of Washington, carried out from the motorcade's end FBI car. Interesting to see the technique at traffic lights: when Bill's car stopped, an FBI blocking jeep would draw up alongside to provide protection. The video was obviously not intended for news purposes. I suspect that it was fed into a circuit at Andrews base for the security service to check/record and was inadvertently fed to the Reuters Atlantic lease!

Some of you may recall the video coverage of live medical operations fed to Europe from the Mayo Clinic in the USA, usually with a commentary from one of the surgeons. The Clinic was back on the 5th with a heart bypass operation – the full action in close up. This was an analogue transmission (PAL) via NSS K at 11·729GHz H, audio 6·6MHz, from 1800 onwards.

Intelsat 810 (31·5°W) continues to be used in the late afternoons for regional UK news feeds. Meridian and Anglia both make prolific use of the services. Anglia had live coverage from the Hatfield rail crash site on the 19th from 1750 hours. The transmission was at 10·983GHz V (SR 5,632, FEC 3/4), using the BT-TES 42 truck for the uplink. Regularly used digital slots via this satellite are at 10·963, 10·974 and 10·988GHz, all V.

Roy Carman continues to receive SNG and OB links via Eutelsat II F3 in its new position at 21·5°E. Because of the closeness of the Astra 1 slot at 19·2°E, precise dish positioning is required to minimise adjacent satellite interference. There is also the need to be able to compensate for II F3's inclined orbit. Most users followed II F3 when it moved from 36°E, but many of us have experienced difficulty in locking the signals from the new position.

Broadcast News

UK – RSL-TV: 'Channel 5', transmitted from the Craigkelly TV mast on ch. E52, has been on test since mid August. The content consists mainly of text, cartoons and local information plus live Sky News between 0800-0900 and 2200-2230. TV 12 (Isle of Wight – ch. E54) was off-air during the weekend October 21/22nd because of a "technical fault". Herts TV (Hertford) is advertising for a "head of station" to organise the start of the service during "the first half of 2001". The advertisement emphasis the need for experience of modern TV news, suggesting a difference from the other current RSL-TV stations that rarely include local news.

Graham Benson, chairman of TV 12, plans to form a consortium of RSL-TV stations to sell advertising space and promote their unique local services. Takeovers are likely to lead to RSL networks, strengthening the financial base of these operations – The Oxford Channel ran into debt last summer.

Greece: The Athenian channel TV Magic has been bought by Socratis Kokkalis, which will introduce new information and entertainment programming. Socratis plans to create a network alliance with other Greek local TV channels – forty have already been signed up – and has been granted a digital satellite TV transmission licence.

Denmark: A new Christian TV channel, Hosianna, is broadcasting from Slagelse on ch. E60.

Monte Carlo: The RTL-TV group is expanding, with more studio space and channels. More shares have been bought in Spanish broadcaster Antena 3, and media interests are being sought in Eastern Europe. RTL now has TV interests in eleven countries. In the UK it has an interest in United Media and Channel 5.

Start of a live pop interview networked from the States to Europe via NSS K at 21·5°W. The hum bar was caused by incorrect camera setting – 1/30th frame speed.

Satellite TV news

SES/Astra is developing a broadband interactive multimedia

service via small, two-way terminals, operating in Ka band with small dishes – typically under 1m. Apparently some 10,000 packages have started to arrive in Europe from Norsat International in Canada. Despite the high frequency, rain fade is said not to be a problem.

Check the BR or Sky-vacated analogue channels at 19·2°E on December 21st, late night, for coverage of the launch of Astra 2D. Recent launches have been carried on these channels in the clear with full control-room 'chat' – some of it suggested that the Kourou TV crew were unaware of being broadcast Europe wide!

Telenor has taken almost a quarter of the transponder capacity aboard Intelsat 10-02, which is due to be launched in 2003 to orbit at 1°W, for broadcasting to Scandinavia. The capacity will provide about 100 digital TV and radio channels.

PanAmSat-4 at 68·5°E, which is just above the SE horizon in the UK, will shortly be replaced by PAS-10. This will extend the footprint to cover S and SE Australia, providing single-hop Europe-Australia operation.

Two Hughes satellites will soon be providing digital L-band radio services in the USA. XM Rock is due for launch on Christmas Eve into orbit at 85°W, to be followed by XM Roll next February 12th. The services will be subscription financed and are intended for use by car and portable radios across the USA and parts of Canada. AsiaSat-4, another Hughes bird, is to be launched into orbit at 122°E in spring 2002, providing Ku- and C-band DTH TV/radio capacity across SE Asia.

Kanal E, a Turkish-language channel, has been started by CNBC-Europe to provide international and local financial news. It will be produced and edited at the E studios in Istanbul.

The CNN London Bureau is to expand programme output, providing an extra two and a half hours of live programming daily at 1100, 1400 and 2130 GMT. The Bureau will then provide eight hours of programming a day for CNN plus two hours for the CNNI channel. Twenty staff are being taken on.

Piracy of satellite programming is common in SE Asia, with illegal local cable systems distributing the pirated channels. Because of this HBO Asia has pulled the plug on its movie channel, replacing it with an advertising-supported service that will provide films from four major libraries. If this is successful, a service to Taiwan will be started.

Fibre-optic communication

You may have seen trenching teams installing green trunking underground for future fibre cables – hereabouts a trunk from Southampton is passing through Romsey en-route to Salisbury via the A27. It will presumably then go farther for future activity all over the country. This is not just for regional but also international communications. Fibre-optic communication is cheap, signal transmission delays are minimal, operation is totally secure, there's immunity to interference both inductive and electromagnetic, the bandwidth is wide and is suitable for data, voice and video, digital and analogue. Transmission loss is very low, an in-line repeater being required at about 50km.

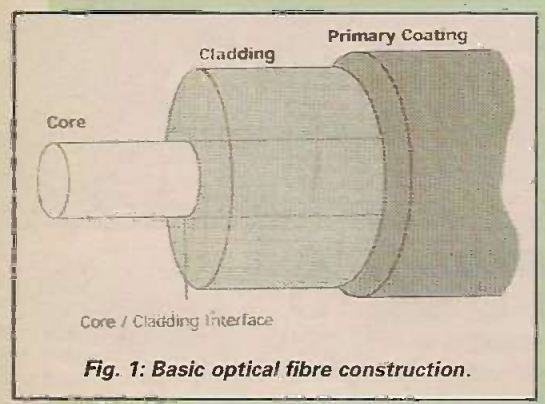


Fig. 1: Basic optical fibre construction.

Most fibre-optic cable is made of silica quartz glass. Fig. 1 shows the basic 'fibre' arrangement. It consists of a core, which is the actual glass transmission path; cladding, which is also glass but has different properties and acts as a waveguide to keep the light within the core; and a primary coating that acts as a protective barrier to prevent external light (especially UV) causing interference. The fibre may be attached to an outer plastic sheath or may be loose within the sheath, with optional gel between the fibre and sheath to prevent water ingress. Fig. 2 shows various forms of practical fibre-optic cable construction, from a single fibre with loose sheath (tube) to a six-fibre bundle with two quads of copper cable – copper may be used to carry power feeds etc.

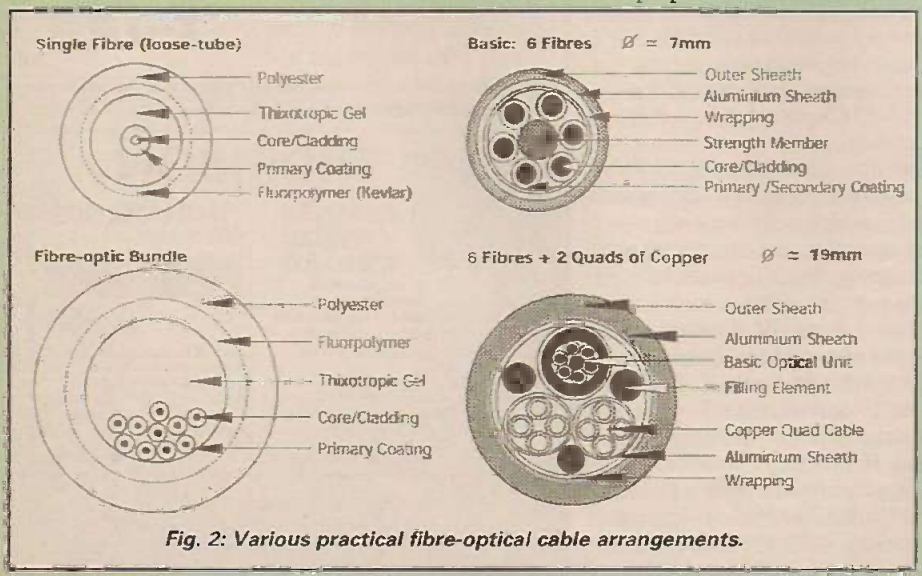


Fig. 2: Various practical fibre-optical cable arrangements.

There are three different types of optical fibre in common use, multi-mode/step index, multi-mode/graded index and single-mode/step index, see Fig. 3. With a step-index fibre there is an abrupt step at the interface between the core and the cladding. This means, with a multi-mode fibre, that light is reflected from the cladding to form a complex propagation pattern. With a single-mode fibre the cladding simply keeps the light within the core – this arrangement provides the best output pulse shape. With a graded-index fibre the core glass index is lower towards the outside. As a result, light is propagated as a series of envelopes, combining at regular intervals, instead of being reflected. Multi-mode/step-index fibres are for short-range (1km) use. Multi-mode/graded-index fibre can be used to provide a range of say 4km: an inexpensive LED can be used as the launch (transmit) device. Single-mode/step-index fibre provides a range of 50km before a repeater is required: a higher-quality, laser diode has to be used

Finally, porn channel Adult X has gone dark – apparently the bills weren't being paid, so it's now off-air. The channel used to be present as part of the Dutch Canal+ package Canal Digitaal via Astra at 19·2°E and the Scandinavian Telenor/Canal+ package Canal Digital via Intelsat 707 at 1°W. Canal+ has introduced its own erotic channel, X Zone, to maintain an adult service for Dutch viewers.

For disposal

Graeme Wilson, Technical Manager at UCB Studios, Stoke-on-Trent, has for disposal a number of professional 19in. rack-mounting Drake ESR1255 analogue satellite receivers. They are only four years old and cost £800 when new. Features of Model ESR1255 include four IF bandwidths, threshold extension, lots of communications features, 950-1,750MHz input, C/Ku-band operation and tuning in 250kHz steps with a front-panel readout. Reason for the sale is that UCB is now using Astra digital at 28·5°E instead of analogue at 19·2°E. Offers for any/all receivers should be made to Graeme on 01782 642 000, ext. 260, between 0800-1600 or e-mail ucb@ucb.co.uk

Satellite dead?

November's leader (page 3) suggested that fibre-optic has "pushed satellite communications into the margins" for international operations. Eutelsat and SES at any rate probably wouldn't agree: they are both investing in additional Clarke Belt capacity, with more satellites on order for both DTH TV and two-way communications and operations being extended into Ka band. There will be a growth of international satellite communications capacity over the next two years, with more launches planned than in previous years.

Fibre does offer many advantages however, including security, reduced carriage cost, wide bandwidth and local distribution networks underground to your home instead of an exposed dish as part of a DTH/VSAT system. Communications are changing rapidly. Medium wave may go digital for example, we have L-band digital radio via satellite, and analogue TV in the UK may be closed within five years. Things are moving fast.

Perhaps, with the prospect of fibre, the internet and ADSL taking over, it's time for some explanatory notes.

as the launch device.

The loss at a fibre-optic join is typically upwards of 0·2dB depending on the way in which the mating glass strands connect. A small air gap in the transmission path is destructive, particularly with an analogue signal. Mating contact faces are usually polished and shaped. Several contact variations are in use, the most efficient being the 'angle physical contact' (APC) which has an 8° angled-contact surface. This minimises return loss (reflection).

To minimise signal loss and reflection very high-quality plugs and connective components are required throughout a system. Fibre ends are cemented to the central pin of a connecting plug, and the pin must match exactly the mating bore for correct fibre alignment and signal transference. This involves fibre glass welding and related thermal techniques. Cable routeing follows satellite feeder practice, i.e. no sharp bends or pinching.

The basic LED launch device can be used to transmit a modulated signal, analogue or digital, over distances of say 10km, providing power of 0·5mW with operation at up to 50Mbits/sec. The LED is slow and non-linear, but cheap. A laser diode launcher emits a coherent light beam with a spectral width of <10nm. It requires a stable, temperature-controlled launch environment but provides up to 4mW transmit power over 50km of cabling. At the receiver end of the cable a pin diode or avalanche photodiode converts the incoming infra-red light to electrical signals for processing.

The technology provides mega bandwidths. Marconi has produced a fibre-optic strand that can carry 500,000 voice circuits, a bandwidth capacity of about 10Gbits/sec, and is carrying out research on a 40Gbits/sec system.

Optical multiplexers can now combine 32 light wavelengths for fibre transmission via a single launch laser diode.

My thanks to Krone (UK) for providing information on fibre-optic cables. For more on the technology, consult Krone's website – www.krone.co.uk

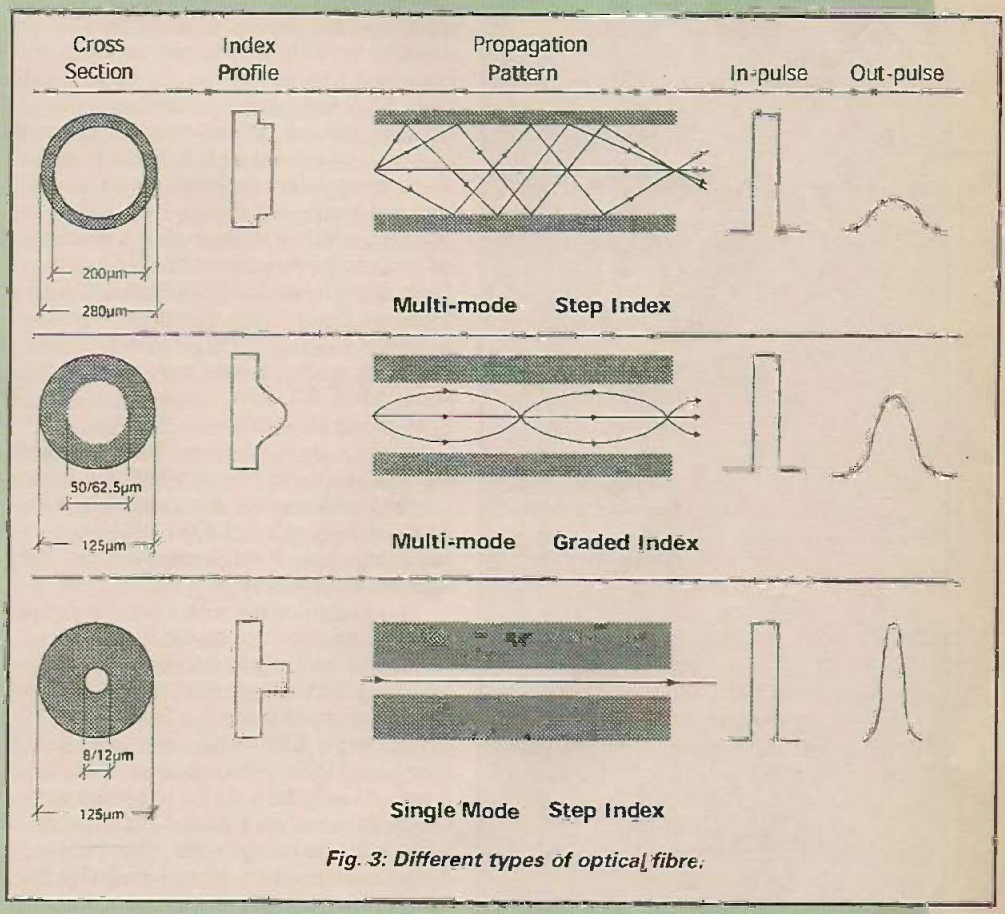
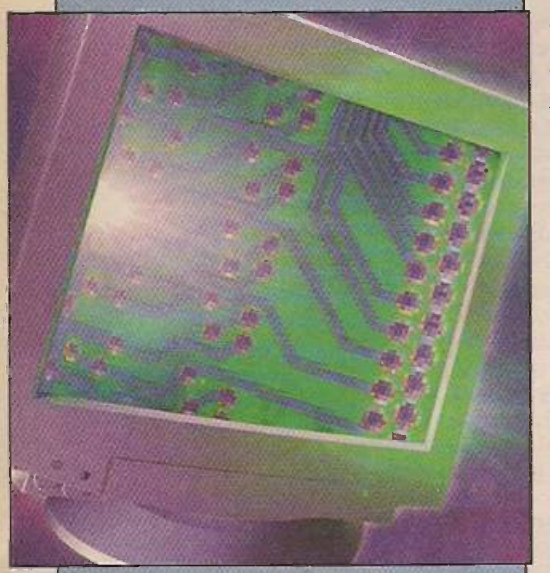


Fig. 3: Different types of optical fibre.



MONITORS

Fault reports from Ian Field and Michael Dranfield

We welcome fault reports from readers – payment for each report is made on publication. Reports can be sent by post to:

Television, Fault Reports, Reed Business Information, Room L514, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS

faxed to: 020 8652 8111

or e-mailed to: tessa2@btinternet.com

JD144K

I don't know what to call this monitor: there was no maker's badge on the front nor any sign that there had ever been one. The label on the back says: Model name 29J44L, Model no. JD144L and FCCID: AMPJD144K.

The 2·5AT mains fuse had blown, the mains switch had a fracture ring around one of its pins, and the soldering to the degaussing posistor looked dull. I removed the posistor for examination. It didn't rattle, but I broke it open to look inside. The plastic insert had vaporised metal deposits on it and the centre contact had a 'nibbled' appearance around the edges. A new 140M271 posistor and a quick go over the soldering, which wasn't too bad, completed the repair. I was expecting to find that the shadowmask was magnetised, but the purity was good when the unit was powered. **I.F.**

AST Vision 7L

"Smokes big time" was the concise job report that accompanied this monitor, which came from a trade customer. On inspection I found that the insides of C343 (1µF, 50V) had been splattered over the adjacent heatsink. Without service information the best I could do was to trace outwards from the most conspicuous damage. The first transistor I checked was Q346 (R1001), which was short-circuit base-to-collector and open-circuit base-to-emitter. This failure mode is often associated with a transistor that's driven to saturation and has an inductive load. There were in fact inductive loads nearby, but they were isolated by power MOSFET driver stages.

Working outwards from the 'epicentre', I checked numerous diodes, transistors and MOSFETs, one or two of which had heat-fatigued soldering but were otherwise OK. As the search widened, Q350 (R1001) came into view. It was burnt away and the adjacent PCB was slightly charred.

This presented me with a bit of a problem, as I hadn't come across the device before and no one had it in stock. Some searching through reference books and catalogues revealed that it's a Samsung device, in the KSR1XXX series, and that there's a '2SC' equivalent, type 2SC4363. It turned out to be a digital transistor with two built-in resistors, both 4·7kΩ, one in series with the base and the other between the base and emitter. When I looked at the basic ratings I decided to try the readily available 2SC1815 and add external resistors. It's a simple matter to cut the base lead short and insert a 4·7kΩ resistor, and the subminiature type fits nicely across the base-emitter leads.

Once the damaged components had been replaced the monitor was OK. When I told the customer that repair was viable and gave him an order number for the correct type of transistor he commented "never mind that, how soon can I collect?" **I.F.**

CTX 1565D

This monitor had an odd fault and I was unable to decide with any certainty whether the cause was the CRT or the LOPT/HV block. When I told the customer this he produced a second one, explaining that it had come to him with the mains fuse wired across. He suggested that I scrap it and use whatever parts were needed to repair the first one, in the hope that its CRT was OK.

When I removed the chassis which had been tampered with I expected to find that various tracks had been blown away. But it was OK in this respect, and the on/off switch was also OK. Further checks revealed that the fuse, the primary side of the power supply and the line output transistor were all OK. The culprit turned out to be Q401 (2SK890), which was short-circuit.

As the B+ PWM in this model is of the flyback type, the short-circuit MOSFET was shunting the power supply and activating the overload shut down. A handy feature of the flyback type B+ PWM controller is that it provides a step-up – in this case the pre-PWM supply is only 89V. Simply removing the MOSFET leaves the inductor and rectifier in series, feeding the pre-B+ PWM supply to the LOPT. When I tried this the monitor produced a display that was about two-thirds normal width.

Since the first chassis had a MOSFET ready assembled on its heatsink, I decided to fit this in the second one. While removing it I noticed that it was an IRF630. Both types are rated at 200V, 75W, but the IRF630 has a 9A rating while the 2SK890 is rated at 10A. A check on the serial numbers indicated that the chassis with the 9A MOSFET was of later production, so I was happy to install the IRF630.

Now that I had a working chassis it was possible to test my theory that the CRT in the other monitor was faulty – by swapping over the LOPTs. Both LOPTs worked faultlessly, confirming that the CRT was indeed defective. **I.F.**

Elonex MN024/F3T+ (Acer chassis)

The basic symptoms were power light on but no picture. I found that the power supply was pulsing because the BU2522 line output transistor Q302 was short-circuit – the capacitor on the rail that feeds the power LED obviously held sufficient charge to keep the LED alight.

While looking for possible causes of the line output transistor's failure I noticed that

there were numerous dry-joints, particularly at the pins of the chopper transformer – one was almost detached. The frame output IC needed resoldering, as did most of the power MOSFETs in the line output stage. I attended to the soldering and then noticed that the line flyback tuning capacitor C307 (4·7nF, 1·6kV) looked a bit bulged. Once this item and Q302 had been replaced the monitor worked perfectly.

C307 is in parallel with the 'damper'/upper EW diode, and both ends are connected via wire links. So it's difficult to find! To add to the difficulty, a large blob of opaque silicone-rubber had been placed over the upper capacitor/wire-link connection. **I.F.**

Elonex MN024/F6Y

This monitor was on its third visit and everyone was getting fed up with it – the end user, the trader and myself. On its first visit I found that there were plenty of dry-joints, but there was little by way of a fault description. The monitor had apparently been losing its width setting, though I had not noticed this while using it for two or three days when setting up new hard drives and carrying out general maintenance on the bench-test PC.

After this first session the monitor didn't even make it back to the end user – the focus was out. The trader had also discussed the fault with the user, since there is a knack to storing new settings on the front panel. The end user had said that he knew perfectly well how to operate the buttons correctly.

When the monitor arrived on my bench for the third time the focus was indeed appalling. The fault cleared as I inserted the trimming tool into the adjuster. After adjusting the focus I decided to press the reset button then centre all the presets. When the width preset (VR301) was moved the monitor went berserk! All that aggravation because of one noisy preset! **I.F.**

Taxan MV789LR

The original fault was that R820 (150kΩ, 0·5W, 1%) in the HT monitoring circuit had gone high in value. Instead of the usual PWM/line output stage blow up there had been severe arcing in the flyback tuning switch circuitry, which uses BDT62C Darlington transistors instead of the power MOSFETs used in more recent designs. In addition there was the usual collection of damaged HT electrolytics. After dealing with the original cause of the problem, then cutting away the charred PCB and linking the damaged tracks, the monitor worked. But it had a heat-sensitive side-pincushion fault that virtually cleared once the running temperature was reached.

These monitors are rare nowadays, but still turn up from time to time. Over the years I've noticed that a couple of 1µF, 35V tantalum bead capacitors (C109 and C121) close to the front edge of the PCB are sometimes fitted the wrong way round. And, yes, they cause side-pincushion faults! Having traced out this part of the circuit I came to the conclusion that the use of a polarised capacitor in one of the two positions was dubious. I decided to replace them both with non-polarised, non-electrolytic capacitors (Mylar or polycarbonate will do). When I did so the display appeared with extreme side pincushion distortion from cold. Adjustment of the S-pin gain and amplitude presets on the UPC1406C sub-panel brought the sides of the display neatly into line with no thermal effects. **I.F.**

Delta Electronics DB1765BA

The green LED was on but there was no rustle-up of EHT. Some quick checks showed that the line drive was missing, so I traced the source back to IC201, a 42-pin sync/jungle chip with an earthed screening strip glued to the top so that the type cannot be read! While tracing back along the track a flylead and 150kΩ resistor, secured about half way with a blob of white glue, had to be moved. When this was being done the resistor end pulled from the PCB, and on investigation I found that its lead had never alloyed to the solder. Fortunately the PCB was very clean, and as this item had been fitted after flux washing its connections to the PCB were the only ones with flux residues on them.

When I returned to IC201, I had no idea which pin was used for its supply. So I decided to check every pin with an oscilloscope. I found that there was no signal other than low-level noise at any of the pins, which confirmed my suspicion that the chip had no supply voltage. Use of the digital multimeter confirmed this.

Checks on the various three-terminal regulators on the secondary side of the power supply brought me to IC201 (78X12), which had no output or input voltage. The input comes via D213 (1N4001), which lost the supply despite checking OK out of circuit.

Incidentally one end of the 150kΩ resistor plus flylead is connected to the junction of R491/Q408 (base), the other to the junction of C526/R529. I have no idea whether the faulty connection made any contribution to the fault. **I.F.**

AOC 5VLr

The complaint was excessive width. There's a conventional EW driver transistor in this chassis, but unfortunately it wasn't the cause. Q411 (IRF630) had run hot and scorched the board: it was now short-circuit. Q410 (IRF630) was also short-circuit. The cause seems to have been a dry-joint at one end of C425 – there was evidence of arcing.

Once the two MOSFETs had been replaced and C425 had been resoldered there was width control, but the grey-scale was appalling. Several attempts at balancing it still left a slightly magenta black level. Any attempt at removing this left a predominance of green in the lightest bars.

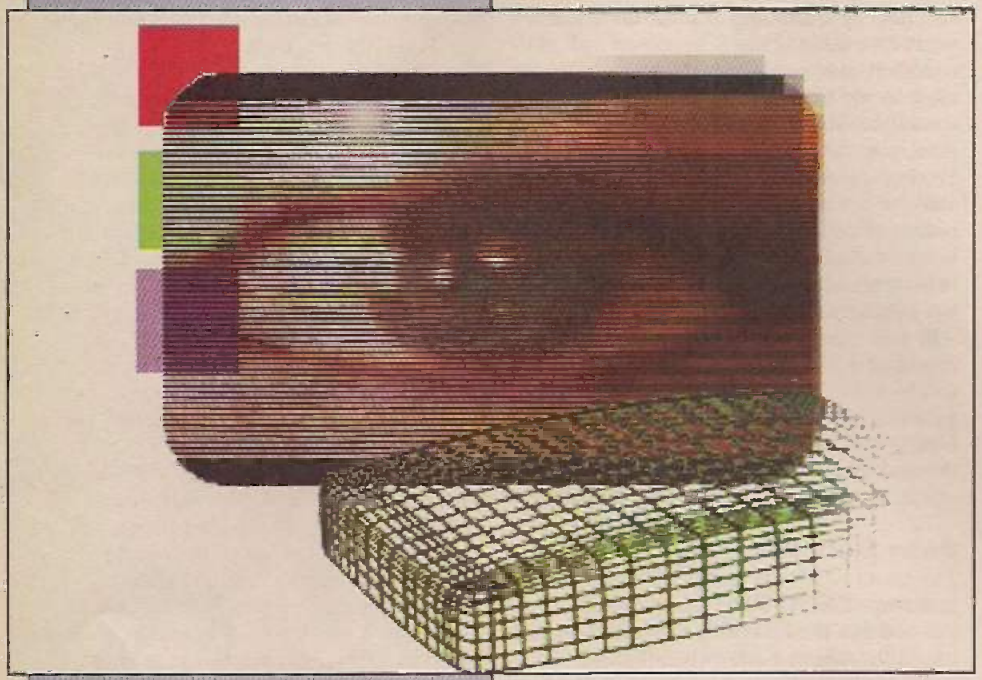
Pins 12, 14 and 17 are the gain control inputs at IC801 (TLS1233N). Only the inputs at pins 12 and 17 (blue and red) are adjustable. Pin 14 is fed from a fixed potential divider (R817 5·6kΩ and R823 1kΩ) between the 12V supply and chassis. The two adjustable potential dividers consist of a 5·6kΩ resistor and a 2·2kΩ preset. All three inputs are fed via series 220Ω resistors, and there are 0·1µF decoupling capacitors at the sliders of the presets and at the fixed tap. It was a simple matter to remove R823 and fit a 2·2kΩ preset in the vacated holes. The track to the 220Ω resistor was then cut, and a flylead was used for connection to the preset's wiper. The track cut isolated the decoupling capacitor, so one had to be fitted on the print side of the board.

It still took two passes to balance the grey-scale. The first was with all three cut-off controls at minimum, all three gain controls at maximum, the A1/G2 control backed off until only the four brightest bars were visible, then backing off the gain controls for the two most prominent colours. When the A1/G2 control was advanced to see which colour flooded the black level first, it became apparent that the cathodes had fairly varied cut-off points. Once these had been equalised by advancing the cut-off presets, only as far as needed, the gains had to be rebalanced.

With an aged tube it's best to start the second-pass gain balance with all three presets at maximum, then back off the two strongest drives to match the weakest. Once this had been done, advancing the A1/G2 control again showed that the black-level balance was only slightly off. A final tweak of the cut-off presets produced an acceptable grey-scale. **I.F.**

Mag DJ530

The power supply worked but this monitor wouldn't switch on. I traced the cause to a TO92-cased voltage regulator that had 16V at its input but only 2V at its output. The circuit reference number, Q309, might have led one to think it was a transistor, though it was marked LM78L05ACZ. It probably provides the 5V supply for the microcontroller chip. **M.D.**



TV FAULT FINDING

Reports from
Michael Dranfield
Kevin Green, TMIIE
Eugene Trundle
Gerald Smith
David Evans
Michael Maurice
Colin J. Guy
David Smith
John Poulton and
Steven Leatherbarrow

We welcome fault reports from readers – payment for each fault is made on publication. See page 166 for where and how to send reports.

Minoka MK1491A

This was an interesting fault condition. The set was tripping and the 112V HT supply was low, but removing its load by disconnecting the collector of the line output transistor made no difference. After many fruitless cold checks I decided to disconnect pin 4 of the optocoupler in the power supply. The HT voltage then rose to 150V – as the line output transistor was still disconnected, no harm was done. What I did find however was that R606 began to smoke. It's in the TDA1013B audio output chip's 20V supply, which is also used to bias the optocoupler. It turned out that the audio output IC was short-circuit. As a result the 20V supply was low and the optocoupler reduced the HT voltage. **M.D.**

Ferguson T51N (TX91 chassis)

This set had all sorts of intermittent faults. It would switch itself to standby, come back on of its own accord, the height would decrease and the sound system data in the EEPROM would change on its own. Presumably the height and sound system values were reverting to their default ones. Reprogramming the EEPROM would cure the problems for a few hours or so, but the EEPROM would then again become corrupt.

I noticed that the set would switch to standby when pin 2 (reset) of the microcontroller chip was touched, so I decided to decouple this pin with a 10nF disc ceramic capacitor. After that, touching pin 2 with a meter probe no longer switched the set to standby, but the other faults were still present.

Ferguson Technical suggested replacing the microcontroller and EEPROM chips as a pair, but this failed to cure the fault. I eventually traced the cause to the surface-mounted BC848B transistor TR01, which is connected to pin 39 (interrupt request) of the microcontroller chip. A replacement transistor restored normal operation.

Note that there are two versions of the TX91 chassis: the other is the TX91G. The microcontroller chips are not interchageable as they have different pinouts. **M.D.**

Tatung 190 series chassis

This set could be tuned in and the stations could be stored, but when the channels were changed the volume fell to zero. The fault was cured by replacing the HD401220RA06S microcontroller chip. Note that there is no separate EEPROM in this chassis – it's in the microcontroller chip. **M.D.**

Matsui 14V1R (Grundig CUC7303 chassis)

The customer complained that a faint picture was still present when this set was switched to standby. I couldn't see any picture when I tested the set, but the CRT heaters remained alight in standby and buzzing came from the field scan coils. Absence of the correct manual caused a bit of a problem, but I managed to find that pin 1 of IC676 should go to 1·2V in standby: in this set it remained at 10·7V. When I traced back from this pin 1 came to a BC848 surface-mounted transistor whose base would switch between 0·7V and zero though its collector remained high. It tested OK, but a replacement cured the fault. **M.D.**

Matsui 2086

For lack of contrast replace R316 (100kΩ). It's part of the beam-limiter circuit and can be found between the field output IC and the power switching relay. **M.D.**

Philips Anubis A AC chassis

One of these sets had a very narrow picture: just a strip about four inches wide some three inches from the left-hand side of the screen. The rest of the screen was blanked out. After some checking and head scratching I eventually found that the cause was the TDA3504 video controller chip IC7280.

Another of these sets had a nice little bread-and-butter problem: it would intermittently blow its BUT11A line output

transistor. The cause was found to be one we've had several times before, dry-joints at the connector plug that feeds the scan coils. **K.G.**

Toshiba 32MW7DB

There was no colour at all, just a very faint pattern over the screen. Checks showed that the relevant supply voltages were OK and that the reference oscillator was working correctly. I then found that the colour could be restored by attenuating the aerial input by about 12-18dB. The cause of the fault was the TA1259N chip Q501. **K.G.**

Sanyo CBP2565 (E3-A25 chassis)

There was complete absence of picture and sound though the front panel LED display was alight. It took a long time to discover that Q724 (2SA608) in the chopper power supply was short-circuit emitter-to-collector. It takes the error bias input from the regulation feedback optocoupler and applies this to the chopper control circuit. **E.T.**

Sharp 66AS05

This set had no sound or picture and it did not take long to discover that the 2SD1546 line output transistor Q600 had failed. I disconnected the HT feed to the line output stage then checked the waveform at C607, which couples the line drive to the pre-driver transistor Q606 (2SC2412). The drive should be 3V peak-to-peak but was cramped. When one end of C607 was lifted it came up full and uncramped. Q606, a surface-mounted device, turned out to be leaky. A replacement produced a clean line drive waveform and, once the line output stage had been repaired, normal sound and pictures were restored. **G.S.**

Nokia 6364UKSFN

The picture had what looked like an EW fault, though the EW correction circuit was OK. When I checked the network D515, R515, C515 I found that C515 (2·2µF) was faulty. A replacement restored correct scanning. **G.S.**

Mitsubishi CT2154TX (Euro 4 chassis)

This set was dead with no sound or picture. There was no activity on the primary side of the chopper power supply because the transformer was open-circuit between pins 5 and 6. A replacement restored the set to normal working order. **G.S.**

Sanyo CBP2180

This set had a snowy picture and wouldn't tune in. Checks at the tuner showed that there was no voltage at the TU pin. It comes from the front area of the PCB, where the cause was traced to dry-joints at link J159 – at the front right of the main PCB. **G.S.**

Decca D14RFG6 (Tatung F series chassis)

This set would switch on normally. After less than half a minute however it would, without any warning, shut down in the standby mode with the standby light flashing – there was a repeated pattern of four flashes. The cause was R909, R913 and R922 (all 180kΩ) which had gone high in value. They are on the CRT base panel. Diodes D901 and D910 in the beam limiter circuit, which is also on the CRT panel, can also cause this fault.

My thanks to Wizard Distributors who obtained this information from Tatung. **D.E.**

Sanyo CBP2876 (ED0 chassis)

This set wouldn't come on: it kept reverting to standby with a squealing noise. It's very difficult to fault-find with this chassis as almost any fault will make it go to standby! There was a tell-tale sign of burning from the TDA8170 field output chip however, and I noticed that it was cracked. I replaced it, along with the 100µF flyback boost capacitor C703, which had certainly seen better days, and the fuselink R715. When I switched on again I was rewarded with a picture that was flashing. There were also hissing and arcing noises from the line output transformer. A new LOPT and setting up restored good results. **M.M.**

Proline NV3200

The complaint with this 33in. monster was lines in the centre of the screen. Because of its size, I had to carry out the repair at the premises. Fortunately the problem turned out to be field flyback lines, caused by the demise of C432 (100µF, 63V). **M.M.**

Finlandia C51JZE (Nokia N chassis)

This set was dead though a clicking noise came from the power supply. Checks soon revealed that the S2000AF line output transistor was short-circuit. When a replacement was fitted there was an EW fault with the EW driver transistor TH03 (BD241D) running very hot. The culprit was CH09 (150nF) in the line output stage tuning network – it was open-circuit. The replacement should be rated at 400V. **M.M.**

Ferguson 59K7 (ICC5 chassis)

Intermittent operation was cured by attending to dry-joints in the line output stage. There was also lack of width, which required replacement of the TDA4950 EW correction chip IG01. **M.M.**

Philips 17PT166A (Anubis A AC chassis)

This set came in dead from another dealer who was convinced that the line output transformer was short-circuit. It wasn't: the cause of the short was the scan coupling capacitor C2450. The value varies with tube size. With 15 and 17in. tubes the value is 330nF. **M.M.**

Philips G110 Chassis

When the channel was changed this set would usually flick to a blank screen with unlocked text lines on it. This also happened when text was selected. The cause was found to be on the text board. I replaced the SAA5231 video processing chip, which then got very hot before blowing the safety resistor R3917 in the 12V supply. I next suspected the 13·875MHz crystal X1801, but it was blameless. The culprit turned out to be the 6MHz tuning coil L5803. Once a replacement had been fitted the SAA5231 chip ran cool and the set worked correctly. **M.M.**

Toshiba 3339DB

The picture was bright with flyback lines. My first check was on the 200V supply to the RGB output stages. As this was correct, attention was turned to the line output transformer. Adjustment of the first anode control got rid of the lines, but so did adjustment of the focus control! When I consulted Toshiba I was told that the CRT had failed. The customer didn't feel inclined to pay for a new tube, so I set up the focus and first anode controls as best I could. The customer was happy with that. **M.M.**

Philips Anubis A Chassis

This dead set required the usual power supply rebuild. When I reconnected it to the mains supply the fuse blew. So I did what I should have done in the first place: I started the set up via the variac, having replaced the fuse and the chopper transistor and connected a light bulb across the 95V supply as a dummy load. As everything was now OK, I refitted the chassis in the set. It worked until I tried to connect the aerial, then spluttered and died. This time a careful inspection of the PCB revealed a hairline crack between pin 12 of the chopper transformer and the optocoupler. Once this had been repaired and a new fuse and BUT11A transistor had been fitted the set worked and continued to work. **M.M.**

Toshiba 2512DBT

There was reduced height and bowing at

the sides of the picture. Both could be set up almost correctly in the service mode, but not quite. The cause was two dried up electrolytic capacitors in the screened DPC module, C372 (2·2µF) and C374 (220µF, 16V). **C.J.G.**

Philips 25PT4103 (L6.2 chassis)

This chassis uses a strange arrangement with the line and field output stages on the non-isolated side, the drives being fed via optocouplers. The problem was that the line output transistor, Tr7906 on the deflection module, ran hot and failed after a few minutes, though there was a perfectly good picture while it lasted. The cause was L5420 which was open-circuit. It's in the line drive circuit.

The parentage of the designers of several modern chassis has been under discussion recently in this workshop! **C.J.G.**

Mitsubishi CT21A2STX (Euro 12 chassis)

The picture was rolling and was generally unstable. Voltage checks revealed that the 12V supply was high at 15V. The cause of the fault was the 1N4148 diode D958, which is connected between pins 4 and 5 of the 12V regulator IC951. **C.J.G.**

Philips 21GR2350 (G90AE chassis)

The power supply was in a right mess following someone's attempt at fitting a repair kit. I had to remove most of the surface-mounted components then install a new kit. After that the outputs from the power supply were all low. The cause was Tr7654 (BC847C) which was leaky. **C.J.G.**

Sony KVE2912U (AE1A chassis)

There was no remote control operation and no sound. In addition the picture size varied with the brightness level, though this would improve as the set warmed up. The cause of all these symptoms was C615 (1,000µF, 25V), which is the reservoir capacitor for the +14V rectifier. **C.J.G.**

GoldStar CF28C28F (PC58A chassis)

Field collapse was cured by replacing IC351 (TDA8350CQ) which had virtually melted. The tatty soldering revealed that it had been replaced before, and when I looked more closely I realised that the puny, badly-designed clip didn't hold the IC tightly to the heatsink. So I adapted a stronger clip from another chassis, and ensured that adequate heatsink compound was applied. **C.J.G.**

Philips 14PV163 tele-video

This set would fire up very briefly when it was switched on from standby or when a tape was inserted. The tape would be immediately ejected, then the set would revert to standby. The cause of the trouble was the switching transistor Tr7352, which is in the middle of the PCB. It was open-circuit. A replacement cured both faults. **D.S.**

Sharp 66CS03H

This set was dead with a short-circuit BUH515 line output transistor. The cause of its demise was dry-joints in the line output stage. Note that the neon lamp is connected in the mains input circuit and indicates power on only. **D.S.**

JVC AV21F1EK (JX chassis)

There was no tuning or on-screen display with this set. The cause was simply dry-joints at the transistors on the long heatsink panel near the power supply and the line output stage. **D.S.**

Philips G90AE Chassis

When this set was switched on there was rapid tripping. The cause was traced to the BC557C transistor Tr7652, which is part of the pulse-width modulator circuit in the power supply. A replacement restored normal operation. **D.S.**

Sony KVE2922U (AE1C chassis)

The BUZ91A FET chopper transistor in this set had failed. The cause was R604 (150kΩ) and R610 (180kΩ) which had gone high in value. A new chopper transistor will fail immediately if these resistors are faulty. **D.S.**

LG GoldStar CF28C22F

If you get one of these sets with field collapse, it's best to fit the modification kit (KITPC33J). This involves replacing about seven components to improve reliability. The kit comes with instructions, and also covers Models CF25C22F and CF29C42F. **D.S.**

Ferguson C51F (ICC6 chassis)

Now and again this set would scroll through the channels, even though they were tuned in. If you get this problem look no farther than the touch membrane. We've also had the problem with similar models. Note that these sets scroll through the channels when no carrier signals are being received. **D.S.**

Goodmans GD2880 (Ferguson TX92 chassis)

This set was stuck in standby. When it was switched on the EHT came up then died instantly. The only clue I could find in the power supply was that pin 4 of the TDA8139 regulator chip IP70 was at 5V instead of 0V. This pin is connected to the set's safety system, which centres of transistor TL60 (BC548B) in the line output stage. When I overrode the protection by linking the collector and emitter of this transistor there was a normal picture and sound, which indicated that the cause of the fault was in the protection circuit. I eventually found that DF30 (BAV103) in the field output stage was open-circuit. Its function is to rectify the field output pulses to produce a bias voltage to hold TL60 on. **J.P.**

Amstrad CTV1410

This set wouldn't store stations. On investigation I found that the EEPROM's –30V supply was missing. Although the 2·2kΩ feed resistor R603 looked very distressed it read correctly when checked. The cause of the trouble was the 10nF decoupling capacitor C602. **J.P.**

Panasonic TX24MD1 (Euro 2 chassis)

This set was stuck in standby. When it was switched on the EHT would rustle up then die. The EAROM IC1203 was faulty. **J.P.**

Bush 2850NTX-A (TV8 chassis)

There was only a single dot in the centre of the screen. I found that the line scan connection was burnt at the plug to PCB joint. After repairing this there was field collapse. The TDA8170 field output chip was short-circuit and its supply components were damaged. These are rectifier D402 (BA157) and fusible resistor R408. The reservoir capacitor was OK. **S.L.**

Mitsubishi CT28AV1B (EE3 chassis)

This set produced a picture with severely crushed highlights (reminiscent of a faulty Sony IF unit – you know the one!). There was also very loud sound hum. I found discoloration and solder deterioration around Q952 (2SC2236) which proved to be leaky. There's a modification for this problem, available from CHS as "8V regulator kit", code 44052, at a very reasonable price. **S.L.**

Hitachi C2846TN

If the TV model number is displayed and cannot be removed, the set is in the 'factory mode'. Press both record buttons on the VCR section of the handset, switch to standby then switch off at the mains. Wait for thirty seconds. After that the set should be all right. **S.L.**

Daewoo TVC14VP tele-video

This unit was dead with the LED at the front moving from red to green. The cause of the trouble was R817, which was virtually open-circuit. Note that if there is a VCR fault that results in no deck operation the LED also, for some reason, produces this indication. **S.L.**

Goodmans 2019R (Onwa chassis)

If, after replacing the usual electrolytics in the power supply and the 12V zener diode D402, you are left with poor, no or excessive contrast, the culprit will be the AN5601K colour decoder chip IC301. **S.L.**

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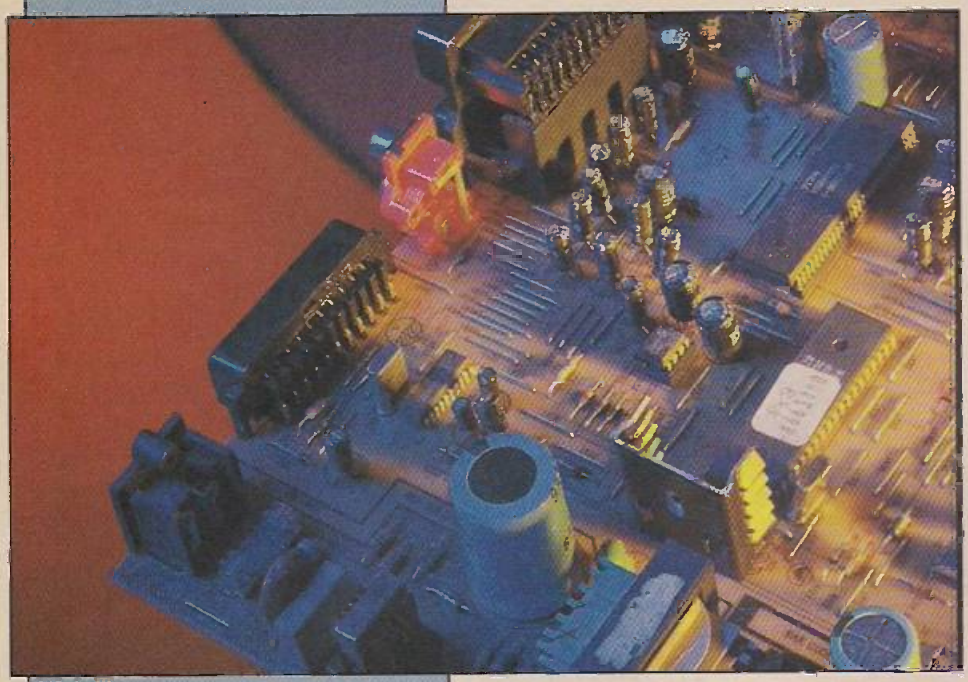
Working voltage	600V DC or pk-pk AC
Switch position 2	
Bandwidth	DC to 150MHz
Rise time	2.4ns
Input resistance	10MΩ ±1% if oscilloscope i/p is 1MΩ
Input capacitance	12pF if oscilloscope i/p is 20pF
Compensation range	10-60pF
Working voltage	600V DC or pk-pk AC
Switch position 'Ref'	
Probe tip grounded via 9MΩ, scope i/p grounded	



SATELLITE WORKSHOP

JACK ARMSTRONG

Grundig GDS200

As mentioned last month, C18 in the GDS200's power supply can be the cause of failure to receive the horizontally-polarised channels. A local installer has just walked in with another GDS200 that has exactly the same "some programmes missing" symptom. C18, which is at the edge of the power supply board, was marked 47µF, 16V (it was impossible to read the value last time because of the glue). It produced a low ESR reading, but I replaced it anyway. As this made no difference I extracted a bulging 1,000µF, 16V electrolytic from the mess of glue and replaced it. An ESR check revealed that it was well past its best, but again the new one made no difference.

I then decided to do the job properly and used my Genie ESR meter to check every capacitor in the power supply. C12 produced too high a reading for a 470µF, 16V electrolytic, so I replaced it with one rated at 35V. I have 16V capacitors of this value in stock but, as they are much smaller than the original component physically, I used the higher-rated one which had a lower ESR. This restored the missing channels.

As with the Amstrad DRX100, you find more than one power supply design in the Grundig digibox. If you can't carry out a repair by checking the ESR of the electrolytic capacitors and replacing any that are suspect, you should arrange to have the receiver fixed by Genserve (01793 886 333). Note that Genserve is unable to provide any technical advice unless you subscribe to its advice service: this costs £50 a year.

Amstrad DRX100

The fact that the tuner module in the DRX100 digibox is prone to failure has been emphasised recently in the *Watchdog* TV programme – though I can't agree with their expert who attributed the cause to flexing of the rear panel! In fact it seems that hundreds of tuners may now be failing each week, so a design problem is the likely cause. MCES Ltd. in Manchester has apparently sorted out the problem and can repair and upgrade the tuner for about £25.

Provided you have workshop facilities and a desoldering station, you can remove the tuner without too much difficulty. The procedure is as follows.

Disconnect the receiver completely. Then remove five screws and lift off the cover. Raise the power cord grommet above the rear panel slot. Remove the tuner nut and washer, the three rear panel screws, and the tiny screw that holds the module inside to the rear panel. Unclip the rear panel at the top corners, then use a thin blade to release the three clips underneath. Pull the panel off and look at the main board.

When you handle the main board, remember that it's susceptible to damage from static electricity. So put your hand on the metal chassis before you touch the board. Take care not to knock any components!

Early models have a screw that's hidden beneath the plug-in module at the rear. Simply pull the module upwards to remove it. Take out the five or six screws that secure the main board, then lift the board just enough to let you get your desoldering iron under it to desolder the tuner's pins, so that gravity assists – see Photo 1. It's sometimes necessary to add fresh solder to each pin before desoldering is possible. It may be possible to remove all traces of solder with desoldering wick or a pump-action solder remover, but I've never managed to do so. I use a Weller DS801 desoldering station that cost about £500 in 1992. Other suitable stations are no doubt available.

Turn the main board upside down. The pins are in plated-through holes – see Photo 2 – with several tracks joined to them on the top surface of the PCB, out of sight beneath the tuner. Place the tip of the soldering iron on each pin in turn and push it from side to side to ensure that it's free to move in the hole, with no solder connecting it to the track. If a pin isn't free, feed fresh solder into its hole then suck it out and try again.

Next, remove some solder from both tuner fixing lugs so that you can untwist them: they must be aligned perfectly with their slots.

The success of the next operation depends on the way in which you hold the tuner and iron. You need a *very* hot iron. I use a 45W Weller iron with a number 8 tip (430°C). Most DIY type irons don't produce enough heat, so you may need an assistant to hold a second iron.

Place your thumb on the threaded F connector – see Photo 2 again – and press down while at the same time pushing up against the board with your first finger. Hold the iron in your right hand. Press the soldering iron's tip against the tuner's lug and apply fresh solder between them to improve the heat transfer. As the solder around the lug melts, maintain the gentle pressure with finger and thumb. When you feel the solder release its grip, ease the tuner's lug out of its slot until it is just clear. Repeat the operation for the other lug.

Ensure that the tracks which are connected to the tuner pin holes on top of the board are undamaged. If any of them are damaged, repair them with very fine wire and check the continuity.

Fit the replacement tuner carefully, soldering the lugs first. If you solder a pin first, any movement of the tuner may break the delicate tracks on top of the board.

Check all plug-in connections – especially the white connector near the front panel. Make sure that the plugs are pushed into their sockets fully, otherwise you might find that the receiver is stuck in standby. Reassemble the receiver, ensuring

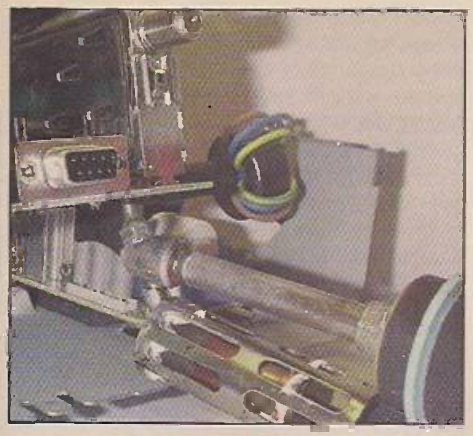


Photo 1: Tuner module removal in the Amstrad DRX100 digibox: access to the tuner module's pins.

that all screws are fitted into the correct holes and tightened. Reconnect all cables and apply mains power.

If the receiver still gives the no-signal indication after a one-minute warm up you've probably damaged a connection or the initial diagnosis was incorrect – the no-signal message can however be due to other causes.

Finally, a couple of general points. The stuck-in-standby symptom means that for some reason the microcontroller chip is unable to start up. Usually this doesn't mean a power supply fault, though it could do. More commonly the cause is at best a loose connector or faulty crystal or, at worst, serious damage to ICs because of a voltage surge on the telephone line.

Reliability can be increased by fitting inside the receiver an almost-silent miniature cooling fan that's available from SatCure (phone 01270 753 311). SatCure can also supply a voltage-spike suppressor adaptor that plugs into the 13A mains socket. This adaptor has, in addition, a pair of telephone sockets for in /out connection, minimising damage from phone-line surges during electrical storms. You can contact SatCure via its latest e-mail address at web site http://www.satcure.co.uk

The DRX100 bears the 'BEAB approved' mark, but a couple of features relating to safety seem to me to have crept into the design after approval was granted. The first is obvious – the mains cable insulation has been removed to enable a ferrite ring to be fitted, see Photo 3. This modification is not present in all versions of the receiver. Where it has been carried out it leaves the brown and blue mains wires free to touch the cover. I recommend that you add insulation over these wires before reassembling the receiver.

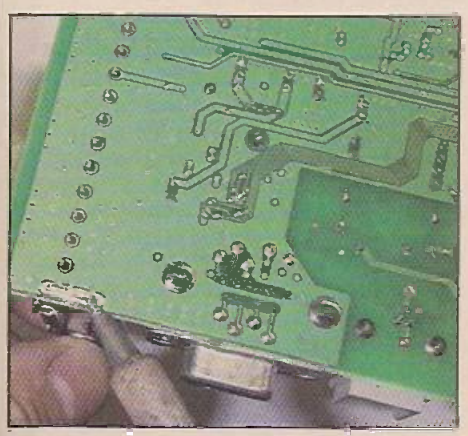


Photo 2: Unsoldering the tuner module's lugs in the Amstrad DRX100 digibox.

The second point compounds the first: the mains-protective earth is connected to chassis by means of a single screw that holds a PCB soldered copper pad in contact with the metal base. The last time I read a safety standard from BSI it said that the fixing method for the earth wire should not be dual-purpose. This requirement stemmed from the days when a mains transformer was bolted to a chassis and one of the bolts was also used to hold the earth tag: if someone changed the transformer the screw could accidentally be left loose. In fact the screw could work loose as a result of transformer vibration, leaving the equipment without a secure earth connection.

In the DRX100 the screw, arrowed in Photo 3, is used to hold the power supply board and the copper pad in contact with the chassis. If someone removes the power supply and fails to replace and retighten the screw, there is no reliable earth connection. In addition the solder on the copper pad is quite thick and could 'creep', leaving the connection loose. Finally there's no locking washer or nut.

A bad earth connection will show up, as any workshop technician knows, when an earth continuity check is made. But how many of us carry out this test with every unit we repair? I recommend, as a minimum, that you fit a locking washer under the screw head.

Working blind

Two magicians were born in my home town of Middlesbrough. One was the famous Paul Daniels. Not so famous, but well known locally, was "Blind Des". I first saw him in action when my granny's Decca DM4-CA had developed a rolling-picture fault (OK, I know this is supposed to be about satellite TV, but you'll like it!).

"Run and get Blind Des" my mum told my uncle, "he'll fix it."

Ten minutes later my uncle returned with an elderly lady who had a white-haired gentleman and a suitcase in tow. I knew he was blind because he tapped things with a white stick.

At the impressionable age of seven I quite expected him to wave his white stick and mutter some magic words that would instantly cure the jittery picture. Instead, he sat down in the armchair and told his wife to kneel down by the TV. She was used to this and described the symptoms in detail.

Blind Des listened then sat back and clasped his hands to his chest. This was better than the cinema!

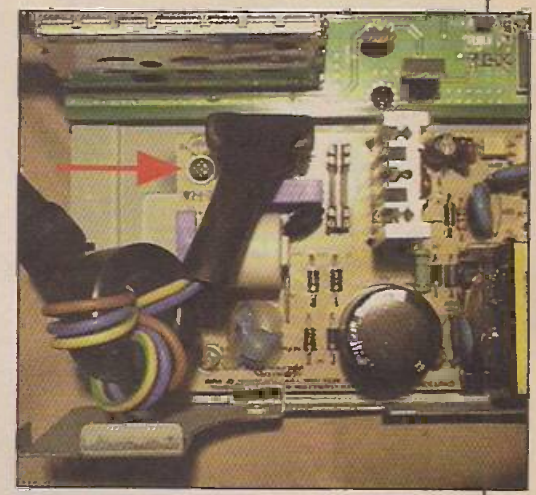


Photo 3: The mains-connection arrangement in the Amstrad DRX100 digibox.

"Swap th' ECC82s" he pronounced. "If that dun't fix it, replace grid bias resistuh under th' flywheel sync valve."

The little woman followed his instructions. It must have been the resistor, because she produced a large soldering iron from the suitcase and plugged it into a wall socket. With amazing dexterity, and much smoke, she replaced the offending resistor in seconds. After that there was a perfect picture.

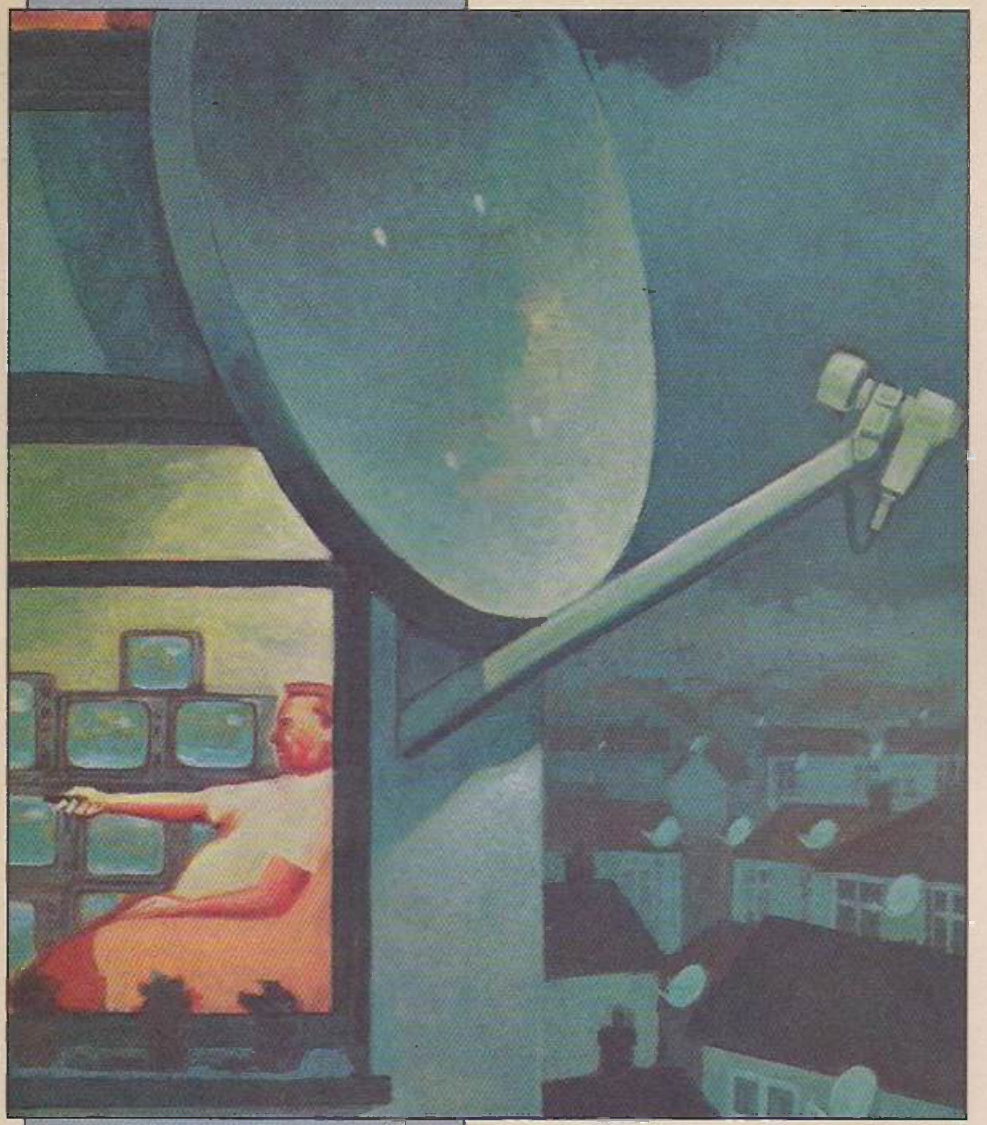
I remember being seriously impressed, and decided at that early age to be a TV repair man. I would learn all about sync valves before I became blind. I'm still not blind, despite the evil invention of surface-mounted devices!

The moral of this story is that you can fix things even when you can't see them, provided someone can 'paint a picture' in words. Most of my headaches arise from telephone calls and e-mails where the other person doesn't describe accurately what he sees and hears. We have to put up with this sort of thing from the public, but it becomes frustrating when engineers make the same mistake. So next time you mention "interference lines" to me, for example, shut your eyes and paint a verbal picture. How many lines? How far apart? What orientation? What colour? Solid, dotted or dashed? ■

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

http://www.ukstay.com/jack

If you have no internet access you can write to him c/o Television, Room L514, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS. Please enclose two first-class stamps.



SATELLITE NOTEBOOK

Reports from Christopher Holland Hugh Cocks and Pete Haylor

BSkyB digibox/card matching

The first BSkyB digiboxes are now two years old. For a number of reasons it's becoming common for a subscriber to change his/her digibox. This is not as easy as in the analogue days, when any valid viewing card could be used in a VideoCrypt decoder. With the digital system the card and box are matched together. When an existing authorised card is slotted into a new digibox none of the sports, film or BBC channels can be seen. There's just a message to say that this is the wrong STB for the card and please phone 08702 404 040 for advice. At the time of writing basic channels (UK Gold, Discovery, etc.) plus channels 4 and 5 can however be viewed. Note that connection of a new box to the telephone line then going through the 'new installation' procedure in the installer set-up menu doesn't resolve this particular problem.

The procedure for matching a card with a new box is quite straightforward. Call 08702 404 040. Once you get through to an operator, give the customer's name and viewing card details, say that a new digibox is to be used and that you want the box and card "re-paired". The operator will then ask you to press the remote control unit's 'services' button, followed by '4', 'system setup', and then 'five'. Table 1 shows the system details menu, with the card number and receiver number represented by Xs.

Normally the receiver version and serial numbers have to be read out over the phone.

Table 1: Typical on-screen system-details menu for an early Pace 2200 digibox.

Manufacturer:	Pace
Model number:	1.2.3r
Version number:	9F0103
Serial number:	XXXXXXXXXX
Viewing card number:	XXX XXX XXX
Operating system version:	1.2S3Bu
EPG software version:	2.7a.2

You are then asked to exit the menu by pressing the 'Sky' button on the remote control unit and go to a premium channel, normally Sky Premier 1 (EPG 301). A picture should appear on all channels within a few seconds. If premium channels don't form part of the subscription package for the card concerned, a message on how to upgrade the subscription appears when one of them is selected. **C.H.**

Amstrad tuner repairs

We've had several Amstrad DRX100 digital STBs recently that were out of the twelve-month guarantee period and displayed the "no signal being received" message. The receiver has also been featured in the BBC TV consumer programme *Watchdog*. In all cases the tuner was the cause of the trouble. The basic problem is that the 479MHz local oscillator, which forms part of an IF double-conversion process within the tuner, stops oscillating. Not surprisingly, there is then no output from the tuner.

Repair is relatively straightforward if you are familiar with RF techniques. Alternatively Kesh Electrics offers a rapid tuner turnaround repair service for £12 plus carriage and VAT. Kesh can be reached on 02868 631 449, or you can visit the company's website at www.pacelink.co.uk where details of the service can be found. **C.H.**

The Panasonic TU-DSB30 digibox

A lot of these Silver Panasonic digiboxes have passed through our hands during the past year or so. To date we've had very few problems with them. This brand new one, straight out of the carton, displayed the "no signal" message despite producing sufficient voltage and current and a 22kHz tone to operate the LNB.

Before putting it back in the box to return it I removed the main PCB to check that the tuner's pins were making contact with the board. Fortunately the cause of the problem was immediately evident. There are five pins in a group nearest the F-socket end of the body: none of them had a good soldered joint. I resoldered these pins, then did the same with the rest, which are separated from the group of

five by a small gap. The digibox then worked normally. **C.H.**

NRK frequency change

NRK International, the Norwegian TV service aimed at expatriates living in other parts of Europe, caused some confusion recently when the frequency was changed. The signal is transmitted via Intelsat 707 at 1°W in MPEG-2 form, using the Conax encryption system. It had previously been available at 11·174GHz with horizontal polarisation. The change was to 11·677GHz, with the symbol rate 26,000 and FEC 3/4. 11·677GHz had been used by the BBC Prime MAC-D2 service before this was transferred to solely digital distribution via Hot Bird at 13°E.

Unlike the SkyDigital system, which automatically updates the EPG for any new signal characteristics, Norwegian receivers had to be reprogrammed manually for the new frequency and symbol rate. Fortunately the old and new frequencies were used in parallel for a period of about two weeks, with an on-screen message at times to tell viewers about the changeover. Nevertheless some had a blank screen for a short time.

Most NRK International viewers use a Nokia 9600 or 9800 STB to receive the service. I found it best to erase all previously stored information and do a 'new installation', using the new parameters to start the receiver searching, other free-to-air services being found during the process. Encrypted services that were found and put in the EPG list were easily deleted using the receiver's channel editing procedure. **H.C.**

SkyDigital update

Table 2 shows the channels added during the last month. The transponder number is shown in brackets after the frequency, the EPG number being shown in brackets after the channel name.

Sunrise Radio (transponder 32), mentioned last month as being on test, has been assigned channel number 948. MBI TV from Nigeria, which has been available for a while, has been allocated channel number 698 in the EPG.

Astra 2B is now co-located with 2A at 28·2°E. Some transponder tests are being carried out on Astra 1D, particularly with transponder 63 (10·921GHz H). **C.H.**

The Amstrad digibox

The Amstrad digibox has been showing its true colours recently, the usual problem being a defective tuner. The boxes tend to fail when they are between 13-15 months old. A customer who contacts his supplier is told that the box is not repairable and that a new one will cost about £400.

We get a few for repair each week. With 95 per cent of them the problem is the tuner, which MCES can repair at a sensible price. I keep some digiboxes in stock so that, whenever possible, I can turn the repair round the same day. The end price to the customer is now affordable.

Another fairly common problem is the "no signal" message because the dish/LNB is faulty. On a number of occasions I've found that the signal provided by the LNB is of low amplitude and cannot be improved no matter how the dish is moved. So I always carry with me a spare new dish/LNB – they have always cured the problem.

When you get this complaint, always check whether the dish is looking into a tree that was smaller when the dish was installed. It's a very common problem now. I suspect that the fitter didn't have a method of checking the line-of-sight alignment before fixing the dish in the first place. **P.H.**

Table 2: SkyDigital channel update.

Frequency (GHz)	*Pol*	*Channel*
11·954 (13)	H	Dating channel (656)
12·324 (32)	H	Prime Time Radio (947)
12·402 (36)	V	CEE(I) TV (693), Liberty TV (202)

HELP WANTED

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

Wanted: Working control panel for the Philips VCR Model 31DV3/05, or the TMP47P1670VN chip IC101 that's located under the display. Phone Roy Wainwright on 01932 784 912 or e-mail roy.wainwright@tesco.net

Wanted: Two STK8050 chips for a Technics SU-V4 stereo amplifier. Phone David Paines on 01302 710 797 (most evenings).

Wanted: Circuit diagram for the Bush CTV Model 2059NTX. Roy Hylands, 25 Greyfriars, Kington Gardens, Solihull B37 5HY. Phone 0121 770 5330 or e-mail old@fathertime.fsnet.co.uk

Wanted: Service sheet for the Matsui Model 20V1T (CUC7303. XCE94). Expenses paid. Allan Watson, 2 Masefield Avenue, Padiham, Burnley, Lancs BB12 8SY. Phone 01282 774 114.

For disposal: Three old VCRs, collectors items, as follows: JVC HR3330TR (8928) PAL/Secam/NTSC; JVC HR7700E (3V23); JVC HR7200 (8930). All working with workshop manuals. Also a Dynamco dual-channel, delayed-sweep scope. needs slight attention. And many early service manuals, some Beta. Offers please to Dave Plummer (Hastings) on 01424 214 088.

Wanted: The following Mullard germanium transistors (or equivalents) for repair of an HMV 2128 transistor radio dating from the Sixties: AF115, AF117, AC155, AC113, AC154 and AC157. Frank Bailey, 53 Peile Drive, Taunton, Somerset TA2 7SZ.

Help/for disposal: Can anyone suggest an equivalent for the HA1141 chip in a JVC CTV Model 3020UK? Have for disposal a Sony CTV Model KV1330UB (working) £10; Decca CTV set (working) fitted with the 30 series chassis £10; and an ITT set fitted with the CVC5 chassis £10. D. Sniggs, 5 Collingwood Avenue, Muswell Hill, London N10 3EH. Phone 020 8374 9070.

Wanted/for disposal: Require an HM9205 stabiliser module (circuit reference CP901) for the Hitachi Model 2476 (G6P chassis) – or does anyone know the component values? Have for disposal. free to caller. *Television* magazines from 1975-79 and 1982-86. G.D. Stocks. 62 Ridge Park Avenue, Plymouth, Devon PL4 6QA. Phone 01752 668 015.

Wanted: Fault diagnosis pocket book covering the Ferguson TX85/86/89/98/99 chassis – photocopy OK. Also an RS203 bridge rectifier (D506) for the Hinari VCR Model VXL9. J. Alder. 37 Palm Avenue, Fenham, Newcastle-upon-Tyne NE4 9QT. Phone 0191 241 0167.

Wanted: Circuit diagram for the Telefunken TR1200 Hi-fi tuner-amplifier, to buy or borrow. B.J. Brandon, 8 Moor Park Avenue, Castleton, Rochdale, Lancs OL11 3JG.

Wanted/for sale: Require the following. A circuit diagram for the Sanyo/Fisher 170 tuner-amplifier; a working memory board for the Nokia SFN3578UK (Core 2 chassis 5861 78 33 on my diagrams) or a working SAA1289C chip; a 1MΩ log tapped (at 20%?) volume plus 5MΩ tone dual-concentric potentiometer with DPSW; circuit diagram (not *Radio and Television Servicing* equivalent) for the HMV radio Model 1381; a set of green Tripletone amplifier concentric control knobs; data for the Heathkit Oxford UXR-2; and a circuit for the Braun Model UKW66. Have for sale a 405-line Pam Model C600 in fair condition, a Tandon 286 and an Apple 11e PC complete with disks and monitors. Any offers? W. Milne. 20 Graham Road, Wimbledon, London SW19 3SR. Phone 020 8543 9542.

Wanted: Two working ECH42 valves or information on where they could be obtained. Also information on the CD player service modes for Philips mini systems, in particular Model FW630. Owen O Reilly, Belfield, Gaybrook, Mullingar, Co. Westmeath, Ireland. E-mail Owen_O'Reilly@eur.3com.com

For sale: U-View circuit diagram books as follows: TV volumes 1 (1989-90) and 2 (1991-92) and Video 1989-90 (two volumes). £20 each plus carriage. All four volumes together, carriage free. Phone Roger Dowling (Sidcup, Kent) on 07785 371 600 or e-mail rogerd@beeb.net

Wanted: For spares or repair, a Quad FM3 tuner. Also a tuner unit for the Sony VCR Model SLV353 (the tuner/RF unit is mounted on a removable panel). Phone Mike on 01758 613 790.

Wanted: A Loewe TV chassis, Model ART95 68447 9001. Good price paid or will swap for brand new Hitachi Model CPT2508/2808 less tube. Phone Peter Ward on 01425 475 445 (Ringwood, Hants).

Wanted: Help/advice on obtaining the manufacturer of and model number for a CRT overhead projection unit. The only identification information I have is the numbers on the PCBs. These are PWBF0597TA, PWBF0600TA, PWBF0590TA and PWBF0598TA. Phone Alun Payne on 0802 848 891 or e-mail paynea@globalnet.co.uk

Wanted: Remote-control handsets for the following Sharp VCRs: VCA105HM (four required), VCA113HM and VCA215HM. Phone Peter on 01282 864 415.

Wanted: Circuit diagram or service manual (photocopy OK) for the CTX VL700 17in. monitor. Q415 and R474 from pin 6 of the LOPT are burnt and cannot be identified. Kenneth G. Cargill, 1 Stradowen Drive, Strathfoyle, Londonderry BT47 6XN. Phone 02871 861 268 or e-mail kcargill@lineone.net

Wanted: Circuit diagram for the Philips CTV Model 24CE4570 (2B chassis). Photocopy OK or if original will photocopy, return immediately and pay all expenses. Khalid Khawaja, 4 Metric Walk, Smethwick, West Midlands B67 7DX.

Wanted: Retired (on medical grounds) engineer requires anything to do with pre-1970s TV and radio sets – parts, valves, books, circuit diagrams, old test gear, anything considered. Will travel to collect. Steve Taylor. 11 Charnborough Road, Coalville LE67 4SF. Phone 01530 832 695 or 07977 805 308 or e-mail steve.tailor@btinternet.com

Wanted: V2000 and Beta VCRs. spares, test tapes and manuals. Particularly looking for later V2000 (Philips, Grundig and B&O) and later Sony Beta machines. Also require heads for Philips N1500 and N1700 VCRs. Phone Steve Rowley on 01889 578 416 or e-mail steve@srowley.fsbusiness.co.uk

Wanted: CRT type 150AYB22 for the Hitachi Model CKP100. or a scrap set with good tube. Steve Partin, 4 Hendon Close, Highbridge, Somerset TA9 3LB. Phone 01278 788 429.

Wanted: White spherical 'ball' TV cabinet/enclosure as used by the Kerracolour 22in. set in the 1970s, with or without the TV chassis (Decca Bradford). Phone Carl Toomer on 07867 903 747 or e-mail tonyx@supanet.com

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What is CTCSS

CTCSS – or 'continuous-tone controlled squelch system' – allows sub channels of the main channels to be used. There are 38 sub channels to each main channel. Using subchannels decreases the likelihood that someone else will be using the same frequency.

RS 446 personal mobile radio...

To celebrate its launch, new test and instrumentation company Tecstar is offering *Television* readers *two* RS446 personal mobile radios for just £75 excluding VAT and carriage.

Capable of transmitting and receiving voice over a distance of up to two miles, depending on terrain, the PMR 446 needs no licence. It offers eight channels, scanning – and with CTCSS up to 304 channel combinations.

A backlit liquid-crystal display shows volume level, channel number, sub-channel number, battery level and transmit/receive or channel busy. A unique call feature enables the user to alert the person they wish to contact.

Transmission distance is up to 2 miles. The radio has an accessory socket for an external headphone, earpiece or vox-microphone/headphone combination. A keypad lock and battery save feature are also standard.

The unit measures only 120 by 50 by 20mm and weighs less than 150 grams – including batteries. It is supplied complete with instructions and belt/mounting clip.

Compact, lightweight and low cost, the RS446 wireless personal communications hand set has a wide range of applications. These include fetes, events and rallies. Builders on building sites could benefit from these radios, as could exhibitors at exhibitions and staff at warehouses, winter activities, sports events, maintenance departments, schools and care homes. Of course you can also use the RS446 just to keep contact with someone locally. The uses are almost limitless.

Send a cheques or postal orders to Tecstar Electronics Limited, 1 Nuffield Road, St Ives, Huntingdon Cambridgeshire PE27 3LX.
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WEB SERVICE

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http://www.acquivision.com

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

All Tech Tips
http://www.skyeinteractive.net/techtips/

Another US technical tips site which deals with subjects related to repair of the whole range of consumer electronic items. The site is being updated and plans to include current repair articles, books on repair, schematics and links to manufacturers technical repair sites. There's also a chat room.

Anatekcorp
http://www.anatekcorp.com/

A US site selling computer databases of fault reports and schematics, but it has some interesting articles for free download - you can even submit your own. There's a technicians forum but you have pay $60/year to be a member.

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/info/reception

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.

Doknet Service manuals
http://www.doknet.com

This Dutch site says it has 350,000 service manuals and 1 million service parts.
You interogate the data base by filling out an order form, with the "request" box ticked, and then wait for an email to arrive back on your computer. However,
an on-line index would be useful and maybe on-line downloading of the manuals.

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@euras.co.uk

"The definitive fault index... based on feedback from manufacturers, technicians and workshops throughout Europe" IER Magazine. Available on CD-ROM including ECA virt-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

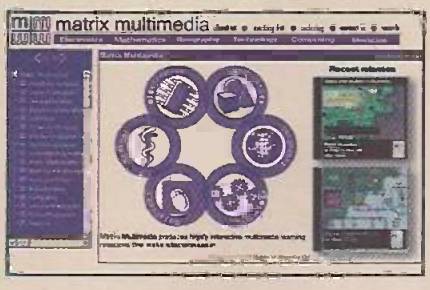
Kiea Trading Company is the sole agent of Goot products, We specialise in supplying the soldering and desoldering product range manfactured by Goot Japan for the UK market. Goot uses advanced production technology to manufacture high quality soldering iron products for industrial, prfessional and general purpose use.

MB21
http://www.mb21.co.uk/index.html

Another enjoyable site with a "telenostalgia" section about the technical aspects of television. There's also a section on transmitter sites, teletext "then and now", and a "rough guide" to widescreen television

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.

Newnes

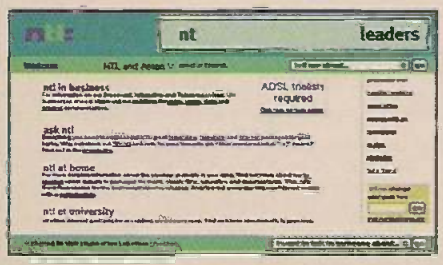
http://www.newnespress.com

Check out this site for the latest book titles on TV & Video Servicing and Technology and their famous Pocket Book series. You can shop on-line and also register for an Email service to tell you when relevant new titles are published.

NTL

http://www.ntl.co.uk

Go to this site for information on NTL's Broadcast, Interactive and Telecom services, including packages for home



area by area. There's also a useful transmitter site map and database, giving locations and information. The site also contains useful documents, which describe digital TV, interactive TV and digital Radio. There's also a useful contacts list.

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.

Pace

http://www.pace.co.uk/trade/index.ht

The Pace site has a product finder. On servicing, there is a restricted access area for Pace retailers and service partners. If you are a member of the trade and you deal with Pace products you can apply for access by following the instructions. The free access area contains some useful Frequently Asked Questions and links to other useful sites such as the Lyngemark Satellite Chart at http://www.lyngsat.com.

Sky digital repairs

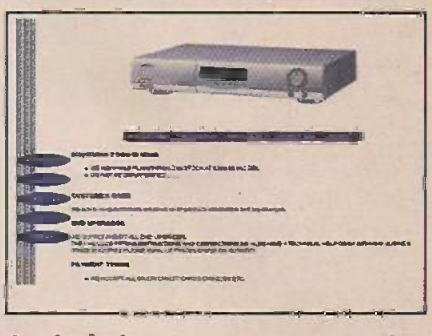
http://www.horizonsatellites.co.uk

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 multiregion 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.

Timecast

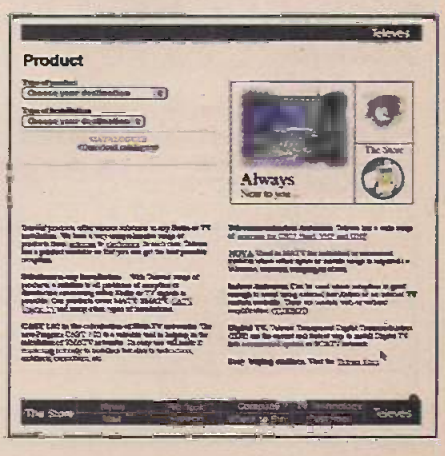
http://realguide.real.com/stations/

This site contains listings of TV and Radio stations available on the Internet. There are also some fixed cameras positioning in locations ranging from game park, high streets and people's houses - not exactly captive viewing! But an interesting thought - are PCs and TVs going to eventually "get married"?

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

UK Electrical Direct

http://www.uked.com

For a comprehensive on-line directory, buyers guide and resource locator for the UK Electrical Industry look at this site. Many of the companies listed have links to their own web sites, making this a one-stop shop for a huge amount of information.

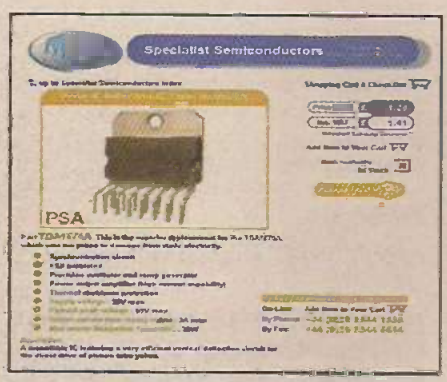
UK Mailing List Group

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 site's shopping facility.

Reed Connect

http://www.reedconnect.net/

Another free internet access site, this time from Reed Business Information. However the site possesses a useful UK People and Business Finder, with an e-mail search. There's also business news and local information, and some good links to directory sites.

Repairworld

http://www.repairworld.com

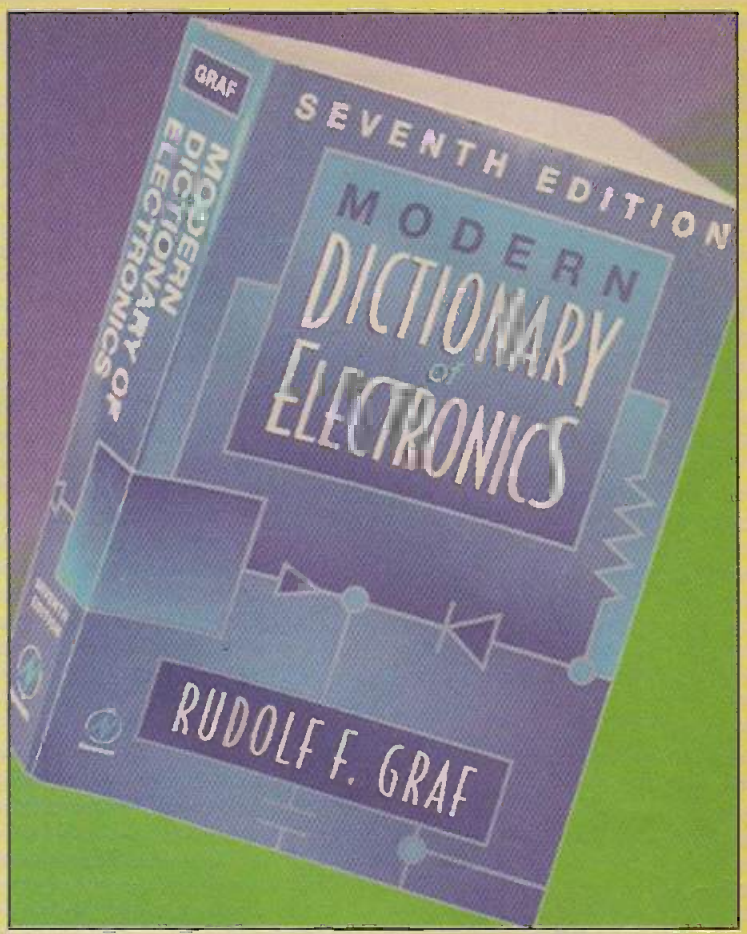
Repairworld is a US based fault report database which is updated bi-weekly. It operates on a subscription basis and describes itself as an "affordable solution for all technicians". There is apparently no minimum number of months for which you have to subscribe. You can see some samples of the material for free, monitors, VCR, DVD and Camcorders being of particular relevance to UK users. The site provides a "chat room" where you can talk via your keyboard to others "in the room".

BOOK TO BUY

Completely updated, this comprehensive dictionary contains over 28,000 electronic terms, phrases, acronyms, and abbreviations from the ever-expanding worlds of consumer electronics, optics, microelectronics, computers, communications, and medical electronics. This dictionary is a valuable resource for professionals in the field, hobbyists, students, or anyone interested in electronics.' - Poptronics

Included in this fully revised classic are well over 28,000 terms, phrases, acronyms, and abbreviations from the ever-expanding worlds of consumer electronics, optics, microelectronics, computers, communications, and medical electronics. From the basic elements of theory to the most cutting-edge circuit technology, this book explains it all in both words and pictures. For easy reference, the author has provided definitions for standard abbreviations and equations as well as tables of SI (International System of Units) units, measurements, and schematic symbols.

Modern Dictionary of Electronics is the bible of technology reference for readers around the world. Now fully updated by the original author, this essential, comprehensive reference book should be in the library of every engineer, technician, technical writer, hobbyist, and student.



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VCR CLINIC

Reports from
Eugene Trundle
Ronnie Boag
David Smith
Paul J. Roberts
Roger Burchett
John Coombes
R.A.F. (Ace TV and Video)
Dave Dulson and
Ian White

Daewoo DVR7372P

The fault symptom, which was very intermittent, was that of dirty heads during playback, with slow and 'slurred' sound reproduction, even though the front panel proclaimed that the machine was operating in the SP mode. In fact the pinch roller was barely in contact with the tape, because of a faulty mode switch. **E.T.**

Panasonic NVSD40

No-go was the symptom with this machine: the only sign of life was a faint ticking that came from the power supply, at a rate of about one tick per second. Checks showed that there were no shorts or excessive loading. We also found that the power supply was of the FET chopper type, which is not covered in the main manual. R1120 had risen in value from 560kΩ to 900kΩ and R1121 from 820kΩ to 1MΩ. To ensure reliability we also replaced C1111 and C1136. **E.T.**

Tatung TVR933V etc

The deck and the electronics used in this and many contemporary Tatung VCRs are made by **Orion**. There is a tendency to erratic mechanical action, one aspect of which is refusal to eject the tape or respond to deck commands. The culprit is the tape-centre LED, which is mounted on the main PCB. I always replace the mode switch at the same time as it can be the cause of similar problems. **E.T.**

JVC HRJ220

This machine refused to accept tapes. The usual cure for this problem is to replace the mode state switch. In this case however the change-arm assembly (part no. PQ46353A-1) also had to be replaced. **R.B.**

Finlux VR163NX

This machine was dead. A new mains bridge-rectifier reservoir capacitor (100µF, 385V) got it going again with no further problems. **R.B.**

Sony SLVE280UK

This machine had been taken two dealers who had said "sorry, can't repair". It played perfectly, but when record was selected it would go into this mode for about fifteen seconds then shut down completely with the display going out. After a second or two it would try to reset and would then behave impeccably until record was again selected.

The cause was that infamous fuse PR512 (1A) in the 5V supply. A resistance check on it produced a reading of about 0·5Ω. As a telltale sign the fuse had a slightly discoloured band around the centre. Should PR512 fail completely there will be no operation or display. **D.S.**

Grundig GV496M

This VCR was dead after being unplugged by the customer. With the machine opened up it was just a matter of replacing C136 (1µF, 400V, 105°C) in the power supply and a general resoldering of dry-joints. **P.J.R.**

Sharp VCM20

This machine damaged the top of the tape. The pinch roller was well worn, but a replacement failed to cure the trouble – the tape continued to ride up the fixed guide. Sharp has issued a technical bulletin on setting up the audio/control head on the VCM23 etc. After going through the procedure I found that the problem was no longer present in the play mode but remained in forward search. Further checks revealed that the take-up torque was excessive. A new pulley reel cured that. **R.Bu.**

Hitachi VTM740E

This machine would accept a tape and the playback, record, rewind and fast-forward functions were OK. When eject was pressed however the machine would try to eject then reload. The cause of the problem was traced to the clutch base assembly. The top of the front-loading gear was damaged and there was a loose spring, which prevented movement of the cogs to the correct position for tape ejection. **J.C.**

Ferguson FV71LV (R3000 chassis)

No results with no display usually means faulty capacitors in the power supply. The first items to check are CP007 (100µF, 25V) and CP008 (10µF, 50V). Further possibilities are CP81 (1,200µF, 16V) and CP82 (1,000µF, 16V). Check them all by replacement.

If the capstan doesn't rotate, check whether the plastic pulley on the capstan spindle has fallen off. **J.C.**

Hitachi VTF450E

For an intermittently snowy picture, as if there are low-amplitude or missing CTL pulses, check the condition of the tension band. With this machine the felt had become unstuck, so that only the plastic rested on the supply spool. A replacement restored reliable operation. **J.C.**

Toshiba V254B

You can get very intermittent no results and a dim display with these machines. The item to check is CP041 (220µF), which tends to fall in value. The last time I had the fault CP041 measured 70µF. **J.C.**

Panasonic NVSD200

We've had several complaints about noisy rewind with these machines. First, ensure that the take-up and supply spools rotate freely and are well lubricated. Then, if necessary, check for a broken loading motor bracket and worm wheel gear. Replace as necessary. **J.C.**

Akai VSF510

If there is no playback picture but the sound appears to be OK, check the 5V reference supply at IC201. When D204 is leaky or short-circuit the supply can drop to 4·8V. There is a modification in this

area: a revised diode type and added 750Ω (1/6W) resistor. **J.C.**

Daewoo V60
For failure to start up, check capacitor C53 (1µF) which goes open-circuit. Then if necessary check resistors R51 and R52 (both 390kΩ) which tend to go high in value. **J.C.**

Thomson V321
If there is a loop of tape when a cassette is ejected, check diode D229 (1N4148) by replacement. **J.C.**

Goodmans TX4000
This machine was dead, so I replaced the usual capacitors in the Sony-made power supply. As this failed to cure the problem I had to take the machine apart again. There are two 390kΩ resistors in the power supply, R21 and R22. One of them was open-circuit, but it seemed wise to replace them both. In fact I suggest that this is done whenever one of these machines comes in – I have since had a two more failures. Use resistors rated at 0·5Ω. **R.A.F.**

Alba VCR7200
This machine would switch off because the drum speed was excessive. Checks showed that the drum servo was very unstable. A couple of freezer cans later I found that C6031 (10µF) near the reel sensor was heat-sensitive and in fact open-circuit. **R.A.F.**

JVC HRD610
The problem was lines across the picture, like mistracking. They were sometimes present when a tape was loaded but not on other occasions. I found that the left guide sometimes failed to reach the V block, because the brass bush beneath was loose. Remove and repair or replace it. **D.D.**

Philips Turbo deck
A fault you can get with these machines (Model VR285 etc.) is intermittent cutting out in play or record, showing error 2. Check the clutch unit underneath the deck. The spring inside cuts a groove in the inner bush and then, instead of gripping, just rotates. So the clutch has no grip. Replace item 115 (manual identification). **D.D.**

Sony SLVE220UB
The chassis used in this machine is used in a number of other models, including some **Sanyo** ones. Circuit protector PR512 is the root of many evils and is worth checking whenever you see any of these machines. If there is any sign of discoloration, replace it.

The faults it causes depend on the extent to which its resistance value has increased. Common ones I have come across are:

(1) Cuts out in record only.

(2) Cuts out in timer record only.

(3) The recorded audio is microphonic and echoey, playback being OK.

(4) Slow to change modes, especially from play to rewind.

(5) Intermittent capstan motor start-up.

So beware and watch this item carefully. **I.W.**

Answer to Test Case 457

– see page 159–

This type of dual-feed installation normally works well. The 60cm dish, aligned with Astra 1, maintains the previous analogue signal strength – in fact the clean new dish may well improve the signal. Astra 2 provides more powerful signals: this, together with the 'oversize' dish (40cm is normal), should compensate for the signal loss associated with the off-centre position of the second LNB. In normal circumstances the result is a more than adequate signal for the new digibox.

In this case however the signal wasn't adequate. The dish and the new LNB had been proved to be OK, but the LNB has to be correctly aligned with the reflected beam from Astra 2 at 28·2°E. This is where the trouble lay. The two Astra positions are nine degrees apart. Somehow Ray had ordered a six-degree bracket, the sort generally used for reception from Astra 1 at 19·2°E and the Eutelsat Hot Bird slot at 13°E. Thus the new LNB was off-beam with respect to its signal, and no amount of adjustment could get this right. Indeed it's surprising that the digital signal had been good enough to get the receiver going at all!

Once the correct bracket had been ordered, fitted and aligned the digital signal was excellent. But any profit from the job had long since disappeared. We had to put it down to experience.

NEXT MONTH IN TELEVISION

TVs that catch fire

In this age of consumer protection and BEAB testing you might think that a TV set being the cause of a fire is a very rare occurrence. It's not common of course, but it does happen from time to time – and standby operation has compounded the situation. In 1998, the last year for which figures are available, 638 fires in the UK were attributed to faulty TV sets. So it's as well to be aware of the possibilities. Michael Maurice has been looking into the subject and presents his findings.

Digital terrestrial TV reception

Digital terrestrial TV transmissions have brought with them a host of challenges for aerial installers. Bill Wright looks at the new problems and possible solutions. Aerials, signal amplifiers, distribution equipment and interconnections can all give rise to problems of one sort or another.

Interference caused by switch-mode PSUs

The chopper power supply has great potential as a cause of interference. What can be done to minimise this? Ray Porter describes the various sources of emissions, their spectrum and the PCB and circuit design rules that should be followed to reduce electromagnetic radiation.

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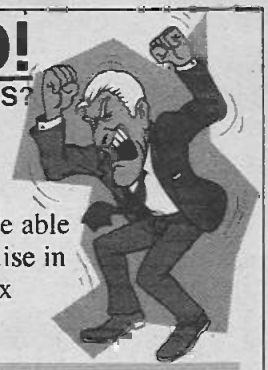

2N 2SA 2SB 2SC 2SD 2P 2SJ 2SK 3N 3SK 4N 6N 17 40 AD ADC AN AM AY BA BC BD BDT BDV BDW BDX BF BFR BFS BFT BFW BFX BFY BLY BLX BS BR BRX BRY BS BSS BSV BSW BSX BT BTA BTB BRW BU BUK BUT BUV BUW BUX BUY BUZ CA CD DX CXA DAC DG DM DS DTA DTC GL GM HA HCF HD HEF ICL ICM IRF J KA KIA L LA LB LC LD LF LM M M5M MA MAB MAX MB MC MDA J MJE MJF MM MN MPS MPSA MPSH MPSU MRF NJM NE OM OP PA PAL PIC PN RC S SAA SAB SAD SAJ SAS SDA SG SI SL SN SO STA STK STR STRD STRM STRS SV1 T TA TAA TAG TBA TC TCA TDA TDB TEA TIC TIP TIPL TEA TL TLC TMP TMS TPU U UA UAA UC UDN ULN UM UPA UPC UPD VN X XR Z ZN ZTX + many others

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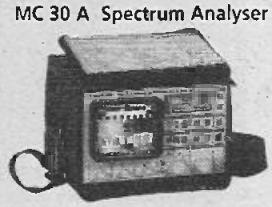
PERIFELEC

MC 30 A Spectrum Analyser



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- Complete microprocessor and ispLSI logic control.
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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 4 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.

SADELTA

TC 80 A/D

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

- Analogue and digital measurement.
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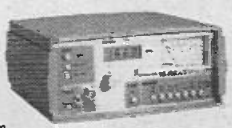
The TC80 A/D has been designed to aid the installation of analogue and digital satellite systems. This high quality meter has video and audio output via scart socket on rear and video only via BNC socket on front panel. The built in speaker delivers demodulated audio from any analogue satellite signals.

Due to its weight and size, the TC-402 A/D is the ideal instrument for the installation of FM and terrestrial TV aerials as well as CATV systems.



- Peak detection.
- Built in loudspeaker for AM and FM reception.
- Frequency indication with 4 digit LCD display.
- Analogue and digital measurement.
- Multi-turn potentiometer to enable tuning.
- Weight including batteries: 1,9 Kg.

TC 402 A/D

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Setbacks

Technical Specification			
Reference	5371	5372	
Inputs(2)	UHF/FM	UHF/FM	
Outputs	5 6 (+1)	7 (+1)	
Gain UHF	10 (+24)	10 (+24)	
Noise Figure	2.5dB		
Line Power	12Vdc		
Output	84dBµV		

Features
- Ideal for digital installations
- Low noise figure
- F connectors
- Fully shielded

Technical Specification				
Reference		8130	8131	8132
Gain (dB)	out 1	23	17	7.5
	out 2	-	15	7.5
	out 3	-	-	12
	out 4	-	-	16
Outputs		1	2	4
Input		1		
Noise Figure		< 3.5dB		

Features
- Design for individual installations
- Proven reliability and performance
- IEC connectors
- CE conforms with EN55013, EN55082-1, EN60065

Technical Specification			
Reference	4381	4382	4383
Ampl.band(MHz)	5-38/470-850		
VHF Gain (dB)	26	13	1 3 0 5
UHF Gain (dB)	30	20	23 9 15
Var. gain VHF (dB)	>20	>20	>20
Var. gain UHF(dB)	>15	>15	>15
Max output level (dBµV)	98	88	90 76 82
Noise Figure (dB)	<2.8db	<2.8db	<2.8db

Features
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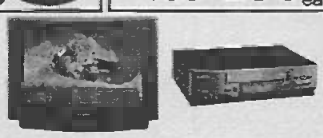

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DST85B235/47328700 & /40153200
DST88N234/4000086AD, &/47805200L
DST88N234/47320041, &/47317590
DST186N243/473058-00
TFB3035D, TFB3069D, TFB4023AD
TFB4039AD, TFB4066AD

FERGUSON
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TX10
TX85, TX86
TX89, TX98, TX99
Y260781
FSTY260482
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LOPT WHITE SPOT & YELLOW SPOT

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TC2203, TLF1456B
TLF1457B, TLF7016

TOSHIBA
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TFB 4038AD, TFB 4110AD
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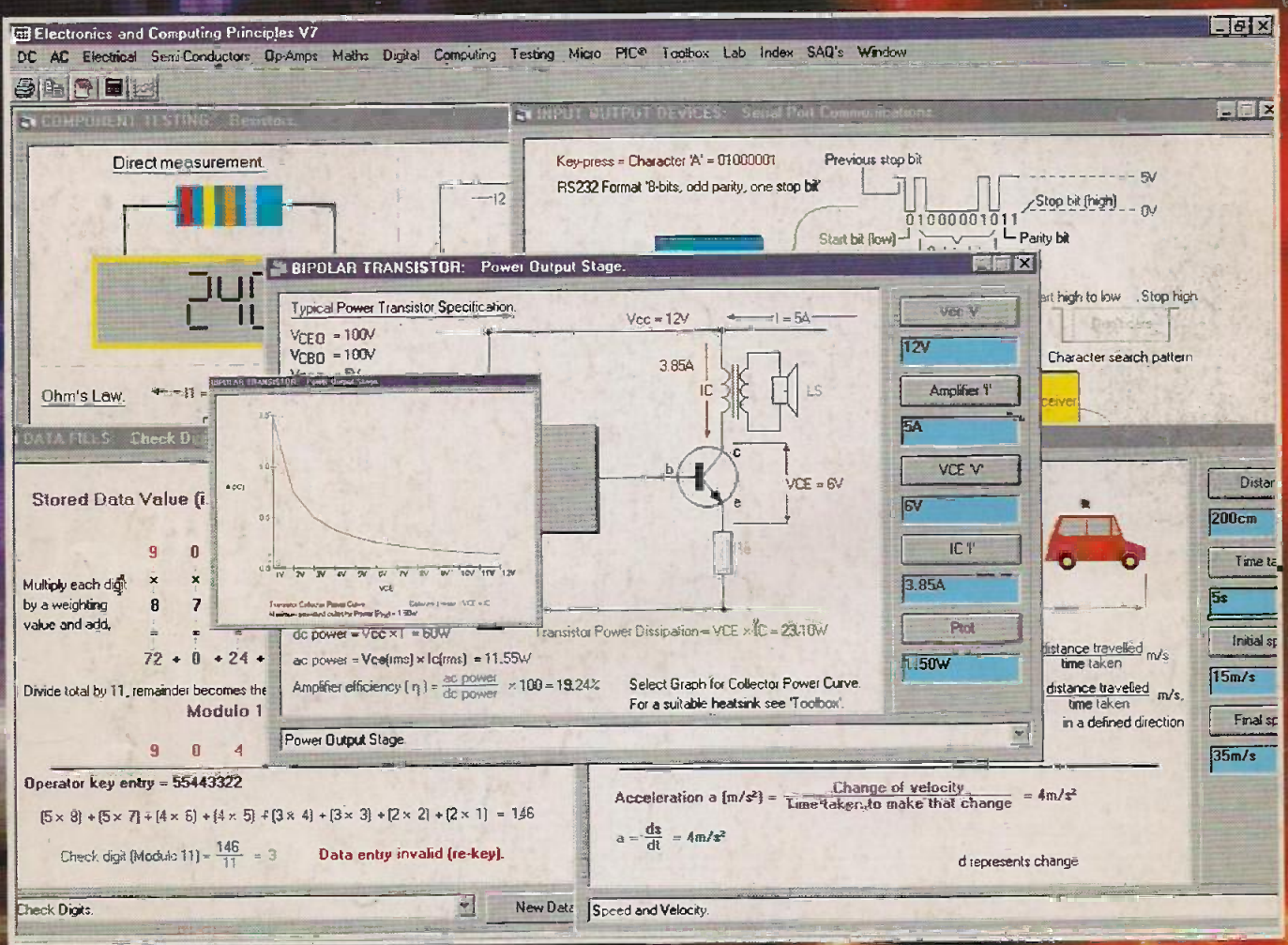

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