TELEVISION
& consumer electronics

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Extracts from Fawzi Ibrahim's book "multi media convergence"

Digital reception using set top aerials

"Fibre to the home" report

AV Coupling

Much more inside.....

FAULT REPORTS over 8 pages!

Photo credit: Geoff Woolf.
Light Valve panel of a dichroic X-cube assembly, for full description and operation, see Newnes Guide to Television and Video Technology, fourth edition.

FAULT FINDING FOR TV · AUDIO · SATELLITE · VIDEO · IT

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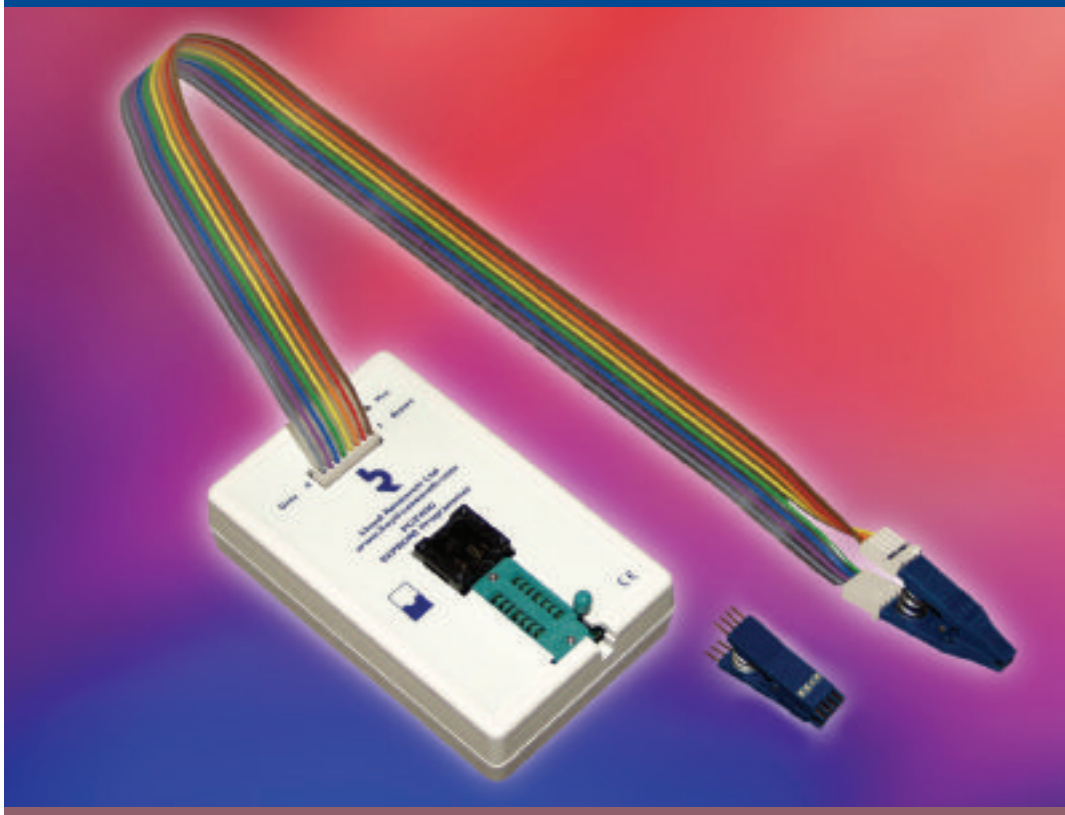

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CONTENTS

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Please note that we are unable to answer technical queries over the telephone and cannot provide information on spares other than that given in our spares guide.

Next issue, dated May, will publish April 28th 2008.


Setting Europe alight - page 10


Reality TV - page 28


AV Coupling - page 30


Satellite DX - page 36

Winners of The Queen's Award For International Trade 2007, Horizon Global Electronics is a UK Company established in 2001 specialising in the design and manufacture of hand held test equipment for the digital satellite and TV sector. Our strength lies in being able to find innovative solutions to leading technology issues.

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It seems only a few weeks ago that I was wishing readers a Merry Christmas, in my first ever issue, of Television magazine, and here we are, just into April and my fourth issue is now published. I hope you all had a good Easter holiday and are looking forward to our summer months ahead.

One of the themes that seems to have developed in this issue is that, in general, customers are less willing to pay for TV repairs these days, whether it is for an older CRT set or an LCD screen. Two of our regular columnists, Mike Leach and Andrew Lyon both report this. In fact Andrew Lyon had a week where five of his customers when presented with an estimate for repair of just £85 decided that they would prefer the set to be dumped rather than repaired. Andrew does have quite a good tip on how to present estimates and bills to customers. Check both Mike's and Andrew's articles out on pages 48 and 39 respectively. There are many other varied articles in this issue for your enjoyment.

LeJeune reports from the fibre to the home council conference held in Paris last month. It seems that Europe is falling behind the likes of South Korea and Japan in connecting homes and businesses directly to a fibre optic network. We have another test case, number 533 in the series, which looks at a problem with a large screen Hitachi. As always the answer can be found on a later page in this issue. Donald Bullock's "What a life" article humorously shares with us one of his many "Heath Robinson" inventions and boyhood interests. Keith Hamer and Garry Smith have contributed two articles to this issue. Long distance TV looks at the sightings from around the world in the month of January. Their second article on the theme of "Digital switchover" takes a close look at digital reception using set top aerials.

The third instalment of Reality TV by Mike Leach demonstrates to us how the price of TV's and TV repairs have not changed too much over the years, particularly in comparison with the amount of change to the price of cars, vans and even beer! Eugene Trundle takes a closer look at AV coupling and comes to the conclusion that digital coupling now provides the best-possible pictures. Roger Bunney continues his reports from the month of January in his regular column "How to satellite"? Pete Dolman manages to cram a great deal of technical information into his "customer focused" article.

I hope you enjoyed part one of the series by Tony Thompson on "the race for television" which commenced in the March issue. Part two demonstrates what a tough time it was with leading television pioneers backing the wrong technology horse.

This issue includes some extracts from Fawzi Ibrahim's book on multi media convergence. It demonstrates how the boundaries between broadcasting and telecoms have become increasingly blurred since the early 1980s; this will be continued in our May edition.

Arthur Jackson's memoirs of the TV man remind us of how it used to be back in the old times.

Thank you for all the faults that you have been sent in to me. I always try and use as many as I can with the space permitting. Please continue to send them in; I know that our readers use this section avidly. For those of you who would like to have all the faults, published in Television magazine since 1988, on cd Rom, in an easy to find format, the latest Television index and directory has just been finalised and is on sale now via our website. For full details on what has to be the most invaluable product for the TV engineer, please email me.

Lastly, a big thank you to all of the contributors to Television magazine. I am delighted with the quality and variety of the articles that you have sent me in the first four issues. Please continue with the great work.

I hope you enjoy the issue.

Tony Greville – Publisher

Nine out of 10 adults aware of switchover

Ninety per cent of adults are aware of the digital television switchover, according to new research from Digital UK and Ofcom.

The Digital UK/Ofcom Tracker Survey at December 2007 indicates national awareness of switchover has reached 89 per cent, up from 66 per cent at the beginning of Digital UK's public information campaign in May 2006.

The figure rises to 96 per cent in the Border TV region, which is set to start the switch at the Selkirk transmitter on November 6.

Around three-quarters of those served by it could also pinpoint the exact date analogue transmissions will be turned off at the mast and replaced with a digital signal.

Following the successful switchover in Whitehaven, Cumbria, the research also shows more people than ever are relaxed about switchover. Nationally, 86 per cent of those interviewed were comfortable with the move to digital TV.

Nine in ten UK adults are now aware of the digital TV switchover.

The release of the figures coincided with the launch of a new national TV advertising campaign, which ran in March. The new advert, entitled 'Skip', reassured viewers that almost any analogue set can be converted for switchover using a digital box.

David Scott, chief executive of Digital UK, said: 'This latest research is further evidence that viewers across the UK are embracing and enjoying digital TV.

"More than three quarters of the UK's 60 million television sets are now ready for digital broadcasts.

"Our figures show there's some work to be done with raising awareness around converting video recorders, and about the date of switchover in each region.

"Anyone uncertain about these or other switchover issues can call our helpline, which advises thousands of people every month, or visit our web site."

FURTHER KEY FINDINGS FROM RESEARCH BY DIGITAL UK AND OFCOM:

- *76% of people are now aware of the 'digital tick' logo, which identifies equipment ready for the digital switchover, up from 65% in previous research.*
- *Eight out of ten viewers in the West Country, Wales and Granada TV areas are already comfortable with switchover, due to start in these regions in 2009.*
- *More than half (53%) of those interviewed had converted every TV in their home, rising to 57% in the Selkirk transmitter area.*
- *43% understood that video recorders were also affected by the switch to digital television (up from 32%).*
- *Viewers in London have the lowest awareness levels, at just 77%.*

Eaga to offer digital help

The BBC has selected Eaga, a leading provider of residential energy efficiency and outsourcing services, as the preferred supplier to deliver the Digital Switchover Help Scheme.

Up to seven million people will be eligible for support from the Digital Switchover Help Scheme to convert one television set to digital during switchover between now and 2013.

People eligible for the Help Scheme are those 75 and over, able to get certain disability benefits, or registered blind or partially sighted.

Peter White, chief executive of the Digital Switchover Help Scheme, said: "We are very pleased to announce Eaga as the preferred supplier of the Digital Switchover Help Scheme.

"We look forward to working in partnership with them in the Borders during 2008 and thereafter across the country.

"Our purpose is to make sure that all those eligible people that need help making the switch to digital TV receive the support they need from us, so they continue to receive television after switchover.

"We will continue to work to reach the people most at risk of being left without a television and ensure they are given the assistance they need."

Leading provider of residential energy efficiency and outsourcing services Eaga has been selected by the Beeb to deliver the 'Digital Switchover Help' Scheme.

Photo: www.clarkefoundation.org

Obituary – Arthur C. Clarke

Father of satellite communications and science fiction writer Prof. Arthur C. Clarke passed away at the age of 90 in a private hospital, Colombo, at around 3.30 in the morning of 19 March this year.

Knighted in 1998, he was chancellor of the Arthur C. Clarke Centre for higher studies, Colombo. Clarke was a Sri Lankan citizen at the time.

Freeview at risk as Ofcom deals HD blow

Ofcom has been attacked over its plans to bring high-definition broadcasts to digital terrestrial TV.

According to the Digital TV Group (DTG), the proposals are so bad that if left unmodified they could jeopardise the future of Freeview.

As a result, it has called for a national HD strategy for all TV platforms – terrestrial, satellite, cable and internet protocol TV (IPTV).

Late last year, Ofcom revealed plans to upgrade multiplex B to use new transmission and compression standards DVB-T2 and MPEG4 – Freeview currently uses DVB-T and MPEG2. This is so that it can be used by the public service broadcasters for high-definition services.

Although it welcomed Ofcom's acceptance that there was demand for high-definition services, the DTG, in a detailed response, sees its plans are flawed.

"Regrettably, we do not consider that they will lead to a successful long-term free-to-air HD platform in the UK," said the DTG.

The DTG was also concerned that the changes proposed by Ofcom could also compromise the existing picture quality for public service broadcasters on Freeview. Also, they relied too heavily on unproven technology.

It noted that all other UK digital TV platforms were beginning the migration to HDTV – for example, Sky, Virgin Media and, when it is launched in spring, Freesat.

On top of this IPTV operators such as BT, Orange, Tiscali and the rest may be able to offer HD services very soon and, of course, games consoles already do.

The trend towards HDTV transmission is a foregone conclusion in all other platforms, it said, as it is in other industrialised countries.

There, it pointed out, "governments and regulators either have taken, or are taking, firm steps to migrate the terrestrial platform to HD with sufficient spectrum inputs to create vibrant markets for domestic content and consumer electronics industries".

HALF OF US HOMES HAVE DIGITAL TV

More than 50% of American households now own a digital television, according to new research from the Consumer Electronics Association (CEA).

As the nation moves over to digital television, consumers are adding DTV to their homes at a record pace.

Gary Shapiro, president and chief executive of CEA, said, "I am proud to announce our nation has hit this digital milestone.

"With 50 per cent of US homes able to experience the reality of digital television, we have crossed a critical threshold.

"2008 will continue to demonstrate the growth and success of DTV, with nearly 32 million units forecasted to ship.

"Consumers are particularly keen to add HDTV to their homes, with high definition expected to account for 79% of total DTV shipments in the US in 2008."

Digital TV Group proposes 12 HD channels on terrestrial TV to operate from 2013 via single-frequency networks

DTG on single frequency networks

The Digital TV Group (DTG) has proposed that single-frequency networks (SFNs) be used to broadcast 12 high definition (HD) channels on terrestrial from 2013. It produced the blueprint framework for the future of advanced digital television amid long-standing industry concern about the availability of HD services on terrestrial TV.

Under the plans, three multi frequency networks, which will give nearly 100 per cent coverage, would be retained to carry public service and regional services.

Meanwhile, two of the channels released by the switch to digital would be used for two single frequency networks which, it is estimated, would reach 70 per cent of UK homes.

Altogether there would be 12 HD channels.

The DTG's proposal, which it wants to be debated and developed, says the change should be introduced in 2013 once switchover is complete.

The SFNs would use DVB-T2 transmission and Mpeg 4 compression.

As the terrestrial network is converted further there would potentially room for up to 40 HD terrestrial channels.

Dr Ian Childs, a member of the DTG, said the concern with current Ofcom proposals was that they did not offer "a sufficiently compelling product for the consumer".

Without a clear HD plan, the industry is worried that the future of digital terrestrial television in the UK will suffer.

Dr Childs said the 12-channel offering "might be the minimum level that allows digital terrestrial television to come up with a proposal to the public that makes it viable".

He admitted that the proposals were "fairly radical", but added that he believed they could succeed.

The DTG has previously made clear its dislike of Ofcom's plans relating to the provision of HD on DTT but said its blueprint would "build" on them.

SES Astra ups its business in Germany

Satellite firm SES Astra has increased the number of digital satellite TV homes reached by its satellite system in Germany by 1.72 million to 9.75m households – a rise of 21.5%.

The latest Satellite Monitor survey, conducted annually by the market research institute TNS Infratest on behalf of SES Astra, found that there are 36.98m analogue and digital TV homes in Germany, with 16.7m homes receiving satellite TV services.

Cable serves 17.9m German homes (48.4%), while 2.3m homes (6.3%) receive terrestrial television services.

The number of cable households in Germany decreased by 600 000 in 2007, while digital terrestrial TV increased its reach by 400 000 households.

Of the c.37 million analogue and digital TV homes in Germany, almost 17 million now receive satellite TV services.

Over this year, BT Vision is planning to put, "significant investment," into applications like gaming and teleshopping

BT Vision invests in new applications

BT Vision as revealed that it is putting "significant investment" into new applications including gaming and teleshopping.

Dan Marks, BT Vision's chief executive, said, "Over the next 12 months, we are going to make a significant investment in applications that can sit on the platform and be interrogated by the viewer allowing them to do those things.

"We're going to build a personalised TV service that brings together the things you do in your study on a PC with some of the things that you do in the living room.

"We are able to hold a lot of content and open up a TV connection between home and the world.

"Once you do that television changes."

MPs call for local TV on Freeview

More than 20 per cent of MPs have backed a call for local television to be allocated space on the Freeview platform.

One in five MPs back a call for local TV on Freeview

An Early Day Motion, supported by campaign group United for Local Television, aims to get the government to set aside spectrum for these services.

A statement from the group said, "United for Local Television is calling for Channel 6 to become a UK-wide network of local channels, launching before the conclusion of digital switchover.

"This would become a local TV channel with local programming inserted at all major transmitter points using 'add/drop' technology.

"No matter where you live in the UK, Channel 6 would be a local channel offering local news, local programming and local advertising.

"Channel 6 would also carry 'networked' public service content."

The motion was proposed by Ian Stewart, a Labour MP and chairman of the all party parliamentary group on community media.

BBC WITHHOLDS FREESAT DETAILS

The BBC has been slammed by a parliamentary committee for withholding information on the costs of its contribution to the free-to-air joint satellite venture Freesat.

The BBC had told the House of Commons Culture, Media and Sport Committee that it could not provide it with the annual budget of the joint venture company behind Freesat for, "reasons of commercial confidentiality".

The committee did not accept this and said it was disappointed overall by the manner in which the BBC responded to its questions.

It concluded that it was, "not reasonable to withhold information about the contribution of the licence fee payer to the Freesat service, although we accept that it may be reasonable to withhold information about the total budget of the joint venture company as commercially confidential".

It pointed out that the BBC Trust had approved Freesat on the basis that a national satellite-based free-to-view digital service represented good value for money.

The committee also expressed concern about who speaks out on behalf of the BBC. It cited as an example the campaign that took place to ensure there was enough spectrum to provide high-definition services on Freeview.

It pointed out that while the BBC Trust thought it inappropriate to comment on which public services deserved spectrum, BBC staff apparently did not.

Under a new partnership, Bebo is to offer 'free and open-access' to premium ITV content for its community of 40 million users

ITV teams up with Bebo

ITV.com has unveiled a new partnership with Bebo which will offer free and open access to premium ITV content to Bebo's community of 40 million users.

Under the deal, ITV will have a member profile on Bebo hosting numerous media channels, each promoting individual programmes.

Bebo users will be given the opportunity to become 'Fans' of programmes meaning they will be notified when new content is uploaded to the profiles.

The broadcaster's first channel launch was US acquisition Gossip Girl, which broadcasts on ITV2.

Zai Bennett, ITV2's controller, said: "ITV2 and Bebo are quite simply a great fit.

"Launching this partnership with Gossip Girl, the new smash hit from the US, makes that fit even more perfect and I'm really excited about the opportunities this opens up for us."

Freeview Playback becomes top seller

Freeview Playback was the biggest-selling digital television recording platform last year, winning more than half of the market.

Around 209 000 of the terrestrial boxes sold during 2007 complied to the Playback specification, while total digital TV recorders (DTR) sales were 400 000.

There were 82 000 recorded Playback sales in 2006, but it only launched in earnest last spring.

Total sales of Freeview hardware increased by 64 per cent from 5.9 million in 2006, to 9.7m last year, according to new figures. The digital terrestrial service also set its quarterly record with 3.8m units sold in the last three months of 2007.

Uptake is helping drive switchover and the strong last-quarter sales will bring the proportion of digital-ready homes above Ofcom and Digital UK's latest recorded figure of 83 per cent.

Ilse Howling, Freeview's general manager, said, "Freeview continues to be a truly compelling offer and the latest sales figures further cement our position as the most popular digital platform in the UK.

"More than half the homes in the country now have Freeview and the value of Freeview Playback is set to grow further for these homes and the millions of others with additional sets still to convert."

Total sales of Freeview hardware increased by 64 per cent from 5.9 million in 2006, to 9.7m last year

DSGi stores to stop selling analogue TVs

DSG International stores in the UK are to stop selling analogue TVs.

Currys, Currys.digital, PC World and Dixons.co.uk will not only stop selling analogue TVs once current stocks are cleared, but will also remove from their ranges DVD recorders with analogue tuners.

Store staff will offer customers buying the remaining analogue TVs the option of a digital set-top box.

The retailer is also planning to increase in-store information about digital switchover with leaflets, display materials and staff trained to give guidance on options – guidance, said the company, that will be designed with vulnerable groups, including the elderly, in mind.

"We believe that it is appropriate to ensure that our customers are able to select from a future-proof range of televisions," said Currys managing director Peter Keenan.

"Integrated digital televisions are relatively simple to operate, offer superior technology and are an important window on the digital future. They are now available for less than £150 from our stores."

DSGi, which claims to have sold nearly two million TVs through its UK outlets in the last year, said more than 90% of the TVs it sells now are digital. However, it pointed out that a third (32%) of the TVs sold in the UK are still analogue.

"We are concerned at the high volumes of analogue televisions still on sale in the UK and we favour early transition to a digital only range," Mr Keenan said.

"Digital provides a better deal for customers and reduces waste by removing the requirement for soon-to-be-obsolete analogue tuners in our television range and the unnecessary purchase of extra digital set-top boxes."

Currys, Currys.digital, PC World and Dixons.co.uk are to stop selling analogue TVs once existing stocks are cleared

Setting Europe alight

J.LeJeune visits the Fibre to the Home Council for Europe Conference 2008

Since the concept of a fibre optical network that is wholly fibre from end to end was first mooted, the FTTH Council for Europe Conferences have been held annually in a major European city, last year it was Barcelona, this year it was staged in Paris. Interest is growing internationally in the "last mile" of the cable network. At present the majority of Cable Networks are termed HFC (Hybrid Fibre/Copper) networks. This means that the last portion of the network, the bit that enters the customer's house, is most definitely copper co-axial cable, the transition from optical to electrical signals being performed in a cabinet in the street somewhere in the neighbourhood. The copper network is the weakest link in a long chain of telecommunications cables that cover the whole of the British Isles and beyond. Although the technology is reliable it is also old and slow in relation to the data carrying capability of optical fibre.

The conversion of optical signals into electrical ones also requires powered equipment to de-modulate the infra-red light beam and process the received data into a form suitable for transmission over the tail-end of the network – the subscriber drop-in cable. The co-axial link also lacks the vast bandwidth of the optical one, and is the poor relation in an otherwise very high speed transport system for data.

Cable Network Operators have used fibre optic technology for over thirty years, principally in trunk cable routes that transport data around the country for feeding into local Cable TV networks, but telephone and business data traffic is also carried at low cost and considerable speed. Over the years the consumer demand for higher communication speeds led to the introduction of ISDN services over the standard telephone lines and this is now largely supplanted by ADSL (Asymmetric Digital Subscriber Line). This is a technology that over-lays the normal audio-only telephone lines with a series of radio frequency carriers that stretch from about 200KHz to 2.1MHz. The lower frequency portion of these, about 10% of them, are used to convey upstream data back to the information highway, the remaining 90% of the bandwidth is allocated to the downstream signals bringing data from the source to your computer. Signals on the ADSL network conform to Internet Protocol, a packet system that provides flexible and fast data communication. The normal telephone service is a point-to-point network and is switchable, in other words, communication is achieved by setting up a communication link between opposite ends by dialling the telephone number. Once the link is established it is used solely by the communicating parties and dropped when no further use is required. Internet Protocol is a non-switched technology that operates only in the digital domain, and delivery of the data packets is controlled by destination and source data embedded at the head of each packet. Devices called routers in the network read the headers and find the best route for the data packets, so that they could possibly reach their destination by a number of different routes. Broadband internet services at present, therefore, are on unswitched networks and, consequently, are 'on' all the time.

The flexibility and robustness of Internet Protocol (IP) has led it to being used for other applications, one of which is IPTV. Television is a user of much greater bandwidth than audio or data communications and requires a fast broadband connection to be of any use. As consumer demand increases for more and more services such as IPTV, Video on Demand, Gaming, Gambling, HDTV, music downloads and fast Internet , plus a variety of domestic control applications, the need for a fast link into the home has become imperative. Current networks in the majority of instances use ADSL over the existing telephone lines but the capacity of this type of technology is limited from the outset by the narrow band of frequencies available to it, and further restricted by the length of the line from the exchange and its quality. Fibre to the Home is the fastest option that fibre optics offers as it uses optical signal transport all the way from source to destination. The commonest type of optical network of the FTTH variety is the Passive Optical Network (PON). This type of network has no amplifiers along its route from the central office to the home, this makes operation and maintenance much less expensive. Digitally modulated infra-red light is launched into the fibre at the central office, the outgoing fibre is split up to 64 ways, each fibre going directly to the customer's home and feeding data into the terminal unit or "set-top box". Because the signal loss in optical fibre is very low, no amplifiers are required to deliver a usable signal to every customer, the optical power loss being around 20dB. Interactive TV and the need for an upstream path for internet users means that two fibres are deployed to each household, the second fibre carrying signals returning to the central office for insertion into the data highway, to order Video on Demand, or just to vote for a contestant in a talent contest. The current delivery speed is 100Mb/S, however, industry wise-men predict that by 2010 the requirement will be for 1Gb/S, by 2015 will be 10Gb/S and by 2020 a huge 40Gb/S or even more. Speeds of up to 100Gb/S are possible beyond 2020. There is, of course, a cost to all this but the benefits of an all-fibre network can be enjoyed by the customer with unequalled speed of communication and all the uses of the Home Network, and by the network operator with reduced maintenance costs, a first-class quality of service and low power requirements due to the absence of network amplifiers.

A sad fact emerging from the FTTH Council for Europe Conference this year was that in the UK under 1% of all homes passed by a Cable TV network are equipped with FTTH. An FTTH project at Ebbsfleet is being undertaken currently by BT. Ten thousand homes being built there and are to be equipped with FTTH. Throughout the world homes and businesses are being connected directly to a fibre optic network with many benefits accruing from it. The highest connection rates are in Japan and South Korea but Europe is catching up. Cities and communities where FTTH has been deployed are lyrical about the benefits it has brought and Amsterdam, currently being re-cabled in fibre, has declared, "We believe that a city with a great future is not a city without FTTH!"

Test Case 533

TV model: Hitachi C28WF560N

"Real Technician should have been more thorough at the outset instead of cavorting about like a bull in a china shop!" Can you work out what he should have done?

Time was when Hitachi manufactured its own TV chassis, and some of our adventures with their A7 variant have been described here. Later large-screen sets use third-party designs, and one such is widescreen model C28WF560N, encountered recently in the workshop, sporting a Vestel 11AK45 chassis.

This one was not familiar to the workshop lads, but its fault symptom suggested that a cure would be easy to find: about the top 10% or so of the picture was stretched, the next 10% tightly cramped, and the rest of the image quite linear. Real Technician immediately jumped in, assuming that this was due to a fault in the 'flyback generator' section of the field timebase circuit – and who needs a service manual to fix such a thing as that? It generally consists of just one diode and one electrolytic capacitor. In he waded with a capacitor ESR tester and a multimeter. All the diodes and electrolytic capacitors he could see in the vicinity of the field timebase chip checked out OK. So, reasoned RT, the IC itself must be faulty. The one in the set was 7-leg type STV9379FA, and the one in the component stores was type STV9379A, physically identical. So Real Technician fitted that, only to find that the set now failed to come on at all! The correct type was ordered, and the set put to one side to await its arrival.

Soon the replacement chip arrived, and was quickly fitted. But when the set was switched on, just the same picture defect was present: clearly the original chip was not faulty. What now? The technical advice section of Hitachi should know about this, thought RT. So he rang them up (this is only possible for account holders), and described the problem to a helpful man who had no doubt where the trouble lay. These strange picture-geometry problems, he declared, are due to a faulty EEPROM memory chip IC502. Replace it. Thus spake the Oracle, and so that's what Real Technician did. Now although this set uses a common type of memory chip, a 24LC16A, it has to be exactly the right type, programmed for the specific TV make and model to which it will be fitted, and so it must be ordered from the setmaker or an appointed spares agent. RT ordered one, then, and once again the TV was put on the shelf.

After a couple of days the new memory IC came through the workshop door. Donning his anti-static wrist strap, RT put it into the set. He checked his work and then fired up the set. To his horror, the fault was still there, along with a lot of minor effects due to mismatches between the data in the new memory and the requirements of this particular set. Going to service location 41 (Panoramic mode vertical amplitude) RT found that at low settings the vertical linearity was fine, but as the height was increased the top of the picture became progressively more distorted. Wow!

Back into the field timebase, then, this time with an oscilloscope and the circuit diagram on view. Careful checks at each pin of the field scan chip IC600 turned something up, and it wasn't long before the fault was located and cured. Don't turn straight to the solution on page 23, but don't take as long as RT to find the cause of this fault!

Fault finding reports

Save time and money by benefiting from the experience of some of the repair business's most respected voices

For convenience, each report is categorised by its relevance to a particular appliance, e.g. TV, satellite, etc. In each appliance section, reports are grouped according to their author, whose name and details appear at the end of their respective report group. First off, Arthur Jackson...

TV FAULT FINDING

Samsung WS32Z306V Slim CRT - S62B chassis

These slim but incredibly heavy sets are about two years old now. Although they have proved reliable, a couple have come in with the complaint of being dead. Checks however proved they were not as dead as they appeared.

In both cases, a shorted line output transistor was found. This FJL6920YD transistor is part No Q_{403}. Fortunately the cause of this component failure was not too serious. The fault was quickly found by a visual check. Capacitor C425, rated at 150nF, 400V, in the line scan circuit was overheated and distressed. Replacing both these components provided a reliable repair in both sets. Their part numbers are; Q_{403}, 0502-001230 and C_{425}, 2306-000134.

Maxim 11-57 26in LCD TV

This set appeared to accept the on command but then quickly reverted back to stand-by. During this brief start-up attempt the backlight was momentarily seen to flash on.

Our attempts to obtain any service information went nowhere so we carried out some basic checks in the power supply and inverter stages. Any marked or traceable supply rails were present and correct but then we hit lucky when carrying out some ESR checks on the power supply components. Capacitor C_{330}, rated at 1000µF, 25V was virtually open circuit. A good quality replacement component produced very good results.

Maxim 11-57 32in LCD TV

"Set dead," was the complaint with this fifteen month old LCD TV. Initial checks in its power supply stage found some quite obvious damage in the primary section.

Two small ICs, namely IC_{21} and IC_{30}, were both blackened and blown apart, as was the 3.15a fuse F_{300}. Initially, we had no luck in obtaining any service information. Fortunately, my colleague decided to search the internet and came up with a power supply repair kit for 26in and above models. It was available from CHS.

This reasonably priced kit contains seven components, IC_{21}, IC_{30}, diode D_{326}, transistor Q_{300}, zener diodes $D_{315/8}$ and fuse F_{300}. In our set, 1N4007 diode D_{325}, which is in parallel with D_{326}, was also shorted and an obvious line of print was blown off the PCB. With all the abovementioned components replaced and the print repaired, excellent results were restored.

Philips 42PF9946/12 42in plasma - lC4.7EAA chassis

A perfectly good picture appeared on this set, but there was no sound. When all menus, options and input sources had been eliminated from blame, we stripped the set down and carried out some checks.

These checks found the audio amplifier IC, part reference 7700, was faulty. Also, both speakers were open-circuit. Replacements were fitted and normal sound was restored. As no further problems arose we returned the set to its owner after a couple of days on test.

By coincidence a few days later we noticed information on Philips' web site about this fault. It seems that volume settings greater than level '85' can cause the amplifier to produce more power than the speakers can handle. This results in the damage to the above mentioned items.

For a reliable repair, Philips suggests entering the service alignment mode, then enter the non-volatile memory editor and change the memory setting at address (ADR) 119-dec to value (VAL) 130-dec and store this change. This altered value gives lower audio power at maximum volume.

My colleague carried out this alteration a few days later in the customer's house in the interests of reliability. He found the adjustment procedure quite confusing. I haven't seen a similar set since to look at this procedure but I'm sure this fault will crop up again with other sets.

Sony KV-32WF1U - BE-3D Chassis

The unusual problem with this large and very heavy set was that perfectly normal picture and sound were

present during normal viewing but when teletext was requested it switched to standby and went into protection with a flashing red led.

I suspected that, since a different aspect ratio is used in text mode, perhaps there was some geometry corruption in certain modes. Similar faults occur in the popular Vestel chassis.

To assist with my diagnosis I temporarily disabled the vertical protection by lifting one end of diode D_{505}. When text was now selected, the set remained on but with severe vertical distortion.

I then found that by choosing different aspect ratios, the distortion was with zoom 1 mode only. When the service mode was accessed to enter the correct vertical values and D_{505} was refitted, text could once again be viewed normally.

Alas, a few hours later the identical symptoms returned. As no dry or arcing joints had been found and there was no indication of tube flashover, I ordered IC_2. This is the non-volatile memory that contains the geometry values, amongst other information. Its part No is 875733420.

However, the chip that arrived was a different type, with part No 875968241. Although both the original and replacement parts are SMD components, the new one was physically only half the size of the original.

With a little manipulation, this was easily fitted. Retuning was the only adjustment now required. After several days testing all values remained and no further problems showed.

Sanyo CE-32FWN5-B - EB8-A28 Chassis

There was a vertical output fault with this modern pure flat screen set. That is, the top half of the screen was being scanned although it was non linear while the bottom half was black and appeared to be folded up giving a bright line near the screen centre.

Voltage checks on the vertical output device IC_{501}, an LA78045, found the +14V supply at pin 2 was present and correct but the -14V supply to pin 4 was low, at only -2.8V. When the source of this rail was traced right back to the associated rectifier, D_{648}, the supply was very low here also. There was only -4V on the diode's anode.

The only component between the cathode of D_{648} and the source – pin 10 of the chopper transformer – has the reference L_{643}. It was stressed and heated. When I tested it, it read 18Ω, despite being referenced as a coil. The parts list confirmed this was a carbon 1Ω, 0.25W flameproof resistor.

A replacement restored full vertical scan but I then found that the PCB was very sensitive. The frame jumped and closed down with slight movement or tapping almost anywhere on the chassis.

The problem was traced to poor soldering on the pins of IC_{201}. This large, multifunction SMD chip produces vertical drive pulses VDRA and VDRB on pins 23 and 22. Re-flowing this component cured all problems.

I suspect the unstable drive conditions had caused IC_{501} to draw excess current via L_{643}, causing the permanent fault.

Arthur Jackson

Samsung LW17M24CPX LCD

Fault: the monitor LED flashes synchronously with a tripping noise from the set. This is probably due to a faulty 1000µF, 25V capacitor C_{241}. Check for high ESR reading or low capacity.

Philips 28PW6508/05 - L01.1E chassis

No sound or picture here. In this case the set was dead but before noticing a complete failure, the customer said the picture flickered and the width came from the side.

If the set is dead then check the BU4508DX line-output transistor 7460, which may be short circuit. This transistor can fail due to overheating caused by drive being unstable due to a faulty 47µF 50V capacitor, C_{2455}. Often, this capacitor has an increased ESR, but in most cases it will probably be open circuit.

Philips 15PF9936/12 - LC03 chassis

Fault: no picture. When the set is switched, on the LED is green. Sometimes sound may be present but there is no picture due to loss of backlight. Check the four capacitors in the power supply, Nos 2920, 2913, 2910, 2933. These are all 470µF, 25V. Also check the 1000µF, 6.3V capacitor 2923. All these capacitors may exhibit low capacitance.

To ensure correct operation, you should also check the capacitors on the Scaler PCB. These have references 2007-10, 2015, 2024, 2026 and 2027. All eight are 470µF by 25/35V.

Sanyo CE28WN5 CRT - EB6-A28 chassis

Fault: Frame collapse.

The first check is to ensure that the LA7846N frame output chip, IC_{501}, is not short circuited or dry-jointed. If this proves negative, check the LT input voltage on the IC. It should be 15V, but the set I had in for repair measured only 9V. This was due to the 3.3Ω feed resistor R_{515A} having increased to 88Ω.

Bush WS6679SIL

If the set is dead but there is just a slight tripping noise, this may be accompanied by a light puff of smoke. Check whether the 222nF, 2kV capacitor CD_{18} in the line stage has gone short circuit.

JVC AV-28GT1SJF CRT - 11AK45B5 chassis

If there is no sound or picture and the LED is flashing red to green, this may well be due to a faulty 24LC16B eeprom, namely IC_{502}. Its part number is VE-20120620.

Philips 37FD9944 plasma - FM33 chassis

If after switch on the set goes immediately into protection mode, with the LED flashing, check all the stand-up capacitors in the power supply. These are C_{2113}, at 470µF, 16V, $C_{2230, 2231}$, at 47µF, 16V each, C_{2508}, at 100µF, 63V, C_{2510}, at 1000µF, 16V, and finally, three 100µF, 25V capacitors, $C_{2540,2663,2664}$. All of these capacitors needed to be replaced to complete the cure.

Goodmans GTV34T8 - BEKO127 chassis

When the set is switched on, if there are no results then check the line output for short circuit. Usually, this will be the case. The HT will have gone high due to a faulty 47µF capacitor, C_{909}. In this case however, the set was dead and failed to start-up, but then main HT was present across the main electrolytic capacitor. The fault was finally traced to a 1N4148 SMD diode, D_{604}, which had gone short circuit.

Toshiba 32WL48 LCD - Beko L6B chassis

This fault only occurs when the set is cold. It will just not start-up. If this is happening then check capacitors C_{460} and/or C_{461} for a high ESR reading. These are both 100µF, 25V.

Panasonic TH42PA20 plasma - GP6 chassis

If the set tries to come on but goes straight into standby, this is usually power regulator IC_{551} that's at fault. It's an STR-F6668M. Other fault symptoms also caused IC_{551} to work incorrectly. The set would shut down when the channels were changed. The set could be dead with the LED flashing seven times. Finally we have found intermittent vertical lines at start-up and there are no remote control functions in E/E mode.

Philips 32PF9964/12 plasma - FM23 chassis

In this case, the set just cut out after a short time with the red LED flashing. This was due to the loss of the 5V supply, which was caused by 11kΩ SMD resistor R_{3225} being open circuit.

Samsung LE32R41 LCD - RE32 chassis

If the set goes immediately into the trip mode then check for faulty resistors, RM_{802-5}. All four are 62kΩ and all are on the power supply in the top left corner near the heat sink.

Goodmans GTV26W LCD

This set was pulsating in standby mode. Check for dry-joints on coil L_2 on the power supply PCB. Then, before switching on, make sure any surplus glue on the component side is carefully removed and resolder the double-sided print to be sure of good contact.

John Coombes

LG RI-32CZ10RX - 14.2 chassis

Fault – set dead. At switch on I could hear a slight tripping noise. This initially led me to the line-output stage. A meter check across the line-output transistor indicated a short.

Immediately jumping to conclusions, I was already thinking about the transformer. So I checked the line-output transistor. I disconnected the line stage and this proved that the fault was in the power supply. Checking the ht rail led me to 470pF, 2kV capacitor C_{619}, which was short-circuited. After replacing it, all was well.

Packard-Bell LCD 20UK

Fault: description said 'dead'. The external power supply checked out OK. This led to the internal power supply. Today luck was on my side. There was a lovely dry joint on the regulator, circuit reference n 108. After a careful reflow, all was well.

Philips A10 chassis

I have had a couple of these ageing sets in recently with the same symptoms, i.e. no Scart inputs or outputs. The RF input is perfect. To solve the problem, go into the service menu and check that the option codes correspond with the codes on the tube sticker. I have found the second and third option codes have become corrupted.

Philips 42 PF 5320/10 plasma

After a few hours, this plasma tv would drift slowly off tune. To solve the problem, I replaced the transistor with circuit reference 7753, part No 4822 130 42804 located on the signal panel. I also upgraded the inductor from a 220µH to a 470µH. This has circuit reference 5753 part No 2422 536 01178. This fault is due to thermal instability on the transistor. Upgrading the inductor provides a lasting cure.

Harte Electronics
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DVD/VCR FAULT FINDING

Goodmans GDVD100R

This home-cinema unit appeared to be completely dead. It employs a standby power supply on a small board at the front right.

There's a relay on this to control power switching to the unit's main power supply. The main supply is based on a large toroidal transformer with linear regulators.

Outputs from the standby supply are +5V and +12V and there's a control input that goes to about +3V to bring the unit out of standby. In this case, the +5V rail was missing. This comes from a 2SC945 regulator transistor, Q_{901}.

The device proved to be open circuit between its base and collector. I replaced this somewhat under-rated device with a chunkier MJE340 normal operation was restored.

JVC DR-MV1SEK

A combination of DVDR and VCR came to my bench with the complaint "Flashes the word LOADING, then turns itself off".

When tried, it did little more than sit there with the back panel fan running, and the word 'LOADING'

blinking in the display, as reported.

Fortunately, for a change, it was a nice easy one! Capacitor C_{5207}, located right next to some hot-running diodes, had dried out, and popped its leadout bung. A replacement soon got the unit going again.

Geoff Derby

Panasonic DVDS35 DVD

If the DVD is dead, check to see if the 3.3V supply is reaching the front panel. If it isn't, check whether the MAZ40390HF diode D_{1170} is short circuit.

Panasonic NV-VP30E VCR/DVD Combi.

If the DVD display is lost with loss of mechanical functions on the video section then this may well be due to there being no 12V supply on the video PCB. A quick check may soon point to the 2SC1959Y transistor Q_{1007}. I suggest replacing it even though it may not appear faulty.

Panasonic NV-VHD1B DVD/VCR Combi

If the unit under test is dead, this may be traced to a MAZ751000C zener diode, D_{1180}, being short circuit. Before turning the set on though after replacing the diode, also consider replacing the PC123 shunt regulator Q_{1200}. I've found that this usually exhibits a short circuit between pins 1 and 2.

John Coombes

AUDIO FAULT FINDING

NAD 5240 CD Player

In this case, the disc wasn't being clamped properly. The disc clamper is pivoted to the rear of the disc and is held in place by a plastic clip on the left hand side of the clamper. There is a strong spring underneath the back of the clamper that provides the clamping action.

Due to wear in the pivot and clip, the spring was pushing the clamper up too high on that side. This meant that the rotating part of the clamp was catching on the fixed part as the disc rotated.

Adjacent to the clip, there was a plastic peg protruding from the chassis. This had a hole in the top. It looked as if the problem had been anticipated but the cure never implemented. When a suitable self-tapping screw and washer were fitted here, the disc was clamped perfectly and discs were played normally.

Technics '790' System

The 790 audio system consists of four units connected with the usual flat ribbon type cables. It is a Dolby Pro-logic surround-sound system driving five loudspeakers. The complaint was no sound.

From the indications on the displays, everything appeared to be working but the only sound was a series of random crackles from the speakers. The volume of the crackles varied as the volume control was operated, which suggested that the fault was in the signal path prior to the volume control. This being the case, I decided to examine the SHEH790 sound-processor unit and firstly checked whether there was a signal present at the input to the DSP chip, IC_{801}.

There was a good signal at the input. A signal injected at the output of the sound processor, on the socket where it feeds the amplifier, gave a good output from the speakers (OK, I stuck my finger on it and got a nice buzz from the speakers!) This proved that the fault was somewhere in the sound processor.

I began to get a bad feeling about the DSP chip, which is a large multi-pin surface-mount device. A check on the output of this IC confirmed my suspicions that it was not producing an output, as the random crackles were the only signal here.

A check on the device's 5V supply showed only that it was only 2.5V – which cheered me up considerably. This 5V supply is derived from a 7V rail, which in turn is derived from a 10V supply. The 7V supply was present on Q_{761}. From here it is fed through 2.2Ω resistor R_{761} and 1N4003 diode D_{762} connected in series to the 5V regulator transistors $Q_{764\&766}$. This diode had a very high forward resistance. After I had replaced it with a 1N4007, all was well.

Musical Fidelity XA50 Amplifier

This was not a nice job. The complaint was "no sound, just buzzes". There was a loud 100Hz hum from the speakers when the unit was turned on. Usually this symptom is caused by short circuit or leaky output transistors drawing excessive current.

The output transistors tested OK. There were no other measurable faults but I decided to replace the output transistors on both channels anyway. These are types SAP15N and SAP15P. This appeared to have cured the fault. When the amplifier was powered up it worked normally.

After soak testing, however, the fault returned and I hastily turned the set off. When I turned it back on, the fault had disappeared again. After scratching my head, I decided to replace all the transistors in both channels as they are very cheap. An intermittent transistor seemed to be the most likely cause of the fault.

All these transistors are either MPSA42 or MPSA92 types. It didn't take long to replace them – 12 in all. Again the amplifier worked normally. It continued to do so for more than a day when the fault returned.

By now I was tearing my hair out, having tried heating, freezing and any other tricks I could think of. To cut a long story short, which involved substituting capacitors, diodes, etc., I eventually replaced the KBPC1004W bridge rectifier. After a further soak test of nearly a week the fault seemed to be cured. It has been three months since the unit was returned to the customer and I have not heard

anything so I hope I can relax now!

In retrospect, I probably should have gone for the bridge rectifier earlier, but for the fact that I don't remember ever having an intermittent one.

Quad FM4 Tuner

"A burning smell," was the complaint here. This was caused by a suppressor capacitor and resistor combination package connected across the mains input.

With these tuners, the capacitor sometimes goes leaky and the component starts burning. A replacement part – 47nF+47Ω – and a new 63mAT fuse got the tuner working again. Note that this is a safety component and only a class X2 part specially designed for the job should be used. Farnell's part number is 971-7307.

Cambridge P80 Amplifier

I hadn't seen one of these venerable old amplifiers for many years. The fault was very simple – the mains on/off switch was faulty. This switch is combined with the 50kΩ log dual volume potentiometer. Despite trawling the internet and every catalogue I could think of, I could not find a supplier.

I was contemplating fitting a toggle switch on the back when I had a sudden idea. I got out the service manual for the Quad 33 preamp. Sure enough it was fitted with an almost identical component. A phone call to Quad produced the appropriate, but rather expensive, part.

Koda AV505 AV Amplifier

I hadn't seen this make of amplifier before and I had no service information for it. The unit was showing no signs of life.

There should have been a 5V standby supply to the CPU. This supply measured low. Disconnecting various items from the supply rail proved that it was being pulled down by something on the front panel. Further disconnection of components showed that the fault was being caused by the remote control receiver, which was the last thing I expected it to be.

With the IR receiver disconnected, the rest of the unit worked normally. I managed to find a replacement part in the Farnell catalogue, part number 1200323. After fitting it and testing with the remote control, which the customer fortunately had brought in, all was well.

Soundlab G097M PA Amplifier

My customer in this case said that the fans did not come on when the amplifier got warm.

There are two fans fitted to the rear of this amplifier. Both run off a 12V supply. The supply is switched on by either of two bi-metallic type sensors bolted to each of the two output-stage heat sinks. Usually these strips operate at about 60°C. Tests proved that the 12V supply was indeed present at the fan connectors above this temperature.

At first I thought that both fans must be faulty, although this seemed rather unlikely. Then I realised that they had been connected with reversed polarity during manufacture and so could never have worked! Reversing the fan connections provided a cure.

JVC THS51 DVD Player and PWS51 subwoofer

This started as an audio fault but then a further fault developed after a lightning storm. Initially, the customer said that the sound had gone off but that DVDs had continued to play with a good picture. After the storm, the unit was dead but the customer wasn't sure whether the storm was the cause.

I am a bit dubious about tackling storm damaged equipment. Sometimes there can be lots of unseen damage that can take hours to put right. The job can end up being hopelessly uneconomical repair.

In this case the STR-G6651 switch-mode power regulator, IC_{901}, was faulty and a replacement brought life to the unit. Everything looked as though it was going to work. However, as soon as the DVD player attempted to read a disc the whole unit would shut down.

Was it the DVD mechanism that was drawing too much current or was it the power supply that couldn't supply sufficient current? Fortunately I managed to borrow a power-supply panel from another machine which proved that the power supply was the cause of the problem.

With the borrowed panel, everything now worked as expected, albeit with no sound. I wasn't too worried about the sound fault as this is known problem. I eventually traced the cause of the power supply fault to the opto-coupler, PC_{902} part No PC123Y22FZ. A replacement got the power supply working.

Now for the sound fault. The cause was located on the panel inside the sub-woofer unit and is the subject of a JVC modification. Resistor R_{2702}, which is 47Ω, goes open circuit and should be replaced with a 22Ω quarter-watt fusible type, JVC part No QRJ146J-220X).

Also the 100µF capacitor C_{2704} should be replaced with 47µF one, JVC part No QETN1HM-476Z. After replacing these parts and reassembling, everything worked as it should.

Linn Mimik CD Player

A fault that I have experienced with several of these CD players is C_{102} and C_{117} leaking. Both are 220µF, 16V. This can cause various symptoms, but usually there is no display and there are no functions.

Often, the distinctive smell of leaking capacitors is noticeable when the cover is removed. Also, the board in the area of the capacitors – which are about half way along the right hand edge of the board looking from the front – may be corroded.

The board will need cleaning up in any case. Adjacent components should be checked for corrosion and

replaced as necessary.

Another fault is no audio output although discs appear to be playing normally. This can be caused by the d-to-a converter U_{100}, Linn part No IC_{133}. This fault can also take out transistors Q101 and Q102, which are a TRAN032/033 pair. Parts will probably have to be obtained via a friendly Linn dealer.

Crate VTX212B Guitar Combo

In this case, there was a loud hum present on the output but no signal. A large DC voltage was measurable on the speaker output. It was almost up to the level of the positive supply.

The output transistors were OK and so were all the other components checked in the output stage. Eventually I traced the fault to an almost invisible crack in the PCB near to Q_{19}, This effectively disconnected the transistor's base and upset the DC conditions throughout the whole output stage. Repairing this crack cured the fault.

Linn Axis Turntable

This fault caused the motor to lose power. It is a synchronous motor that runs from a power supply. This supply provides an alternating voltage at two selectable frequencies, enabling the motor to drive the platter at 33 or 45rev/min.

Replacing the electrolytic capacitors, which tend to dry out, is a good starting point. If these are tested with an ESR meter you will find most of them are out of specification or even open circuit. I find it best to replace the lot.

Usually this will get the motor running again but I have had one or two other problems. If the motor judders and won't run properly try R_9 or R_{20}. These are both 390kΩ or 430kΩ. If either is open circuit it will cause this fault.

If the motor runs even when switched off and 43kΩ resistor R_{17} is burning, then 820kΩ resistor R_{23} is probably open circuit. Sometimes I have found several of the ICs on the PCB faulty. In one case, most of them were cracked, which I assumed must have been caused by a lighting strike. Replacing them all cured the fault. Most of them only cost a few pence.

Occasionally the motor will have one of its two windings open circuit. In this case it will run with no load – belt not fitted – or if started by hand. It can also partially seize, which can sometimes be cured by cleaning and lubrication, although you can't dismantle it.

Sharp MDMX10H Mini Stereo Unit

Here, the customer said that everything was working, but because the display was not illuminated, he could not tune in the radio.

I replace LCD display backlights fairly frequently, but in this case the unit was fitted with a fluorescent display. On investigating, I found that about half the many pins of the display were badly dry jointed. Resoldering all the pins restored the display and produced a happy customer.

Andrew Beynon
Abacus Electronics

Marantz 74PM66/95B

The problem with this stylish hi-fi amplifier was that there was no output. This was because the speaker protect relay was not closing. For once, the reason for this was a nice simple one. A 4.7Ω safety resistor, R_{802}, was open circuit. I could find no particular issue to have caused it to fail, so I went ahead and replaced it. This restored normal operation.

Denon PMA - 355UK

This was a bit of an odd one. The unit arrived on the bench with the word 'Dead' on the job ticket, and this proved to be the case.

I opened the case and had a little poke around the standby transformer board. Ths board contains the relay for switching the main power transformer. I was surprised to find that the yellow wire to the primary of that transformer, was close, but not attached to, the wrapping pin where it should have been soldered.

Once the wire had been stripped back and resoldered where it belonged, all was well. How the wire became disconnected is a mystery.

Yamaha DSP - AZ1

These high-end AV amplifiers fall into the 'boat anchor' category. Make no mistake, we're talking hernia territory here.

Once you've struggled to get the thing onto your bench, and taken the covers off, you will find yourself presented with what is probably one of the most intimidating pieces of mechanical design work you will ever come across. Fortunately, most of the problems that these suffer from come down to one reasonably easy to get at component.

In this case, the unit was intermittently dead from the front end. Applying signal to the 'Main-in' sockets produced normal audio on all of its many channels, proving that the power amps were OK. However, when it was wrong, no signals applied to any of its analogue, coaxial digital or optical digital inputs, were detected or processed. Occasionally, the unit would burst into life, and continue to work normally until it was next powered down.

At the front centre of the amplifier, between the two large output stage heatsinks, is another smaller one. Once the strengthener bar, which runs from front to back of the unit, has been removed you can undo its two mounting screws and gently lift it out as far as its cabling will allow. You will need to cut some cable ties here.

This will give you access to the previously mentioned 'reasonably easy to get at' component, which is a regulator IC. It is actually one of seven that run along the edge of the board. Four of these are four-pin specials types. Three of them are type

PQ05RD11 and the fourth is a PQ3RD13.

The 'RD11 types are +5V, and the 'RD13 is +3.3V. Check the pin 2 outputs of all of these regulators, counting from their left-most pin. There's a good chance that you will find that one of the 5V ones, is only providing 2-3V.

All seven regulators need to be unscrewed from the heatsink to get to the back of the board. When you separate the devices from the heatsink, you will probably find that no thermal grease has been used. This may be a contributory factor in the frequent failure of these devices. Before refitting the board, I always put a smear of heatsink compound on all seven regulators.

In this particular example, the failed regulator was IC_{451} which had just 2.59V coming out of it. A replacement restored a full 5V, and normal operation of the amplifier.

Geoff Derby

PA FAULT FINDING

Behringer Eurodesk HX3282A

This was one of those problems that you never really get to the bottom of. Like Michael commented in the January issue of Television, my heart also sinks when I see a big mixer desk walking in the door. Not so much in my case because of the bulk and weight – I have plenty of bench space available – but more because of the potential for the repair requiring boards to be removed.

Mixer desks are invariably built such that in order to get a board out, every associated rotary and slider knob has to be first removed, then all of the fixing nuts and screws on the potentiometers, as well as those on any sockets. Often, there may be 200 or more knobs to come off, and a similar number of nuts to undo. It's very time consuming, and of course, when you come to put them all back on again, you have to get the colour coding correct. A useful tip here, is to take a digital photo of the desk before you start removing knobs.

The reported fault with this one was "Peak lights all on". The chap from the shop said that he thought it might be a power supply problem. I did too, but I'm not sure how he arrived at his conclusion. These desks use a separate external rack-mount power supply. It's a quite straightforward linear affair producing ±18V, +48V, +12V and +5V. I have in the past had the linear regulator ICs fail, so this was my first hope.

When I checked at the output of the LM337 regulator for the -18V rail, there was indeed nothing there, although there was a good solid -27V going in. Unfortunately, the regulator was too hot to touch, indicating that it had gone into safety foldback, due to a serious overload.

A quick switch to an ohms range on my meter confirmed that there was an almost dead short across the rail. When the desk was unplugged, the short went away, and the output of the regulator returned to its normal value. This was the point at which my heart really began to sink.

The cables from the mixer's rear-panel power socket split two ways. When the one to the main boards – there's three of them – was disconnected, the short was again gone.

There are several sets of link plugs between the boards, so my next move was to disconnect the first one in line, to isolate the first main board from the other two. Again, the short went away, indicating that the problem was not on the first board. It was at this point that I did a foolish thing. I re-plugged the link cable with the power still switched on, and guess what ? Still no short. In fact, the whole desk now worked correctly.

I think that it's fairly unlikely that there was anything wrong with the connector to be causing a short. This means that the sudden application of fully established power to whatever part was at fault blasted the problem away.

So, have I fixed it ? Short-term, certainly. It survived several days of soak testing in the workshop, and it's now been a few weeks since it went back to its owner.

Geoff Derby

Fault index by model

What a life!

By Don Bullock

This pike fishing has slipped out of hand. Steven and Paul are at it all the time now. The other morning I awoke to find another of their beer-stained notes on the mat. 'Gone fishing!' said the scrawl across an opened-out cigarette packet. 'Will you open the shop at nine?'

I hate opening the shop. If there isn't a small knot of bores waiting to pester me, there will be before I've got the door open. And it isn't funny, when a chap has a perfectly unjustified headache just because the night before he'd had a few extra whiskeys purely to oblige a celebrating mate whose bulky and flatulent wife had left him for a boss-eyed tripe-dresser. I felt nasty, so I ran upstairs and smacked the bedroom lights on. Greeneyes stirred and sat up and gave me a sunny smile, "I so enjoy the early-morning cups of tea you bring" she breathed.

"Well, there ain't any tea," I snapped. Her eyes opened wide, like a pair of emeralds set against a promising sky. "The boys have slid off fishing again," I said. "They want us to open the shop! And for some obscure reason I've got a headache this-morning!" And with that I ran down the stairs to make the tea, met her favourite dog on its way up, and kicked it down to the hall, where it landed on its chin which slid it along and into the front door. I felt better already.

"What was that noise?" called Greeneyes. "I didn't hear anything, dear!" I said.

Mrs Ruff

Sure enough, there was a gang of oddballs milling outside the shop.

"'Ere's Mr Billhook, kids, gettin' outa that banger!" cried the bulkiest of my adversaries as I opened the car door. "Now – where's that bloody player-thing?" It was Mrs. Ruff, the perpetually pregnant parasite with a foghorn voice and three thick lodgers who failed to reflect much light.

I tried to raise a false smile, but my face slipped to a lop-sided leer as I started to unlock the shop door. Her three assorted brats helped by kicking it open and rushing in first. One ran to the counter and laid into it with his boots whilst another stuffed yards of bubblegum into the mouth of a DVD recorder on display. And the third spun the battery rack so hard that its batteries shot about the shop like shells. I collected a pack of high velocity U2s on the shin as I wove and ducked my way behind the counter. Greeneyes, I noticed as I spun, was cleverly dawdling about the car, divorced from the drama.

With my shins safe from further assault, I drew up the pad of job cards and was patting about for my pen as Mrs. Ruff slammed her DVD player down onto my hand.

"Old Pukey bought me this 'un, Mr. Billhook," she grated. "Or was it that Sappy Squinter? No, I tell a lie! It was my 'usband!" I nodded, as though it mattered.

'Oh, e's dead, by the way!" she grinned, displaying a ramshackle happening of yellow, brown and black gravestones leaning around her gums.

I tried to look suitably sad. "Of course, I… er… don't really know your husband," I said. She looked thoughtful and pursed her rubber lips. "Nor do I" she said. "But mind, it 'en't 'im as is dead. It's this DVD."

Boyhood interests.

When I was a schoolboy there was no television and my indoor interests were mainly centred on sound. I still remember the thrill I got when I encountered, on the forecourt of the local second-hand shop, an HMV table cabinet gramophone. It was ancient *then*. "Please, how much?" I asked the one-eyed Mr. James. "Fifteen shillings!" he rasped. I nodded and drifted. Three days later I asked him again. He skewed his good eye towards me and shouted "Ten and six!" I smiled, and again slid off. About four days after that I wandered back to have another look. Out he darted and I asked him again.

He stopped, fixed me with his eye, breathed in, and cried "Five and Sixpence!" It was well worth that, I

thought – but I didn't have five and six, so I skipped off to look for some conkers. The weekend came and went, and on the Tuesday I wandered there again. Presently he came out and sloped over, and as I breathed in to speak, he put his fingers over my lips. "No more! Give me Half a Crown for the gramophone and all these records!" he screamed, indicating a pile of Bing Crosby records on a nearby table. I had half-a crown!

But my people weren't that keen on my gramophone, and insisted that I kept it in my bedroom at the top of the house. But the volume from its giant horn was too much for the room. I tried stuffing rags down the horn, but this made the sound tinny, and one hot afternoon I half-pointed its horn through my open window. Not only did it reduce the volume in my room, but I felt I was doing our neighbours a great favour by letting them share in the magic of 'Where the blue of the night', and 'Dancing in the dark', with 'Stardust' as a special treat.

Trouble

Whilst it played away, I sat beside it with my eyes closed in ecstasy. None of my school chums had a gramophone, I mused. Poor devils! Occasionally I looked out of the window, past the horn, but was disappointed to see there was nobody about – except a miserable old fool jumping about with his fingers in his ears. Troubled with some sort of insect phobia, I concluded, as I pushed the horn right through the open window and pointed it up the street.

Suddenly I spotted a distant figure on a bike, energetically peddling towards our house. He was wearing a trilby, as our father did, and every now and again he lifted it and waved it heartily at someone whom I couldn't see. He seemed a friendly man.

He was travelling at a terrific speed, and as he neared the house I saw that it was our father. And he was waving at me! I smiled and waved back. I hadn't realised that he was a Crosby fan!

He rode his bicycle straight over the kerb and through our open front gate, jumped off it whilst it was still speeding, and ran into the house, crouching and snatching at his bicycle clips and shouting for our mother. His bicycle crashed noisily and I felt surprised at his carelessness, for he usually stowed it most carefully in the shed.

"Florrie!" I heard him call, "Florrie! Can't you hear that terrible noise?" I stopped the gramophone and listened. "That bloody ass has been playing that damned big horn all over the City for nearly an hour!" he cried. "We could hear it at work – the fellahs wondered what the devil it was!"

He ran up the stairs and through my door and gave me a serious look. "You know you're mental, don't you?" he rasped. "You know you're not quite the ticket! It's a wonder the police aren't here. I've got a good mind to call 'em myself"

When I crept down a bit later he was earnestly talking to our mother.

"Florrie, that boy needs to be looked at! I never thought that a son of mine would be such an idiot. There must be a bit of your father in him." She reared up at that, and as the row developed I crept to the yard to look at my maggots – the ones I was breeding for fishing bait.

Heath Robinson inventions

My interests soon graduated to wireless sets and suchlike. After making crystal sets in matchboxes (which I sold at school) I progressed to valve sets, first a single-valve one, later to some that used three and four. If I had a pick-up, I mused, I could play my records through them – and control the volume.

Before long I knocked up a moving-iron Heath Robinson pick-up with a single-valve preamplifier, and its output, played into a twelve inch speaker in a 'dead' cabinet I'd made (thanks to its layers of egg boxes) it sounded better.

Meanwhile, I studied the track characteristics of my old records, and found that whilst some tracks 'wiggled' their ways around the disc in their diminishing circles, others seemed to have un-modulated grooves. There were, of course, two different methods of cutting the sound vibrations into their grooves. In one, they wiggled the stylus from side to side, and in the other they 'punched' it vertically into the track. They were called the 'lateral' and 'hill-and-dale' methods. When I dared to see if I could cut a home-made record, I tried the lateral way.

I secured a short length of threaded rod, cranked one end to form a primitive 'handle', and mounted it centrally across my gramophone's turntable. Onto this I mounted my knocked-up cutting head and found that I could move my stylus across the turntable by slowly rotating the cranked handle.

I had already found a shallow tin lid to suit the size of my proposed 'master' disc. All I needed now, I mused, was a supply of fairly hard wax to melt into it. At that point my father came in with some newly bought materials for his latest batch of shoe repairs; including half a dozen sticks of black and brown cobblers' wax which he placed on the table.

Whilst he busied himself outside, I borrowed his wax sticks and melted them into my tin lid. It set quickly and I soon had my disc on the turntable. I wound my stylus cutter to its edge, switched on my amplifiers, and called our mother and father to talk near the microphone whilst I wound the stylus across the wax.

'What is it now, you fool?' he intoned as they came through my door. 'What have you invented now, a hot-air balloon to take you to the moon?'

"Harry!" said my mother.

'Just speak into this microphone!' I instructed, pointing to a bird's-nest of wires and bits that hung from a string across the ceiling.

"Microphone?" he echoed. He curled his face and looked towards our mother. I watched his lips, ready to wind my stylus across the disc as he spoke.

"Well, Florrie, I've come across some idiots, but never one like him!" he said. "Look at this mess dangling from the ceiling! Look at the state of this bedroom! You can't tell me he's sane! And another thing – I've spotted an open tin of rotten fish on the privy window-sill, up the back. It's absolutely swarming with blow-flies – some nearly as big as bullets! The idiot says he's breeding maggots or something! That's what that terrible smell is! Mrs Hall's complained all the time about the stench. She's going to get the Public Health in to check the drains!"

Unfortunately, his words weren't to live for ever, alongside Thomas Edison's more restrained 'Mary had a little lamb', for a thought suddenly struck him. He ran off, found that his sticks of wax had gone, sniffed at the waxy air, feared that he'd just been talking to them, and rushed back in to examine my disc.

"Florrie!" he cried. "Every stick's gone! And look at this! My wax! The crazy ass has mixed the black and the brown! It looks like some of your mother's burnt gravy! I shan't be able to finish Dr. Duggan's brogues for the morning!" And as he rubbed his sleeve across his moistening brow he let the record slip to smash onto the floor.

Eventually he straightened up, looked at me darkly, and adjusted himself.

"You mark my words!" he said. "You'll either end up in the loony-bin, or on the scaffold! You don't care *what* you do as long as you get what you want! You're never right in the napper, my lad! You need looking at!

My efforts at disc recording were almost at a close. I eventually managed a few snatches of syllables buried in the noises of Niagara Falls, then other magical things caught me. For one thing I discovered magnetic wire recording. I'd *have* to have a go at that!

To contact Donald Bullock please email enquiries@wheatleypress.com

Solution to Test Case 533

This is the solution to test case 533 detailed on page 12

Real Technician should have been more thorough at the outset instead of cavorting about like a bull in a china shop! Had he studied the manual he would have seen that this set does not use the traditional 'voltage doubler' circuit to generate a high voltage for the field retrace stroke. Instead there's a 'flyback voltage' of +60V applied to IC pin 3, while the main operating power comes from plus and minus 11V supplies at chip pins 2 and 4 respectively. This balanced feed arrangement permits direct coupling (here at output pin 5) of the vertical deflection coils, the bottom end of which are virtually grounded.

There was nothing wrong with the 60V supply, ironically enough, but the other feeds were awry: the –11V line sat at –15V with a parabolic ripple superimposed, while the +11V line was down to +5V, again with a parabolic ripple riding on it. The culprit turned out to be fusible feed resistor R614 in the +11V line, billed in the manual as 0·47R. Actually fitted in the set (likewise –11V counterpart R611) was 1·5R, which had gone up to 42R. Fitting the correct 1·5R type restored a linear field scan, and refitting the original memory chip saved a lot of setting up: there are 143 settings and masses of option bytes here. Phew! Real Technician has learned a few lessons from this. Maybe you too?

TV model: Hitachi C28WF560N

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WANTED!

Can anyone supply me with a Panasonic Euro-8 Technical Guide? I've problems with a TX28DT30 IDTV. It forgets stations over 88. Teletext on 100 and analogue stations can be tuned in but are not stored. I suspect the X/V board as a software upgrade through the CI slot doesn't work. Any suggestions would also be welcomed.
Paul Hardy, Oxfordshire. T: 01844 354878

Long-distance television

by Keith Hamer & Garry Smith

January is usually noted for its intense Meteor-Shower event, the Quadrantids, peaking during the first few days of the month. This year it was amazingly quiet with only the odd 'burst' of a picture in Band I. Sporadic-E made up for it though, with several relatively intense openings around the middle of the month, the best occurring on the 15th.

Reception round-up

Sporadic-E activity commenced shortly after midday on January 13th, with Paul Farley in Newhaven identifying TVE-1 (Spain) on E2, followed by the Italian private station Tizianasat (TLA) on Channel A at 1228 UTC with adverts and a spinning logo.

The 15th was active for a large part of the day commencing with Moldova R2 in the morning, then Ukraine R2, Croatia E4, Italy A and unidentified R1 signals until late afternoon. Tom Crane in Hawkwell has presented a puzzle: Portugal was identified by its logo on E4, a supposedly defunct channel since the 35W Valenca do Douro relay transferred to UHF last May. The only other E4 station ever listed was Cume (Azores) with 180W ERP. This is quite a shot in the dark but at present there are no explanations as to Tom's reception.

The 16th was also a favourable day with all the Norwegian Band I channels active during the morning, according to reports. Andrew Jackson in Birkenhead viewed the Icelandic RUV PM5544 test card on E4, which was steady for almost an hour from 1100. The test card was received again late on the 17th but at a much weaker level. France (Canal Plus) L3 and Hungary (RTL KLUB) R2 were identified on the 21st.

On the 27th, Paul Farley discovered that the 11-metre band had been open towards France and Austria from lunchtime via Sporadic-E. Then at around 1600, Band I became active with colour and audio from Italy (RAI UNO) on Channel B before fade-out at around 1700. RTP-1 Portugal on E2 was also logged. Numerous RAI UNO carriers on Channels A and B in addition to the unstable Italian private carrier just below E2 were heard on a scanner.

While speaking to a Spanish amateur on January 27th, Paul discovered that there is still no firm news regarding the closure of the Madrid E2 outlet with suggestions that it may remain on-air until final analogue switch-off occurs, whenever that is. At least we may have a true traditional DX signal to look forward to during the next Sporadic-E season!

Tropospheric reception

On the 26th at 1635, John Langley (Eastbourne) discovered a French multiplex on Channel D36 which included W9, NTI, Paris Premiere, TF6, AB1 and an unknown programme, the 3rd, 4th and 5th programmes being encrypted. W9 was breaking up but seemed to air a programme for children.

On the 27th in Birkenhead, Andrew Jackson heard several French and German FM stations including one from the Hornisgrinde outlet. Band III was also active with Canal Plus (France) on Channel L5 from Lille and also ARD (Germany) on E9. This latter signal is a mystery as all the German E9 stations were set to close in November and December 2007.

John Langley also saw ARD on E9 in colour with a film about a dog at 0925 on the 28th. A German digital multiplex on D37 also carried the film. The multiplex originated from the 'HR Fernsehen' region but John wonders what the actual transmitter was. John comments that digital DX-ing is rather challenging and requires a lot of patience, something we will have to get used to!

TEP display

TEP (Trans-Equatorial Propagation) in Northern India was active for most of January with its characteristic smeary images from Thailand E2 and Vietnam R1 on most afternoons with reception sometimes lasting three hours. The R1 transmissions were using the American 525-line 60Hz standard which is unusual for this channel allocation. Rana Roy also discovered R1 signals from the west or north-west with one analogue clock showing a time difference of three and a half hours, probably from an outlet in Central Europe. China on Channel R1/C1 was identified on one occasion.

DX newsdesk

Norway: Band III transmitters in the south-west coastal region of the country are set to close during March and April as the digital switchover progresses. Band III casualties

Fig. 1

The German digital MDR multiplex received by Peter Barclay in Sunderland

Fig. 2

TV-3 Bangkok, received in Northern India by Rana Roy via TEP at 1820 local time, on October 20th, 1990

Fig. 3

Unidentified TEP reception at 1350 local time, on September 9th, 1988

Fig. 4

The BFBS clock received in the UK from a German transmitter

include Bjerkreim E6, Bokn E8 and Halden E11. UHF transmitters in the region will also be affected.

Germany: BFBS (British Forces Broadcasting Service) are all set to switch to digital with the possibility of an encrypted service. AFN (American Forces Network) currently have no immediate plans to end their analogue broadcasts.

Feedback!

Please send news, comments and any off-screen DX-TV photographs, particularly any unusual test cards and captions, to:
Garry Smith, 17 Collingham Gardens, Derby DE22 4FS.
Our E-mail address is: **Television@dx-tv.fsnet.co.uk**

If you are interested in archive TV, test cards and identification captions, check out our website at **www.test-cards.fsnet.co.uk** via the Internet.

Fig. 5

Typical American 'Colour Bar' test pattern from a German AFN-TV outlet

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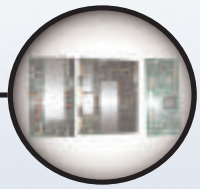

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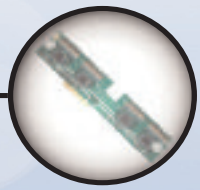

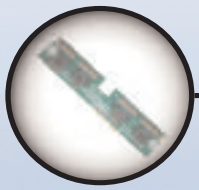

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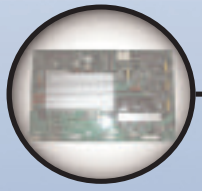

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AI-0068	INV0.015R	£32.50
AI-0093	INV06.016R	£35.00
AI-0095	INV06.017R	£27.00
AI-0097	INV06.018R	£27.00
AIP-0108	INV06.019R	£27.00
AIP-0108	INV06.020R	£21.00
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AIVP.0006	INV06.026R	£40.00
AIVP-0001A	INV06.022R	£33.00
AIVP-0003	INV06.024R	£33.00
AIVP-0003 A	INV06.025R	£33.00
AIVP-0009	INV06.027R	£40.00
AIVP-0017	INV06.028	£40.00
AIVP-0017	INV06.028R	£40.00
AIVP-0017	INV06.029R	£40.00
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AIVP-0026A	INV06.031R	£48.00
AIVP-0032	INV06.032R	£40.00
AIVP-0035	INV06.033R	£75.00
DAC-12M018B1F	INV03.001R	£62.00

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DAC-12M019A0F	INV03.002R	£66.00
DAC-12M019C0F	INV03.003R	£66.00
LI.2206	INV06.006R	£18.00
LI-1045	INV06.001R	£14.00
LI-1047	INV06.002R	£14.00
LI-1048	INV06.003R	£14.00
LI-2165	INV06.004R	£12.00
LI-2205	INV06.005R	£18.00
LI-4018	INV06.007R	£16.00
LIV-1050	INV06.008R	£12.00
LIV-2209	INV06.009R	£12.00
LIVP-6009	INV06.010R	£30.00
LIVP-6010	INV06.011R	£30.00
QF131V1.00	INV04.006R	£44.00
V0.21148.101	INV01.045R	£16.00
V0.88070.001	INV01.011R	£82.50
V0.88070.101	INV01.012R	£82.50
V0.89144.001	INV01.046R	£87.00
V0.89144.102	INV01.001R	£74.00
V0.89144.103	INV01.015R	£87.00
V0.89144.303	INV01.007R	£87.00
V0.89144.401	INV01.004R	£82.50
V0.89144.402	INV01.016R	£82.50
V0.89144.601	INV01.018R	£82.50
V0.89144.602	INV01.005R	£82.50
V0.89144.603	INV01.006R	£82.50
V0.89144.C02	INV01.009R	£87.00
V0.89144.C06	INV01.008R	£87.00
VIT70002.50	INV05.007R	£70.00
VIT70002.51	INV05.008R	£73.00
VIT70002.51	INV05.009R	£55.00
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VIT71008.90	INV05.001R	£57.00
VIT71008.91	INV05.002R	£59.00
VIT71008.92	INV05.003R	£57.00
VIT71008.92	INV05.004R	£80.00
VIT71010.53	INV05.005R	£84.00
VIT71010.53	INV05.006R	£75.00
VK.21148.101	INV01.002R	£16.00

Part Number	Code	Price
VK.88070.101	INV01.041R	£82.50
VK.88070.102	INV01.042R	£82.50
VK.88070.702	INV01.039R	£65.00
VK.88070.703	INV01.040R	£65.00
VK.88070.901	INV01.003R	£65.00
VK.88070.S01	INV01.031R	£92.00
VK.88070.S02	INV01.032R	£92.00
VK.89144.103	INV01.044R	£87.00
VK.89144.701	INV01.022R	£87.00
VK.89144.A01	INV01.019R	£82.50
VK.89144.C03	INV01.010R	£87.00
VK.89144.E01	INV01.020R	£82.50
VK.89144.H02	INV01.026R	£87.00
VK.89144.H03	INV01.029R	£87.00
VK.89144.H05	INV01.027R	£87.00
VK.89144.H05	INV01.028R	£87.00
VK.89211.001	INV01.030R	£87.00
VK.8A183.001	INV01.037R	£100.00
VK.8A183.041	INV01.033R	£92.00
VK.8A183.081	INV01.038R	£100.00
VK.8A183.F01	INV01.034R	£92.00
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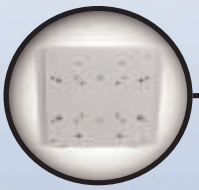
Plasma and LCD Wall Brackets



Simply fit one piece to the wall and other to the LCD and then simply slide the two pieces together
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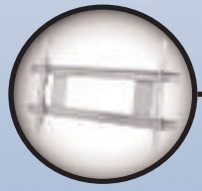

This plasma bracket can be used with most plasma and LCD televisions, due to its universal mounting possibilities
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5 m	HDMI4/Q	£20.00 + vat	£15.00 +vat
10 m	HDMI6/Q	£30.00 + vat	£20.00 +vat
15 m	HDMI7/Q	£50.00 + vat	£30.00 +vat
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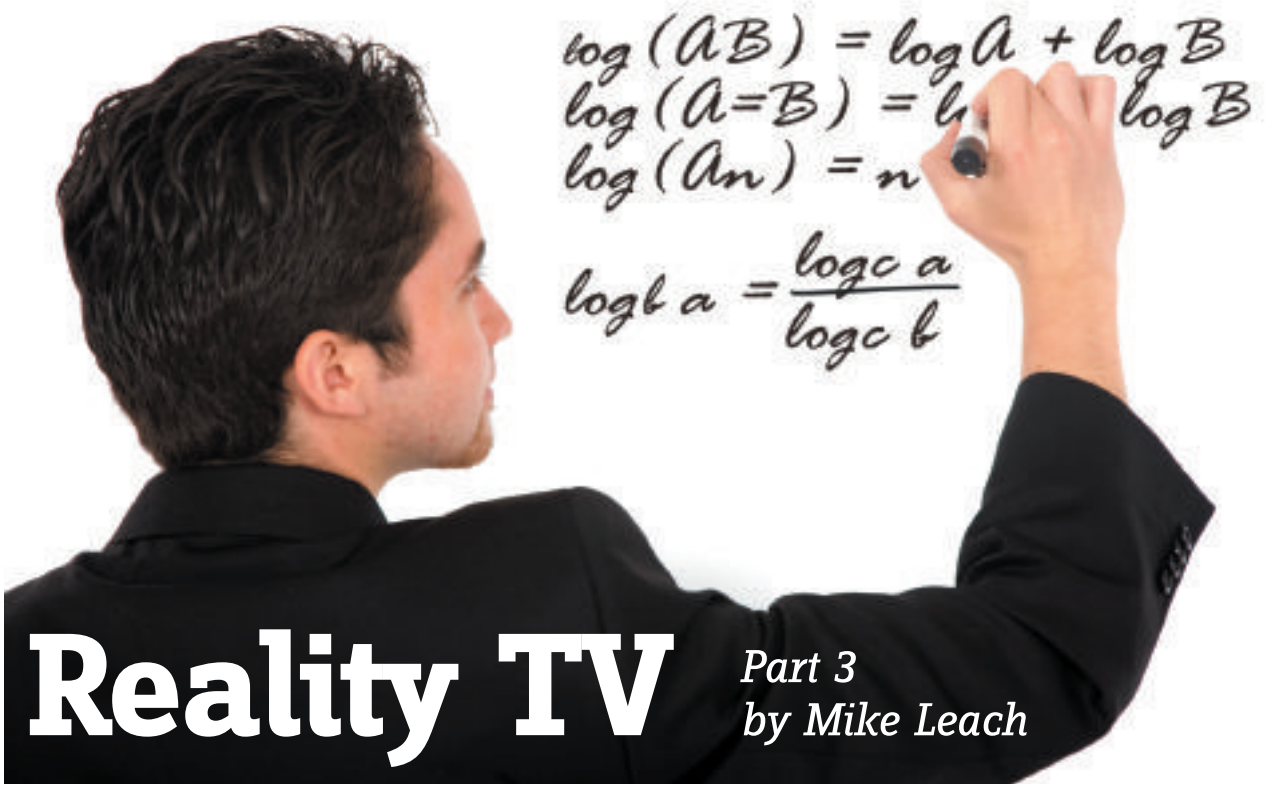


Reality TV

Part 3
by Mike Leach

In my last article I mentioned the increase in the cost of a TV set with the advent of Plasma and LCD. Sets had been getting cheaper and cheaper and all of a sudden we saw light at the end of the tunnel in terms of repair costs. With new sets costing in the region of £2000 it was more than conceivable that repair costs would escalate and engineers could once again afford butter on their toast in the mornings as opposed to axle grease! Well I should have known better. You only have to look back to see what happened in the past to realise that service charges would never hold up. It's fair to say that my understanding of algebraic formula was never top of the class at school, it was more akin to lower "C stream" but even I could work out with simple mathematics which way things were going to go.

Affordability

Back in the late sixties a new larger screen colour TV would cost something in the region of £300 plus. The van that delivered it (if it was a new one) was priced in the region of £500. Therefore the TV was approximately three fifths the value of the van. But what was the average wage in those days? Well I was still a youngster at school but if my memory isn't completely shot I would say the "average" wage was in the region of £30 - £35 per week. This would make the value of the colour set about eight times the value of the average weekly wage. In fairness, most people still had black and white in those days – colour TV was for the rich. People on slightly higher earnings would rent.

Come 2008 and according to reports we hear on political programmes, the average salary is now in the region of £23,000 or in weekly terms, £442. You can buy a decent size flat panel screen from the supermarket for less than that. So we started with a colour TV costing over eight times the average weekly wage and ending up with a situation where we can buy a new TV out of a weeks' wages and still have fifty quid in our pockets to buy a new freeview box and a DVD player to go with it!

But what happened to that van I mentioned? You know, the one that delivered our first colour set in 1968. Well the actual van is probably being advertised on an internet auction site for about £2000, but a new van today (not a big one) would be in the region of £10,000 plus!

So the van that delivers your new set today is now 20 times more expensive than it was in 1968 and your TV is basically the same price but not the same value, due to the wage increase from £30 a week to £400.

The Boom!

Most of us can remember the colour sales boom of the 1970's. This was also the time when you could make a few bob out of servicing. The TV was still relatively expensive and so servicing costs followed suit.

However, it was also a rental boom with the national rental companies fighting over every customer but generally, engineers earned more working for these companies than for small retailers.

By the mid to late seventies wages had shot up. In 1978 the company I worked for, the long gone British Relay, it paid good wages to its top

engineers – around the £75 per week mark. If you were giving a bill to a customer for around £25 to replace a tripler you were doing well and the customer knew they would have to pay it. A new set would cost them a few bob more!

And what of today: what happens when we attempt to quote relative prices today? Well, at a quote of £50 they say "how much?", at £80 they seek permission from their other half and say "can we get back to you?" and anything over £100 and they huff and puff incoherently!

Sometimes you feel like bellowing back down the phone to them and say: "But my bloody van cost ten grand!"

The thing is, with the spares that are available from manufacturers these days, we have to quote relatively high numbers. The cost of replacement boards for Plasma and LCD TV's is huge in comparison to the cost of a new set. Some manufactrurers are charging up to £300 for a replacement Y sustain or X sustain board. Whilst this is not unreasonable when you consider the technology that has gone into it, customers just don't expect high charges for TV repair.

I think one of the major factors for the low price of TV is market saturation. Just about every home in the land has a TV and a large majority of those also have TV recording equipment of some sort.

When only one per cent of the population has something it's relatively easy to sell to the ninety nine per cent who haven't. When the ninety nine per cent have got it, it's damned hard work to sell to the one per cent who haven't, so you have to be competitive to keep re-selling to the majority. That's when prices plummet and service costs follow suit.

The "AAA" Brigade

What's the AAA brigade I hear you ask. Well these are the advertisements placed in local free press for TV repair. The capital "A" at the beginning of the ad places them at the top of the pile so as customers read their ad first. They usually advertise free estimates and no call out charge and often have a tendency to pick and choose the jobs they take on. And I'm sure we've all been to customers who have experience of these traders. "Oh yes, he came round and said he needed a part and would come back the next day – that was six weeks ago!"

Whilst it's only a few engineers who adopt this servicing policy, it doesn't help the rest of us who have to clear up after them. They give the impression that service is cheap for someone with thirty years' experience in the trade. In our own little world of reality, free call out and free estimates are a thing of the past. In fact things have completely changed. At one time you had to call out for nothing and estimate for free to get the work. If you charged for these services you were often considered to be a rogue and on the make. Now it's the other way round. A lot of (not all!) the rogues and the "AAA" brigades adopt this free for all policy and the competent outfits who want to earn an honest living and can capably handle the work make reasonable charges for what they do.

An inspection charge of £20 is not an unreasonable amount to do an estimate. If the customer says yes to the estimate then the £20 forms part of the total bill. If they don't accept it then you have been paid for your time working on behalf of your customer. Nearly all the customers I've dealt with accept this. The few who don't are probably the types that would never pick the set up when it was repaired anyway! And again, if you are called out, then a £20 call out charge is not asking the earth to help cover the cost of a van worth ten grand!

Getting the best value for yourself

Just quoting a total price for a repair is not always the best way of getting maximum value for yourself. I always separate the quote and the final bill into it's component values i.e. call out; parts; labour and of course VAT where applicable. When the customer then sees that your labour charge is only half of the total quote they are probably more inclined to accept the estimate and give you the go ahead. If you just quote them a round figure of say £100 they tend to think this is excessive. If you say £20 for call out; £30 for parts; £35 for labour with the rest being VAT they may just give the job more consideration.

We've come a long way since the £25 a job for a new tripler and driving Mini Clubmans to get us about – or even a good old Morris Minor van. What sturdy workhorses they were! Whatever we say, we are stuck with the never ending falling price of TV's and what we can charge when we are able to repair them. I'm approaching the end of this small series of articles looking at our trade, but next time I'm going to take a look at field service and see if I can find a way of earning us all lots of money!

Just one thing before I sign off for this month. Does anybody remember cans of Watneys Party Seven? If only beer was the same price now as it was in 1968! Cheers for now.

AV coupling

Digital coupling systems now provide best-possible pictures. Eugene Trundle examines HDMI and its analogue predecessors

We've come a long way in AV connectivity in the thirty-five years since home video recorders appeared. In the 1970s most TV chassis were 'live', with direct connections between the mains and the chassis.

AEI's in-line wireless sender

RF connections

A live-chassis TV's only signal input port was its UHF aerial socket, isolated by high-impedance R and C components. Thus VCRs and other AV-source boxes were necessarily provided with an RF modulator; its output, generally near UHF channel 36, had to be tuned in on one of the TV's programme selector buttons. As TV design progressed, switch-mode power convertors made it possible to isolate the TV chassis and to connect AV signals directly.

The RF system has the advantages of universal compatibility and simple hook-up. It can be subject to interference and mistuning, however, and is unable to convey playback stereo sound. *Broadcast* TV stereo was introduced to the UK in 1988 with the Nicam system. Even when direct (baseband) coupling systems became available their take-up was relatively slow; still the RF coupling system is popular, especially for home distribution systems. Provision of internal RF modulators was discontinued with the advent of DVD players.

Home networks

As stereo sound, higher quality pictures and large TV screens became common the shortcomings of RF coupling were increasingly obvious, and for home distribution systems something better appeared: video over CAT5.

This wired system (CAT5 is Category 5, a type of cable used for data links between computers) uses four twisted-pair conductors to convey – between special send and receive modules – stereo sound and video signals, the latter in the guises of composite/PAL; S-video; a form of RGB; and component video, listed here in ascending order of picture quality.

This form of networking is not limited to point-to-point coupling: vision and sound, the latter in digital form if required, can be looped in and out of the system at any point, using Scart-terminated send and receive nodes. These take the form of slave modules powered from the master/sender unit.

The system can be configured for any form of video by switches on each unit, and offers good sound and vision quality, but at relatively high cost.

Cordless AV links

An alternative way of distributing analogue video to other TV sets about the house is the use of a video sender. These Scart-terminated jobs operate in the 2·4GHz band, and can convey PAL pictures and stereo sound over a range of 10m or so, though problems may arise with some forms of building construction. Infra-red loopback is provided with most video senders so that a satellite tuner or DVD player, for instance, can be controlled from another room. The send and receive units became progressively smaller, and to aid connectivity and convenience one type was made to go 'in series' with an existing Scart plug. In a typical household a single sender might be used with several identical receivers, one for each remote TV set.

Wireless high-definition AV link systems are not yet established in the UK – the large bandwidth needed even for compressed data makes them difficult to produce at mass-market prices. At present there are two competing technologies:

UWB (UltraWideBand) in its various guises; and Wireless HD (WiHD) developed by LG, NEC, Panasonic, Samsung, Sony and Toshiba. The way has been opened for such devices by Ofcom's release last year of spectrum space for fast wideband transmissions of the sort required to provide a wireless substitute for an HDMI connecting cable. HD wireless systems are available from Philips in the USA. The problems to be overcome in the European market are cost, the reliable provision of the HDMI handshake, and universal compatibility between different makes of equipment.

Scart link

The Scart AV coupling system is universally used in Europe whence it sprang. It's a very versatile one, with the ability to carry composite/PAL, RGB and S-video signals, along with baseband analogue stereo sound. With analogue video signals the build quality of the cable is very important: unscreened conductors permit crosstalk between them so that, for instance, an image of the TV's Scart *output* signal (e.g. from its tuner) can be seen to float on top of the incoming picture in the form of colour blobs, black bars or a superimposed 'transparency'. The presence of common ground paths in cheap cables aggravates this crosstalk effect, which also introduces vision buzz on sound, especially noticeable at high volume settings. Inter-conductor capacitance can also reduce definition, especially in long cables.

Modern TV designs can automatically recognise the type of signals being received from a Scart source, and switch accordingly; some of them display this status on screen. Older models required programming for the type of signal in use, perhaps at both ends of the link. An example of this is a standard Sky receiver box and a middle-aged CRT-type receiver, where the viewer may be getting inferior PAL-encoded pictures for the want of a fully-wired Scart cable and/or a few keystrokes in an installation menu. The best Scart cables are fully wired with each signal conductor individually screened, and have gold-plated blades and skirt for low contact impedance and resistance to tarnishing. The multiplicity of screened conductors makes the cable rather thick and heavy, sometimes leading to problems with retention and support, exacerbated by some TV manufacturers' inadequate physical support for PCB-mounted sockets. The result can be dry soldered joints and intermittent contact.

Versatility for analogue coupling: Scart

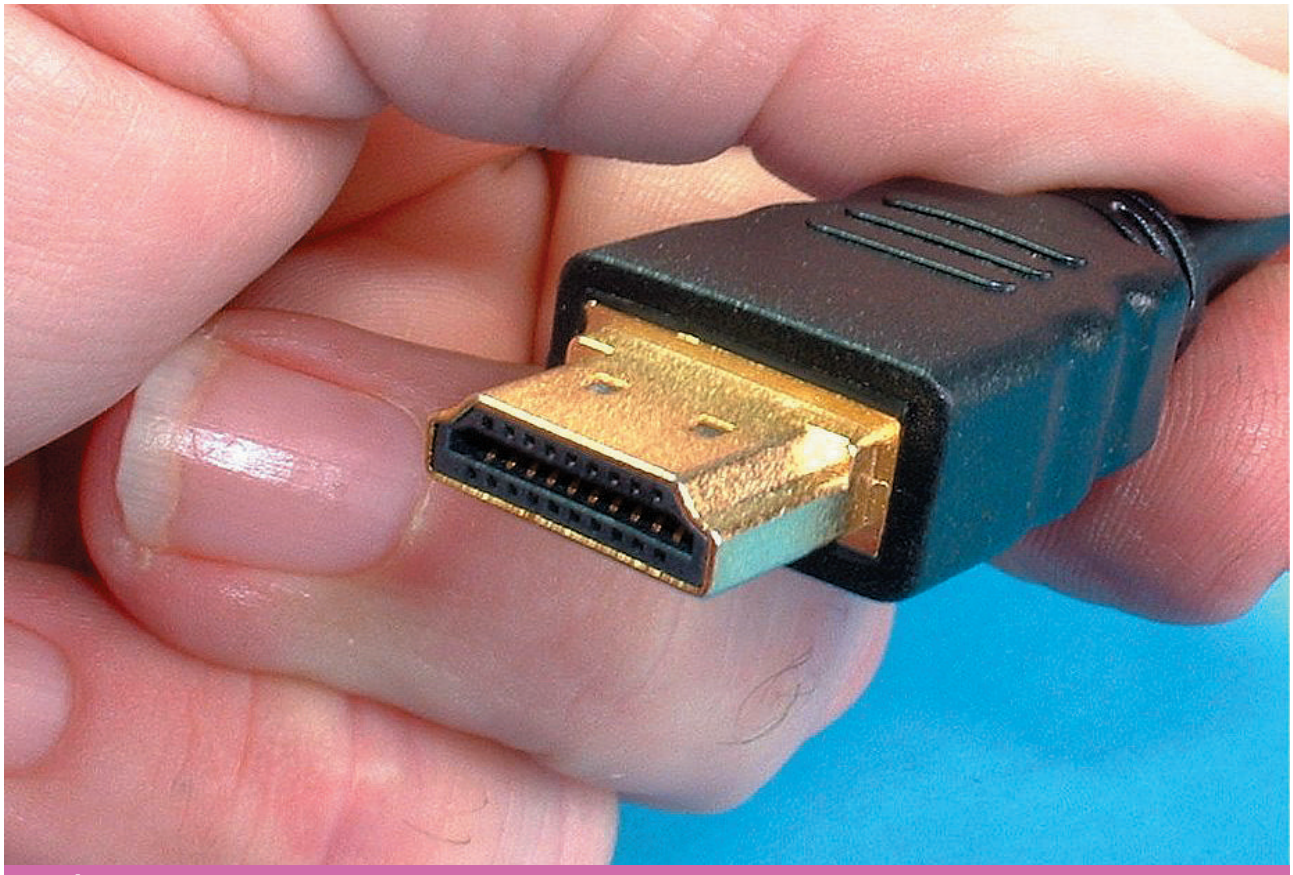
Scart cables do not carry high definition TV signals; their best possible use with thin-screen panels is with RGB mode. Indeed apart from computer links the only analogue coupling system amenable to high-def uses *component* video (Y, PB/CB, PR/CR) signals carried in three phono-plugged cables. An excellent aspect of Scart operation (with which HDMI has only just caught up!) is its ability to carry signal-switching flags on plug pin 8: when that goes to 10V it switches a digibox to loopthrough and a TV to AV mode; and when it goes to 6V it can switch a TV to wide-aspect scanning.

Digital connectors

As long as the display device is a cathode ray tube there is no need for digital couplings, even with digital transmissions because the CRT requires an analogue feed, identical (but bigger!) to that conveyed by an RGB signal-cable feed. With thin screens, however, the signal-processing, scaling and display electronics are all digital in operation, and where the signal starts off in digital form (digibox, DVD player etc.) its conversion to analogue form – just for a one-metre journey to the TV screen – and then back to analogue introduces losses and artefacts, especially on fast-moving pictures. Digital coupling, then, has huge advantages for HDTV.

DVI

The first 'domestic' digital video coupler was DVI, Digital Video Interface, originally introduced to link high-spec computers to LCD monitors. It cannot carry audio, but



Digital master connector HDMI

does have the ability, in DVI-I form, to carry analogue (RGB) and digital video. The data in DVI is carried by Transition Minimised Differential Signalling, *TMDS*, in three conductor pairs, TMDS 1, 2 and 3, along with a synchronising clock pulse train. Other lines are provided for housekeeping purposes: power, display data bus (SCL/SDA), control etc. The same pulse trains and protocols are used in DVI's successor for home entertainment use, HDMI, High Definition Multimedia Interface: simple passive adaptors are available to connect these two systems together. DVI is now being phased out in entertainment equipment.

Enter HDMI

HDMI is primarily about content security and anti-pirating rather than high definition picture display! It has the HDCP (High-bandwidth Digital Content Protection) copyright protection feature, involving an electronic 'handshake' between send and receive equipment. This establishes that both boxes are HDCP compliant and then sets up an encryption key for use in scrambling the data passing over the link between them. HDMI can handle picture formats up to 1920x1080p, along with multi-channel (surround) audio data at sampling rates up to 192kHz. At present the main sources of hi-def pictures via HDMI are Sky HD receiver boxes; high-definition disc players like Blu-ray and the now obsolescent HD-DVD format; and the TV games consoles Sony PlayStation 3 and Xbox 360, both of which can also play high definition video discs, the latter from an add-on deck accessory.

The HDMI plug and socket are small and sweet, and now there's a smaller one still, see above. The cables can be very expensive, and in view of the fact that digital TV decoding is virtually an all-or-nothing affair, some of the claims made for them in adverts and reviews can stretch credibility somewhat. High quality cables become relevant when a link more than ten metres long is required to pass a 1080p signal.

The HDMI system is now about five years old, and has undergone several revisions and updates. The current version v1.3 has provision for data rates up to 10.2Gb/s, offering higher definition and 'deep' (10-bit) colour; automatic lip-synchronisation; 'lossless' audio passage with Dolby TrueHD and DTS-HD formats; an alternative miniature plug/socket connector for (e.g.) camcorders; etc.

Digital reception using set-top aerials – part 1

by Keith Hamer and Garry Smith

The enforced changeover to digital will be the wake-up call for many viewers with dilapidated aerial installations. Unfortunately, once they have been dragged kicking and screaming into the hi-tech digital age, there will be new problems lurking in the wings.

Shortcomings

Freeview is not without its shortcomings. Picture quality is noticeably inferior when compared with a first-class analogue display, although most viewers seem prepared to accept anything on their screens so long as it moves and looks colourful. A saving on the bandwidth required for digital transmission means more channels, with picture quality taking its toll. Ongoing 'improvements' and tinkering with the transmission system means that some equipment will be virtually redundant by the time the whole switchover process is complete – somewhat a kick in the teeth for early converts to digital TV.

Even the 'improved' Teletext service on Channel 100 is not without its problems. With some set-top boxes, even relatively modern ones, the text cannot easily and reliably be accessed; more often than not, the menu topic 'loading' message is displayed indefinitely. The BBC and Sky text services are unaffected.

Set-top aerials

According to recent estimates, nearly 25% of television sets rely on set-top aerials to collect their signal. When digital switchover occurs, there could be trouble ahead as signal levels may be insufficient to provide an instant and painless transition from analogue to digital when the viewer connects the aerial to the set-top box.

Indoor aerial users

There are many reasons why so many viewers rely on the use of a set-top aerial. The main receiver is often supplied by a decent external aerial but the time spent viewing programmes in the kitchen or bedroom does not seem to justify the cost of additional outdoor receiving aerials. In many homes, a set-top array, or more commonly the set's own loop aerial, is used.

Fig. 1: An original ondigital box - the Philips DTX6370

Tackling the technical complexity of routing coaxial cables around the house from a distribution amplifier is beyond the capabilities of many people. Some have attempted to use multiple passive splitters and then created a disaster with degraded pictures affecting the main set. At this point they admit defeat and then turn to the easy set-top solution.

Bedroom sets, particularly those used by the children and teenagers, seem the prime contenders for a set-top aerial. The TV sets are frequently used for other pursuits such as playing videos and DVD's rather than tuning into the analogue broadcasts, so the need for a decent aerial might not be justified. Bedrooms are often rearranged so a portable aerial is often the easiest option. This category of viewer is possibly the most unlikely to express a need to convert to digital when analogue switch-off is forced upon their region.

Short-term property lettings such as flats, bed-sits and other rented accommodation are other likely candidates for relying on set-top aerials. Landlords usually consider the provision of multiple aerial outlet points and distribution amplifiers an unnecessary expense. It goes without saying that such dwellings are unlikely to have the luxury of a satellite dish or cable installation and when analogue switches off, the set-top aerial will be expected to cope.

Other situations where set-top aerials are often relied upon include homes in conservation areas and premises where outside aerials are banned due to local planning

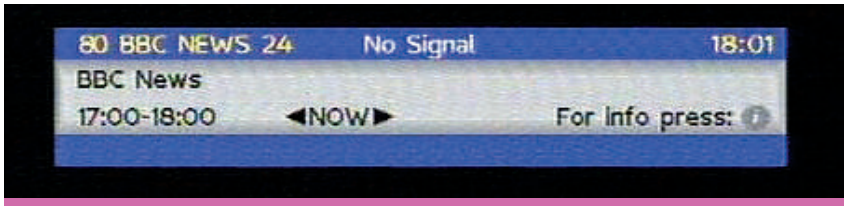


Fig. 2: Insufficient digital signal leaves the viewer with only the on-screen banner or a red dot on older receivers

restrictions and bye-laws. In some cases, loft aerials may be used but even these may prove inadequate for digital when changeover comes. Some of these properties are already located in marginal or difficult reception areas.

Homes located within a few kilometres of the transmitter often enjoy good reception using a set-top aerial but the ratio of digital and analogue levels at very close proximity to the site can be unpredictable and erratic due to phase reinforcement and cancellation effects of the signal which is radiated from stacked transmitting arrays. While the analogue reception may seem fine on the surface, some multiplexes may be too weak for reliable reception on both set-top and outdoor arrays and in the future, diversity techniques using two aerials may need to be employed to secure a reliable signal.

Signal levels

For snow-free analogue pictures, a level of around 60dBµV is the recommended minimum figure required. If this is available then the theoretical digital level should typically lie between 40 and 50dBµV, particularly if the digital and analogue signals share the same aerial group.

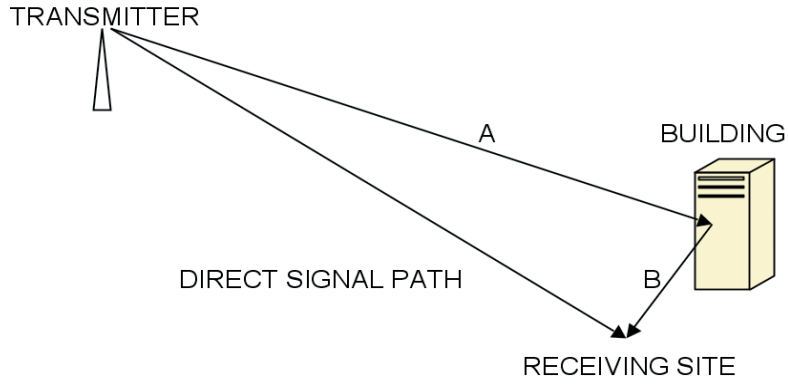
Sudden signal loss

With analogue, insufficient signal strength is characterised by snowy pictures. As the signal strength gradually reduces, the amount of picture graininess increases. Deterioration is gradual but, with digital, it is abrupt. Once the digital level falls below a certain figure (the 'digital cliff'), the picture suddenly begins to pixilate or break up, finally disappearing altogether. The sound also suffers a similar fate.

Signal variation

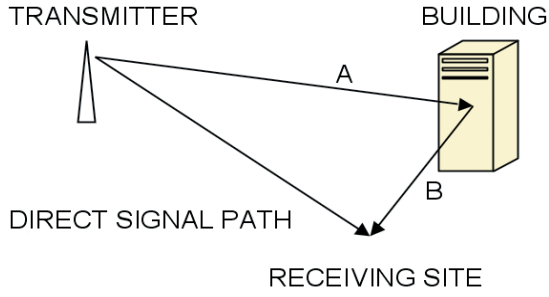
Experience has shown that signal levels do vary during the day which means that some channels may disappear when levels drop below a certain level. The recommended digital level has increased over the years from around 39 to 50dBµV in order to provide a comfortable safety margin. A poor carrier-to-noise ratio will also adversely affect the reliability of a digital display, but if the signal level is way below the minimum recommended level, there is little hope of securing reliable digital reception.

Fig. A: Receiving site far away from the transmitter.



The ratio of the signal path A + B compared to the direct signal path is smaller than that of Fig. B.

Fig. B: Receiving site close to the transmitter.



A + B = REFLECTED SIGNAL PATH

The larger reflected path ratio means that ghosting can be more troublesome at a receiving site closer to the transmitter.

Fig. 3: The Tevion STB715 is a comparatively recent 'budget' receiver with a 7-day EPG and the ability to load channels manually

Set-top box sensitivity will also play a part but this has always been the case with receivers in general, particularly in the early days of television where some manufacturers produced both basic and fringe models.

Reflections

As a rule of thumb, if the existing reception on a set-top aerial is good on all of its channels, then the reception of digital multiplexes from the same transmitter will probably be satisfactory too, particularly if they occupy the same group as the analogue channels.

A set-top aerial is generally frowned upon as it 'sees' a signal that has been attenuated while passing through the wall of a building. In addition, the signal is also reflected off the internal walls and furniture within the room which means ghosting or general muzziness of the analogue picture is usually unavoidable.

Fig. 4: A digital terrestrial television service was introduced in the United Kingdom in November 1998

The smaller the ratio of the reflection path compared with the direct one, the lower is its visual impact on the analogue picture. The strength of the reflection will also affect its visibility. Ghosting is often more problematic closer to the transmitter site where the ratio of the direct and reflected signal paths will be relatively large.

Depending on the phase relationship between the direct and reflected signals, an addition or subtraction process can take place resulting in the weakening of some channels while enhancing the level of others.

Wildly varying results due to the phase relationships are often experienced when re-positioning a set-top aerial within a relatively small area. This is why BBC-1 may be fine but ITV disappointing, with the need for some aerial maneuvering when changing channels. Where the window is facing the transmitter and the direct signal is received, a relatively clear signal may be obtained with the aerial located on the window ledge.

Fig. 5: A simple home-made loop aerial can produce surprisingly good results. This German test card from Südwestfunk was received in Derby during an autumn tropospheric lift way back in 1971

Digital reception is generally more tolerant of multi-path reflections but as cancellation and reinforcement caused by reflected signals is often very frequency-selective, this can have an adverse effect upon the shape of the multiplex which lies within a channel bandwidth approaching 8MHz. Depending upon the amount of distortion, severe picture break-up may be experienced or the set-top box may even refuse to load the affected multiplex.

There are some schools of thought that suggest an aerial with an omni-directional pick-up response may be more suitable to take advantage of signal reinforcement caused by reflected signals. Equally, of course, the reflections may reduce the signal level or cause cancellation. Unfortunately, aerials with an omni-directional pick-up response provide a low signal level output and will be of little use in marginal signal situations but their characteristics may have some value in high signal areas.

Next time we will look at the various types of set-top aerial designs which are currently available.

Satellite DX

by Roger Bunney

Perhaps the most dramatic 'event' during the January 2008 period was the landing of BA's 377 at Heathrow from Beijing on January 17th. The drama was clearly reported by Kevin Hewitt [Chatham] when at 12.42hrs the aircraft skipped the A30 and perimeter fence of Heathrow to land short of the runway on the grass, severely damaging the plane, fortunately all passengers and crew escaped virtually unharmed. The BBC sent out 2 satellite uplink trucks to provide live coverage into the BBC-1 news and BBC News 24. All downlinks were carried on Atlantic Bird-1 [AB-1] @ 12½° West and content, other than live report updates were pictures of the wreckage from differing angles. Kevin logged 'UKI-999 PATH 1' via Taridan Scopus @ 11.081GHz-Vertical [Symbol Rate 4224 + Forward Error Correction 7/8]. The 'UKI-999 PATH 2' circuit appears @ 11.092GHz-V. The other arrival at Heathrow was 'BBC UKI-777P1', another Taridan Scopus truck downlinking @ 11.087GHz-V [4224+7/8] over AB-1. MPEG-4:2:2 was used on all transmissions. Kevin incidentally uses a Triax 1.1m dish and 0.3dB quad LNB.

Meanwhile Sky News appeared on a site next to the busy A30 road, in fact staying put until late afternoon of the 19th; running 2 active downlinks. 'UKI 511-SKY NEWS' ['SKY NEWS DSNG'] transmitted in plain MPEG-2 @ 12.529GHz - Horizontal [2816+¾], this their 'PATH 2' feed. Meanwhile Sky also provided an MPEG 4:2:2 circuit @ 12.525GHz-H [2816+¾], identifying as 'UKI_511_Coder 1'. The Sky News unit provided site pictures injected live into Sky News up to the 2200hrs bulletin, night-time images showing the wreckage, the 2 supporting cranes and investigative work around the base of the stricken aircraft. Sky used Eutelsat W2 @ 16° East for their satellite hook-ups back into nearby Sky HQ at Isleworth.

The BA 038 flight ex Beijing ends in disaster at Heathrow [W1]

Live pictures were 'punched up' on the European distribution slot of APTN – UP4 – on Eutelsat W1 @ 10.974GHz-V [4167+5/6], evening of January 26th. A large skyscraper building – the Monte Carlo Hotel – was on fire across its upper stories in central Las Vegas, Nevada. The height of some 30 stories created difficulties for fighters who had to make their way through the building itself to access the roof, the fire was limited mainly to external cladding and once the few hoses available came into play the fire was rapidly extinguished.

An occasional check on IS-12 @ 45° east can prove useful as increased broadcast TV channels have spawned within the Russian multiplex at 12.553GHz-V the original details were in last month's column. The decidedly East European biased content has added 'RUSKY EXTRA'; STN Promo' and 'STN LJUBLJANA' – for more info try – www.stn,sl [Slovenia]. The same day [12th Jan] was an important day for political meetings at Government House, Pretoria, South Africa with 'GCA SNG-LF1' appearing @ 12.527GHz-V [6111+5/6] carrying several live reports from the pavements outside for both African and European TV channels. GCA = Globecast Africa.

A major London fire broke out in the roof of the Royal Marsden Hospital on January 2nd just after lunchtime. This is a famous cancer hospital and on the outbreak of fire a textbook evacuation of patients, some undergoing operations took place with all being cleared without injury. Live pictures were linked through Eutelsat W2, 16° west – 12.535GHz-H [5632+¾], the service identification 'SERVICE NAME'.

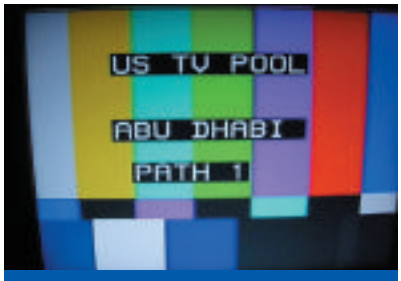
Fire chief updates the press at the Royal Marsden Hospital, London [W2]

Intelsat 801 @ 31½° west has for a very long time been in a state of slumber but suddenly she's been woken and is extremely busy with downlinking several programme multiplxes. Though content of the newly arrived mpx changes with time, mid January the status was as follows :- 11.497GHz-V [7499+5/6] ~ 4 channels all in the clear; 11.508GHz-V [27500+¾] ~ this 'One TV' mpx has 12 channels most with Nagra encryption; 11.620GHz-V

[27500+5/6], the target area suggests the Balkans, it's Nagra encrypted.

On the World's stage there has been the build up to the US presidential elections in February. Whilst electioneering continues on mainland US, President Bush has been on a Middle Eastern tour, touching down daily in different countries spreading the good word. I monitored most activity out of the Gulf over Eutelsat W1, 10° East, generally being news output ex the Gulf destined for the networks back home, this primary link into the various European news bureau prior to the Atlantic hop. On the 12th for example 'US TV POOL', 'BAHRAIN PATH 2' appeared as an NTSC signal @11.047GHz-V [2849+3/4]. The 13th the presidential troop arrived in Abu Dhabi and 'SNG PATH 2' fired up with reports from Ed Henry for CNN, again W1 @ 11.067GHz-V. 'SNG PATH 1' was busy on W1's 11.053GHz-V slot [both used 3124+3/4]. The next day and the entourage were entrenched in Riyadh, Saudi Arabia with CNN/CBS sharing capacity over 11.057GHz-V [3124+3/4]. Still in Saudi on the 15th and 'NBC NEWS TX POOL PATH 2' were now down linking at 11.057GHz-V [3124+3/4]. During the tour it was possible to locate a 'PATH 1' but not find a matching 'PATH 2' suggesting additional capacity was fired up only when news commitments were intense.

I was surprised to find a football feed evening of January 21st from



The TV press pool test card during the President Bush visit to the Middle East [W1]

the African Cup series, being the Nigeria v Cote d'Ivoire match but linked through Eutelsat W1, 10° east @ 12.707GHz-V [6111+3/4] with service identification 'F53 TV2'. The floodlit game revealed the lack of camera skills with crash zooms in and out, losing the ball and loss of focus were common! Only audio was crowd/stadium fx. Earlier the same evening saw the football game + on the pitch interviews afterwards using Intelsat 10-02 @ 1° west capacity from the 'Blues' stadium – Birmingham City. Our old sat truck friend 'BT TES 33' provided the essential signal linking @ 11.467GHz-V [5632+3/4]. The evening 'SAGA MASTERS' snooker championships from the Wembley Arena was another W1 sporting hookup on the 20th when Mark Selby won the finals. 'ARQIVA ENC 9' provided satellite linking of the finals + post match interviews found at 11.092GHz-V [5632+3/4].

From time to time the CBS crew in both Iraq and Afghanistan run long duration footage of military operations in those areas, the camera travels alongside GIs in action or on patrol. January 11th saw another of these long duration unedited play-outs running to nearly 30 minutes. The January 11th transmission covered a patrol in Iraq along dusty roads together with a glimpse of control room ops, a large room with monitors. US warplanes were being directed to specific locations to either use missiles or to straff areas with cannon fire or in their words "to beat up the earth"! CBS as usual linked their transmission through Eutelsat W2, 10° East – 12.550GHz-H [5632+3/4] and identifying as 'CBS NEWS BAGHDAD'. The video featured the US Army in action on station in Iraq and carried a title 'Show of Force'.

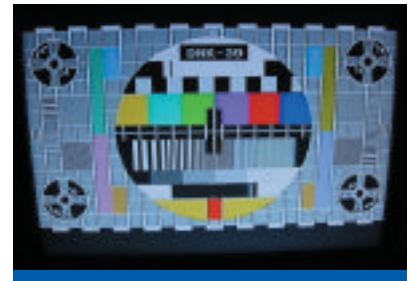
The assassination of Mrs. Bhutto in late December resulted in civil unrest particularly in Islamabad with

Small Iranian craft frequently hastle US naval ships in the Arabian Gulf [W1]

satellite circuits remaining open into early January. 'ISLAMABAD – UKI148' continued in APTN service over W1 @ 12.732GHz-V [4166+5/6], meanwhile 'ABC NEWS ISLAMABAD' were feeding content over Intelsat 10-02, 1° west – 11.674GHz-V [3207+7/8], just a few MHz down from the regular 'ABC SCOPUS' slot ex Baghdad – 11.679GHz-V.

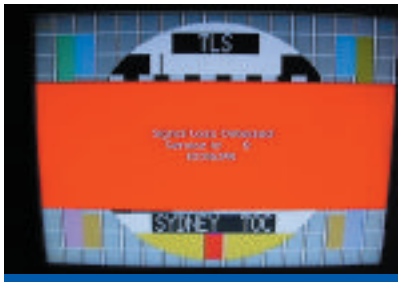
Broadcast news

Digital moves. March and April 2008 will see an increasing number of Norwegian analogue TV stations close in favour of the move to DTV. Over 70% of household had access to DTV by December 2007. Norwegian DAB is also rapidly expanding and recent plans have suggested that there'll be a close down of all FM [analogue] radio networks in 2014.



A Danish SNG test card [10-02]

Surprise news from the Benelux DX Club is that Poland will start the move into DTV by June 2008, simulcasting both analogue and digital channels for the following 12 months, aiming for a complete switch-off of analogue TV in the first digital TV regions approx. mid 2009.



Technical problems on an Australian news feed [W1]

Analogue TV close-down dates for Denmark are set for October 31st, 2009; in the Czech Republic analogue is timetabled to close down October 10th 2010.

And a note from our old friend George Gaskin in Gibraltar advises the Gibraltar Regulatory Authority have confirmed to Parliament that analogue TV on the 'Rock' will switch off in 2012. To provide full digital coverage another 6 relay transmitter sites will be operational; the government has confirmed that the maximum number of TV channels on the 'Rock' will rise to 8.

The BFBS [British Forces Broadcasting Service] commenced DAB trials in the UK alongside their FM and AM transmissions from January 18th. BFBS are using bandwidth provided by digital broadcaster 'Digital One' now vacated by departing radio channels 'Oneword' and 'Core'. Digital One are hopeful that the audience response will be positive sufficient for BFBS-DAB to become a permanent radio channel.

The Isle of Wight is the base for an Internet TV channel 'UK Entertainment Channel' that opened New Year's Eve. The channel will provide family values on a 24/7 basis with 'lots of comedy, films and entertainment'. A companion channel 'Mediterranean International Television' has been broadcasting in Southern Spain for 16 years. The channel will not air terrestrially and the Rowridge ch. 54 allocation will remain empty, formally used by 'Solent.TV' that closed down end May 2007. A long term aim is to provide local [IW] news. For a sampler presentation and more information on the news channel check the following – www.ukentertainmentchannel.com

The WorldSpace satellite broadcast radio services for Europe will open in 2009, offering upwards of 40 commercial free radio channels within the 1479.5 – 1492.0MHz band. Sports, music, news and entertainment programming will be available using 'MPEG-4accPLUS v2'. Delphi will develop a European version receiver at their Bad Salzdetfurt plant in Germany; Delphi has designed and manufactured 18 million satellite radio for the USA since 2001.

Irish broadcaster RTE have announced the March 24th closedown of their 500kW Medium Wave transmitter at Tullamore – that carries the RTE Radio 1 service – on grounds of cost and minimal audience figures. The same radio service remains available on 252KHz Long Wave from Summerhill, Co.Meath.

Satellite TV news National Afghanistan TV is now available in Europe over the Hot Bird 7A slot @ 13° , check 11.411GHz-H [27500+5/6]. The ITU are considering the Azerbaijan request to launch their own satellite which if successful will allow not only their own TV programming to be transmitted into Europe but will also provide another platform of other broadcasters.

An RAF 'chopper departs from duty over the stranded [Blackpool beach] 'Riverdance' [W2]

In early January the Thaicom satellite operator began downlinking the Lebanese TV channel Al Manar from their 78½° East Thaicom-5 slot, providing a potential coverage of Eastern Europe, Middle East and Asia in C Band. Al Manar is well known for its support of the Shi'i group Hezbollah. The US added Al Manar to its 'Terrorist Exclusion List' nearly 4 years ago resulting in Eutelsat, Intelsat, Hispasat and AsiaSat dropping all transmissions of Al Manar. Thaicom switched off the Al Manar downlink on January 14th. Al Manar can be seen over Nilesat and Arabsat capacity.

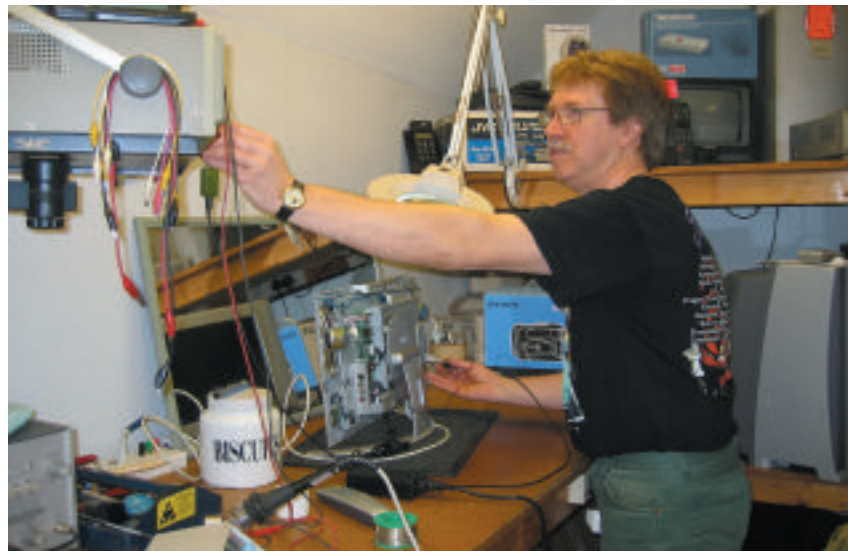
A cat eats a microphone as seen on Hispasat

Day in the life

by Peter Dolman

There's a quote I read somewhere that might well have been written with people like me in mind: 'It's so simple to be wise. Just think of something stupid to say and then don't say it'. Good advice, but easier said than done, if you get my drift.

Take the other day for example. I was at my bench, minding my own business and prodding hopefully at the remote control of a Panasonic DMR-E50 DVD recorder when the voice of reason floated over. "Do you actually know what you're up to?" enquired Dear Heart casually. "What's wrong with it?" Affronted, I puffed myself up and explained grandly that it ignored remote commands, sometimes wouldn't record, and that 'recover' or 'U99' would occasionally appear on the display, followed by shut down. Then I blustered an impressive something or other about software, error codes and the like. By the time I ran out of words, I knew I'd dug myself a deep hole. "You do realise how easy it is to accidentally change the remote command mode on this model," she said quietly, picking up the remote. "All you do is hold down enter and prod one, two three or whatever to alter it. Chances are that the customer's done just that while he's been flapping about in the menu trying to sort the other problems. Then he couldn't get back in again." I tried to think of a clever response, but nothing happened. Somewhere in the evolutionary chain, mother nature had programmed her female logic, conferring a knack when it came to software and button pushing. A guy could find that somewhat irritating. Moments later



she'd matched the remote and the machine's command mode and returned to her own job, leaving me with the remaining symptoms which suddenly seemed more like power supply trouble now the remote control issue had been despatched. Sure enough, I discovered that C112 (470µF 16V) and C127 (47µF 35V) in the PSU secondaries read high ESR. I replaced them, cleaned the pickup lens and the owner's ropey old discs. Everything worked perfectly and I surreptitiously began parcelling the job up. "You really ought to set it back to command mode one", sang out the voice behind me long before the one in my head had a chance.

Presently, I became aware of a series of low level grizzling sounds radiating from the vicinity of the audio bench, and grabbed my chance to redress the balance. Frequency-wise I reckoned they were around 100 to 500Hz and certainly rich in odd harmonics; investigation revealed the source to be human, not electronic. "Do you actually know what you're up to?", I enquired unkindly giving her a playful prod. She squirmed away irritably. "Get off me. I've just spent the last hour replacing the pick up in this Teac, but it's still not right. Listen". Sure enough, as the CD played, it was momentarily interrupted, then a second or two later, resumed from where it had left off. "I thought it was mistracking, but it's not as such is it?", she said earnestly. "It just seems to pause, then continue again, and the longer it's on the worse it gets". The machine in question was a CR-H250, a real looker of a compact CD receiver with a brushed aluminium fascia. So compact that repairs to it were, by necessity, rather time consuming.

The disc mechanism is positioned beneath two PCB's, all linked with short flexi cables. We found it was just possible, by rearranging the positions of the front panel and uppermost PCB, to get a closer look at – and listen to – what was going on at the moment the malfunction occurred. When the symptom showed, the disc slowed fractionally

and there was a click as the focus servo forcibly offset the lens. The CD section employs a Toshiba TA2125AF surface mounted driver chip, reference IC13 which delivers the necessary current drives for focus, tracking, disc motor and drawer motor. It's sandwiched between the two PCB's, and I soon found it was running hot. "My guess is that there's an internal thermal shut-off incorporated in that chip," I spluttered ruefully, sucking my scorched finger. "Did I just witness one of those well-honed measurement techniques you were droning on about the other day?", grinned my companion "years of experience and all that jazz?" I chose to ignore her, finding comfort in the fact that freezing the chip made the symptom disappear. "How's about I sort out a cuppa for us while you remove the mechanism and check the motor resistances," I called out over my shoulder, en route to the cold tap. Sure enough, the culprit turned out to be the disc motor. Its terminal resistance had fallen from 10Ω to just over 4, because of an internal build up of carbon brush material peppering the armature. The resultant increase in IC13's dissipation triggered its inbuilt thermal protection, briefly inhibiting drive until its temperature fell sufficiently to allow the cycle to repeat. In this instance the repair was urgent, so we decided to install a new motor from stock; however Teac can supply the complete traverse mechanism if required at a very reasonable price, via Charles Hyde.

Just as we were boxing the job up, in slithered Mr Strange. He leered toothily at Dear Heart who recoiled slightly, then his lips set in a tight line. "What can 'ee do 'im for?" he grated, thrusting a Matsui LM20N2 LCD set at me. "I know Argos got 'em going cheap down there see, but I thought I'd give thee a chance". "Well, you're in luck," I began smoothly, "because today just happens to be our estimate day". My colleague shot me a questioning look. "Of course, you'll appreciate that we have to charge you for the time we spend doing it". I continued. He turned away, losing interest. "Can't be more than a wire off," he asserted. Once he'd made his exit, I powered up the set, and noted there was no backlight operation. Even so, initial checks indicated that the inverter was running. (A quick test for this is to clip the scope probe ground clip and tip together, then forming a loop with the ground lead, place it close to one of the inverter transformers). I then shone a light through one of the small holes of the LCD's rear cover, and could definitely make out an image on the screen. This meant that the problem was due to the backlights not operating, despite the fact that the inverter was running, which on the face of it seemed to be a contradiction! I wasn't at all convinced that the inverter panel was faulty, and when I learned that I was expected to order an absurd pack of ten boards in order to prove it one way or another, my exasperation made me determined to trace the problem to component level. I scratched my head, but as that didn't seem to help much, I searched out a heap of assorted scribbles, which I'd hastily made during various LCD training sessions, and tried to make sense of them.

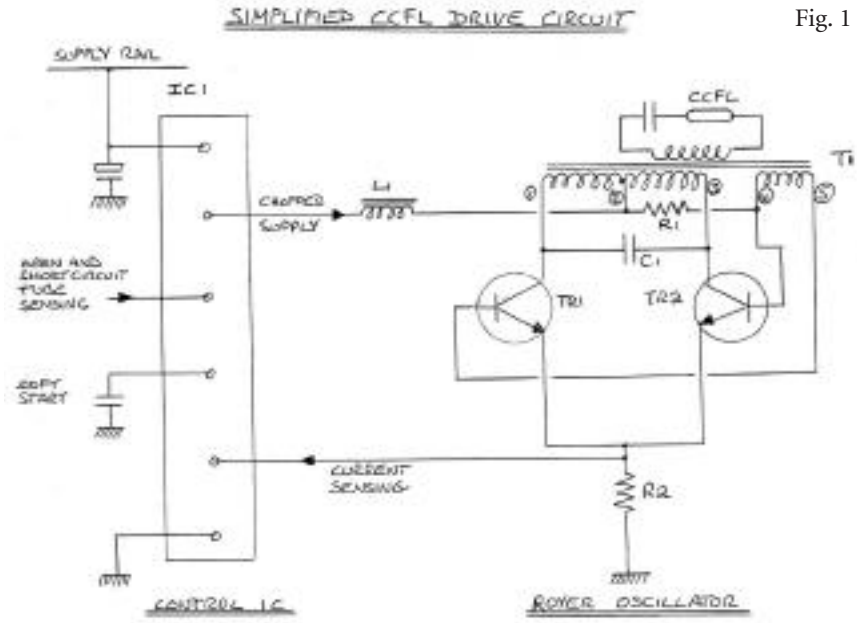


Fig. 1

Now I'm one of those folk who need plenty of information as to how things work. It could be down to the fact that the exceptional training that was the norm when I entered this trade forty years ago has spoilt me for today's so-called information age. Hence, if there's too much I don't understand on a subject, I find I just can't get going at all. Maybe I hadn't paid enough attention at the time I wrote them, but each set of jottings I looked at seemed rather short on real practical information, providing but a glimpse of the bigger picture. So I settled down to compile something a bit more descriptive. Eventually, I'd combined some selected basics and a simplified example of practical circuit operation. Although my notes referred to one of several variations on LCD backlights and inverter circuits, their essence seemed to correspond quite closely to the set in question.

A backlight comprises an array of cold cathode fluorescent lamps (CCFL's), containing Neon and Argon gas mixed with Mercury, which generally require a sinusoidal ac power source to drive them, provided by a dc to ac inverter. This source is controlled in order to:

a) Establish the required operating drive conditions for each backlight in the group, so as to equalise performance and optomise lifespan of the assembly; typically 1750V p-p to 3500V p-p is required here.

b) Produce the initial high voltage required to ionise the gas contained in the CCFL's (approximately 1.2 to 1.8 times the above operating value), for a few hundred microseconds or so. The greater the tube length, and the narrower its diameter, the greater the required strike voltage will need to be. This value is also dependent on the ambient temperature of the tube, rising by up to 40% at temperatures of less than 25°C.

The inverter panel of a typical basic LCD receiver, similar to the one in question, comprises a self-oscillating sinewave generator and control section, an example of which is shown in the diagram overleaf. The circuit formed by T1, TR1, TR2, C1 and R1 is known as a Royer oscillator, whose resonant frequency is set by C1, T1 and the impedance seen by T1 secondary; 50Khz is a typical value, but anything in the range of 20Khz to 70Khz may be encountered, depending on the individual design. Positive feedback is provided by the tertiary winding at pins 4 and 5. The role of IC1 is to control the amplitude of oscillating current flow in T1 primary, sensed by monitoring the voltage drop across R2, to bring about dependable striking and illumination. For a given oscillator frequency, this voltage will represent the power delivered to the CCFL. In our example, IC1 provides pulse width modulation of the oscillator's on-time duty cycle as the means of control, by chopping the supply fed via L1 to pin 2 of T1 at a suitable rate (faster than the eye can detect, typically 270Hz or 330Hz to avoid frame interaction).

Armed with this information I attempted to check the amplitude of the backlight drive waveforms, but quickly realised that my 'scope probe was having a significant impact on circuit action. Then I tried connecting high voltage 2pF capacitors in series with the tip and ground connections. Assuming a 15pF probe capacitance, I concluded that there was plenty of oscillation here. Surely every CCFL couldn't have failed? Finally, after re-reading my notes, light dawned. "For a given oscillator frequency the drive amplitude determines the power delivered to the CCFL". Maybe the problem was one of frequency, not amplitude? Dispensing with direct 'scope connections, I used my old trick and formed a loop next to one of the inverter transformers; this time I looked at the period of the waveform and measured 1.7µS, ie almost 590 kHz! Panther-like I homed in on the component corresponding to C1, finding that it comprised a parallel pair of blue 270nF 250V capacitors blobbed together with silicone. Even as I removed them to check values, I realised that this was a long shot because, even if one of them was open circuit, it couldn't possibly account for a ten-fold increase in oscillator frequency. They would both have to be faulty. To my delight one read 6nF and the other only 1nF!

Although I couldn't source the original component types, I finally installed a 220nF and 330nF parallel pair of 250V capacitors (RS codes 190 7817 and 190 7823), curing the fault. These capacitors need to be carefully chosen to have a low dissipation factor (DF) to prevent self-heating. As two components of the same type had failed, I hoped this would become a common fault on a high volume production set…just what we need! On a high from my triumph against the odds, I happened to spot Strange beetling past the window and ushered him in to share the moment. He quickly cut to the chase. "So what'll it cost? Only down the one pound store my missus seen one just like 'im with a free bag of carrots thrown in". I turned away feeling irritated; then the voice in my head told me he was far more streetwise than I'd ever be, so I might as well call his bluff. "Here's your paperwork, Mr Strange," I announced brightly, "you can either scrap the set and settle for our time as I explained, or have it repaired and working perfectly for less than the cost of replacement. Either way, the charge is the same, so it's your decision". Realising that his attempt at getting something for nothing had failed he delved reluctantly in to his bulging back pocket and pulled out a fat wad of folded notes. "Every time I comes here it costs me money" he lamented. I thought of the money I'd just saved him and the time and skill I'd put in on his repair, and opened my mouth to protest. Then over his shoulder I caught a glimpse of Dear Heart, looking as exasperated as I felt. "Don't" she mouthed. "Get off your soap box" added the voice in my head. Just for once, I decided the wisest thing would be to heed them both. So, remaining silent I watched as he laboriously counted out the notes, a look of agonised resignation etched on his face…

The race for television

Part 2 of Tony Thompson's TV history

While John Logie Baird was opening the world's first television sales department at Selfridges on 20th February 1928, The new department sold kits and parts to enable amateurs to build their own very simple receivers), the always forward-thinking Campbell Swinton[1] gave his opinion on the state of television. He concluded that it needed vast improvement, such as could only be brought about by the use of cathode ray electrons instead of moving material parts which must always be too sluggish for real success. He added that his views coincided with those of P.P. Eckersley and Sir Oliver Lodge: in the magazine 'Modern Wireless', he wrote 'Surely it would be better policy if those who can afford the time and money would abandon mechanical devices and expend their labours in what appears likely to prove the ultimately more promising method in which the only moving parts are imponderable electrons.' History was to prove him right.

Low definition transmissions begin

As Baird pressed on doggedly with mechanical television, an electronic television system was patented by V. K. Zworykin in 1928. The insensitivity of the latter's 'iconoscope' needed a great deal of light to work, but did produce images of a high resolution.[2] Still committed to mechanical methods, Baird ignored what we, with the benefit of hindsight, might consider obvious. He finally gained permission by the end of February to broadcast sound simultaneously with his 30-line vision, using twin transmitters from the BBC's Brookman's Park facility. Sound went

The Man with the Flower in his Mouth. Actors and scenery of the very first televised play are pictured. Note the heavy make-up, the simplified background panel and clothing: requirements for low-definition TV

via the London Regional transmitter on 356 metres medium wave and vision was simultaneously transmitted on the National wave-length of 261 metres. The broadcasts originated in the Baird studio in Long Acre. The transmissions were said to be highly successful: Gracie Fields sang and Sir Ambrose Fleming spoke. The detail of the images was said to be 'remarkable' given the simplicity of the apparatus, although it was felt that some faces unaccountably televised better than others!

In another first, the Luigi Pirandello drama 'The Man with a Flower in his Mouth' was broadcast on the afternoon of July 14th 1930. The play was chosen for its limited cast and for the lack of action and showed the head and shoulders of one actor at a time, with any movement being slow and deliberate so as not to blur the images seen due to motion. Actor changes were accomplished by means of a checkerboard pattern being interposed between the camera and the actors. Scenery, such as it was, took the form of simplified and stylised drawings. The limitations of Baird's system were still all too obvious and severely all-pervading, with a miniscule entertainment value and of interest to the public only as a novelty, yet by the end of the 1920s the name of Baird was synonymous with television in Great Britain –- there was simply nobody else; and the skilled publicist constantly claimed that advances would in any case soon be made. Baird's name headed both a British and an international company and even a magazine publication entitled 'Television' (naturally). Despite the standard practice, then as now, of technical and experimental concerns to employ skilled and highly qualified men, Baird had no such cadre of quality among the admittedly talented artisans in his workshops and laboratories.

To make matters worse, his restless, active and inventive nature caused him to change direction somewhat randomly. Once he'd thought up some device or other, no matter how imperfect, his interest would be taken

elsewhere and he would fixate on some new task, leaving others in his employ to iron out the problems left unsolved in his wake. It was perhaps due to this wayward tendency – inventing but not perfecting – that he was able to give the very first demonstration of colour television in 1928, based upon his patent of some three years previous. The transmitting and receiving discs each held three spirals of holes, covered respectively by red, green and blue filters. The receiver images were provided by a neon lamp for the red and mercury vapour/helium lamp for the blue and green. The generated image was postcard in size. His other devices, phonovision (video recordings on disc) and Noctovision (the use of invisible infra-red rays to 'see' in the dark) were other unrefined examples of his spread of thought, being inventions in principle but never brought to a sufficient level of competence to enable practical employment.

Baird also demonstrated large screen television in the prestigious London Coliseum on July 28th 1930. The display was by means of a 'screen' consisting of 2100 lamp elements, each cell separated from each other and containing a small filament lamp of the type used in torches. A sheet of ground glass covered the open fronts of the cell grid. Each lamp was connected to a switching commutator which powered each lamp in succession, every lamp being switched during one twelfth of a second. The incoming vision signal was amplified and fed to the commutator, its fluctuations affecting the brightness of each lamp. Due to the low resolution, the 'lag' of the lamp filaments actually reduced flicker! Tellingly, a newspaper correspondent present at the demonstration said that when standing close to the screen, images were unrecognizable and it was necessary to retreat to 150 feet distant, when the image compared very favourably with that of a normal televisor.

A missed opportunity

Baird was in Berlin in 1930[3] for the radio show. He met up with Manfred Von Ardenne, an affluent young scientist who in the previous year had produced a paper outlining his development of a cathode ray tube 'for recording images'. In other words, a form of flying spot scanner[4]. Von Ardenne tried to convince Baird to use cathode ray tubes for television display, mainly because he saw him as a possible customer for his tubes and amplifiers, but at the time Baird still saw the future in Nipkow discs, mirror drums and other mechanical devices and tended to disregard the electronic approach. It was to prove a costly mistake on his part.

Sydney Moseley, Baird's professional associate, somewhat belatedly complained about the BBC in a letter to The Times in 1933, claiming that it was only after the strenuous efforts on his part had resulted in the formation of a parliamentary committee that the BBC finally permitted experimental transmissions. The BBC, in the form of John Reith, chief engineer Peter Eckersley and his successor, Noel Ashbridge, were a continual thorn in the side of Baird and his struggling company. They only grudgingly allowed the simultaneous transmissions of sound and vision after their hand was forced by the licensing authorities. Baird was aware that transmission bandwidth was one of the keys to higher definition yet he was never allowed to experiment on the essential higher frequencies.

Lance Sieveking, the producer of 'The Man with the Flower in his Mouth' and later to become a distinguished BBC producer, wrote a long memorandum after the broadcast in which he recommended that the BBC should co-operate with Baird in the production of future programmes, allocate greater bandwidth for Baird's experiments and institute a five year research program into television, giving the Baird company and its technicians advice and encouragement. It was all to no effect. Predictably, at a BBC meeting involving Reith, Ashbridge and others, the latter's negative views of the value of the Baird system prevailed; Baird was allowed to continue his transmissions 'for the present' but there was to be no programme co-operation, though 'technical liaison should be closer'.

In an editorial of August 14th 1934, The Times commented upon the state of broadcasting, remarking that 'television remains the most fugitive of the electrical arts… the BBC has wisely(!) participated [in television transmission].' The Baird 30-line system was said not to be universally popular due to low quality and poor image stability and 'pictures of much greater detail … will be necessary before there is any marked response from the public'. There was mention of the need for ultra-short wavelength transmissions for a practical high-definition system. The item concluded by saying that the cathode ray tube is by general agreement the way forward.

EMI show their hand

Though still lacking a truly successful studio camera, EMI demonstrated all-electronic 150-line film transmissions in 1934, using their own ultra-short-wave transmitter and prompting the possibility of television programme content eschewing live broadcasting in favour of 'all-film' based material; perhaps feature films as made for the cinema, and newsreels and programme fillers of the cinema type. A committee was set up to advise the Postmaster General on the development of television.

In December, the Baird Company fought back by bringing into operation a 10kW ultra-short-wave transmitter at Crystal Palace. It was at the time the most powerful short wave transmitter in existence.

The final chapter, Part 3 of The Race for Television will appear in the next issue...

Multimedia convergence

Fawzi Ibrahim investigates how the increasing use of digital mediums is causing a convergence in the technologies used to convey multimedia information. This article is based on a chapter from his recent book, Newnes guide to Television and Video Technology, fourth edition

In the digital world, a 'bit' is a 'bit' whether it represents audio, video, data, software, etc. Consequently, in principle, there is no reason for separate networks for broadcasting and telecommunications.

Of course, the reality is slightly more complex. In practice, there are some fundamental distinctions between broadcasting and telecommunications. Broadcasting essentially delivers one-way, one-to-many services, whereas telecoms operators provide two-way, one-to-one services.

Nevertheless, the boundaries between broadcasting and telecoms have become increasingly blurred since the early 1980s; some analogue TV services have been used to deliver limited 'telecoms-like' services. An examples is the delivery of encrypted teletext services for individuals or closed groups of users.

The introduction of digital radio and TV networks opens up new opportunities for data services, particularly for delivery to portable or hand-held devices. Demand for short 30-second video clip – e.g. a football goal – on mobile phones is increasing.

Large-scale on-demand video services via the Universal Mobile Telecommunication System, or UMTS, proved to be uneconomical. Instead, attention has turned to the benefits of one-to-many services: rather than sending individual video streams to each consumer, it would be much more efficient to transmit the same material simultaneously to all those interested. Of course, this "new idea" is actually "broadcasting"!

The over-used concept of convergence can apply to incorporating internet services onto a broadcasting platform, known as Digital Multimedia Broadcasting, or conversely, incorporating broadcasting services onto the internet platform, known as on-line convergence, or a mixture of the two.

Digital multimedia broadcasting

Arising from the hype surrounding the Internet, there has been increasing interest in offering multimedia services to mobiles.

First, there was the big bang of selling frequencies for UMTS all over Europe, but it turned out that UMTS will not offer the huge bandwidth that modern streaming internet applications, such as TV, require. This means that, apart from point-to-point applications, there is an increasing requirement for point-to-multipoint, wireless, internet access technologies. Hence the terrestrial broadcast systems coming into focus, as a means of streaming multimedia content to mobile, portable and hand-held receivers.

There are two different technical solutions that could meet these requirements:

- DVB-H (H for hand-held), the latest terrestrial standard from DVB
- DAB (Digital Audio Broadcasting), adapted for multimedia delivery

A third solution, ISDB-T from Japan, is not to be deployed in Europe.

Although the fact that all three components, i.e. audio, video and data, are presented in digital form makes it possible for them to share the same transmission medium, it is not sufficient for practical convergence. What makes the whole enterprise a practical possibility is their adherence to a standard network communication model, the open system interconnect (OSI) model.

DVB for hand-helds

The terrestrial version of the DVB system (DVB-T) is fully described in my book. Developed in the mid-1990s, it was primarily intended for portable and stationary reception using roof-top antennas. The design of the system was strongly influenced by the cost of the receiver.

To make the receivers cheaper, time interleaving – which would have benefited mobile reception – was not implemented. Instead, the same error correction as the satellite system, DVB-S, was used. DVB-T can effectively be used for mobile and portable reception provided the multi-antenna diversity receiver is available to enable high-speed mobile reception of DVB-T. However, fast such varying channels are error prone.

The situation is worsened by the fact that antennas built into hand-held devices have limited dimensions and cannot be continuously pointed at the transmitter if the hand-held

terminal is in motion. This is just one of the problems of using DVB-T. The stumbling block for the use of straight forward DVB-T for mobile devices is however, the very practical problem of battery life.

Power consumption of DVB-T front ends is too high to support hand-held receivers that are expected to last from one to several days on a single battery charge.

To make DVB-T suitable for mobile multimedia services, a dedicated standard for hand-helds, based on DVB-T, was necessary. It is called DVB-H, i.e. DVB-hand-helds. Its aim is to provide an efficient way of carrying multimedia services over digital terrestrial broadcasting networks to hand-held terminals.

DVB-H specifications were drawn up with the objectives listed in **Panel 1**. These requirements were drawn up after much debate and with an eye on the emerging convergence devices providing video services and other broadcast data services to 3G hand-held devices.

Hand-held screen resolution

Broadcasters initially supported the Quarter VGA (QVGA, 320 x 240 pixels) standard, while cellular phone carriers supported Quarter Common Intermediate Format (QCIF, 176 x 144 pixels). DVB-H solves the rift between them.

When the user watches a program on a mobile phone, there will be two types of content on the mobile phone screen. One is a broadcast program – such as a sport or drama – by a broadcast service provider. The other is custom data relevant to the program – such as on-line shopping information – prepared by a telecom carrier.

Panel 1. Objectives of the DVB for hand-helds

- *To power off some part of the reception chain to increase the battery life.*
- *Easy access to services and seamless transition from one service to another.*
- *Sufficient flexibility/scalability to allow reception of services at various speeds, while optimizing transmitter coverage.*
- *To mitigate against the effects of high levels of man-made noise such as car ignitions interference.*
- *To provide a generic way to serve hand-held terminals in various transmission bands and channel bandwidth around the world.*
- *To receive multimedia services using a single antenna in the portable, mobile and indoor environments.*
- *To maintain maximum compatibility with existing DVB-T networks and systems.*

DVB-H system properties

The main properties of DVB-H are: time-slicing, IP interfacing, enhanced signalling and in-depth interleaving. In order to save power, a power-saving algorithm based on time division has been introduced. The technique, called time slicing, results in a large battery power-saving.

In order to provide a common platform with Internet services, and for reliable transmission in poor signal reception conditions, IP interfacing with an enhanced error-protection scheme was developed.

This scheme is called MPE-FEC (Multi-Protocol Encapsulation – Forward Error Correction). It employs powerful channel coding on top of the channel coding included in the DVB-T specification and offers a degree of time interleaving.

Furthermore, the DVB-H standard features an extra network mode, the 4K mode, offering additional flexibility in designing single-frequency networks (SFNs). This is still well suited to mobile reception. It also provides an enhanced signalling channel for improving access to the various services.

Convergence with Internet services is accomplished by IP (Internet protocol) encapsulation of Internet services prior to the transport multiplexing stage.

Time-slicing

A special problem for DVB-H terminals is the limited battery life caused by the relatively high power consumption of a DVB-T front end. This is in the region of 600-1000mW.

Before any one of the multiplexed elementary streams of the selected programmes can be accessed, the whole data stream has to be decoded first. A large part of the power consumed by the front end is therefore unnecessary.

The power saving made possible by DVB-H is derived from the fact that essentially only those parts of the transport stream which carry the data of the service currently selected have to be processed. In order to do this, the data stream needs to be re-organised in a suitable way for that purpose.

With DVB-H, several service are multiplexed using pure time-division. The data of one particular service are therefore not transmitted continuously but in compact periodical bursts with interruptions in between.

At the transmitting end, several services with different bit rates are multiplexed and a a continuous, uninterrupted transport stream at a constant bit rate is maintained.

To indicate to the receiver when to expect the next burst, the time to the beginning of the next burst is indicated within the burst. Between the bursts, data of the elementary stream is not transmitted, allowing other elementary streams to be transmitted using the remaining bandwidth. Time-slicing enables a receiver to stay active only a fraction of the time, while receiving bursts of a requested service.

Bursts entering the receiver have to be buffered and read out of the buffer at the service bit rate. Practically, the duration of one burst is in the range of several hundred milliseconds whereas the power-save time may amount to several seconds. Depending on the ratio of on-time/power-save time, the resulting power saving may be more than 90%.

Time slicing offers another benefit for the terminal architecture. The comparatively long power-save periods may be used to search for

channels in neighbouring network cells offering the same service but that offers better reception.

This is important as the hand-held receiver movement may take him from one network cell to another. In this way a channel handover can be performed at the border between two cells which remains imperceptible for the user.

IP interfacing

In contrast to other DVB transmission systems that are based on the DVB Transport Stream adopted from the MPEG-2 standard, the DVB-H system is based on IP (Internet Protocol). The Internet protocol operates at Layer 3 (Network) of the seven-layer OSI model.

In the preceding layer – Transport Layer 4 – two types of protocols are available: a unicast (one-to-one) TCP and multicast UDP. Transmission Control protocol, or TCP, is a 'reliable' connection-orientated service. It ensures that a connection is made and an acknowledgment is received before data is exchanged.

In contrast, User Data Protocol, or UDP, is an 'unreliable' connectionless service. It sends out messages regardless of a connection being established. For the purposes of DVB-H, UDP is used which is sent in 'datagram' packets to the Layer 3 for IP encapsulation.

Layer 3 precedes the bottom two layers (Data Link and Physical layers) which incorporate the channel decoder, **Fig. 1**. The IP encapsulated packet from Layer 3 is fed into the channel decoder as just another elementary stream to be multiplexed with other elementary streams from MPEG-2 broadcast services to form the MPEG-2 transport stream.

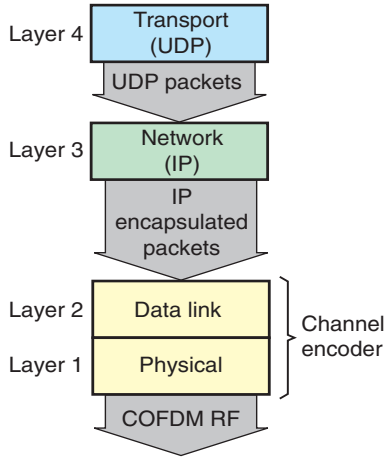


Fig. 1. IP encapsulation

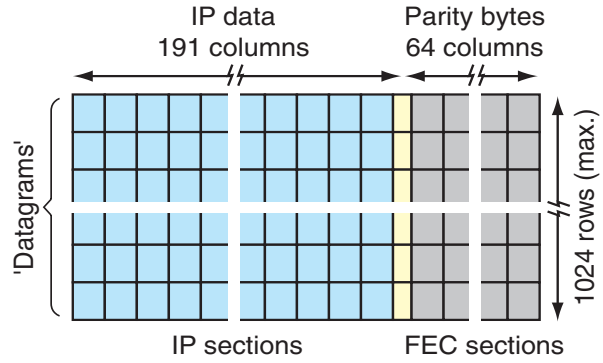


Fig. 2. Multi-Protocol Encapsulation, or MPE

The IP interface allows the DVB-H system to be combined with other IP-based networks. This combination is one feature of the IP Datacast system. Embedding of the IP data into the transport stream is carried out by means of 'Data Piping' technique known as Multi-Protocol Encapsulation (MPE).

Enhanced FEC

One of the main problems facing mobile TV transmission is the low signal-to-nose, S/N (or carrier-to-noise, C/N) ratio and the effect on the received radio frequencies caused by the Doppler effect.

The Doppler effect, named after Christian Doppler, is the apparent change in frequency of a wave received by a handset that is moving relative to the transmitting source. This is the same effect on sound waves when the source e.g. an ambulance moves towards or away from a stationary person. To overcome this problem, enhanced FEC is employed.

On the Data Link layer that precedes the Physical layer, an additional stage of forward error correction (FEC) is added. This technique, called MPE-FEC, is the second main innovation of DVB-H besides the time slicing. MPE-FEC complements the physical layer FEC of the underlying DVB-T standard. It is intended to reduce the S/N requirements for reception by a hand-held device by as much as 7dB.

The MPE-FEC encoder creates a specific frame structure, incorporating the incoming data of the DVB-H codec. The FEC frame consists of a maximum of 1024 rows and a constant number of 255 columns, **Fig. 2**. The frame is separated into two parts, the application data table (191 columns) and the RS parity data table (64 columns). The application data table is filled with the IP packets of the service being received. After applying the RS error the coding, the IP packets are read out of the application data table and are encapsulated in IP sections. This is followed by the parity data which are read out of the RS data table column-by-column and are encapsulated in separate FEC sections. Each MPE-FEC frame is contained within one time-slicing burst.

By adding parity information calculated from the datagrams and sending this parity data in separate MPE-FEC sections, error-free datagrams can be output after MPE-FEC decoding at the receiver despite a very bad reception condition.

The effect of MPE-FEC overhead in terms of increased redundancy can be fully compensated by choosing a slightly weaker transmission code rate. This MPE-FEC scheme should allow high-speed single antenna DVB-T reception using 8K/16-QAM or even 8K/64-QAM signals. In addition MPE-FEC provides good immunity to impulse interference.

Separating the IP data and parity data of each burst makes the use of MPE-FEC decoding in the receiver optional, since the application data can be utilised while ignoring the parity

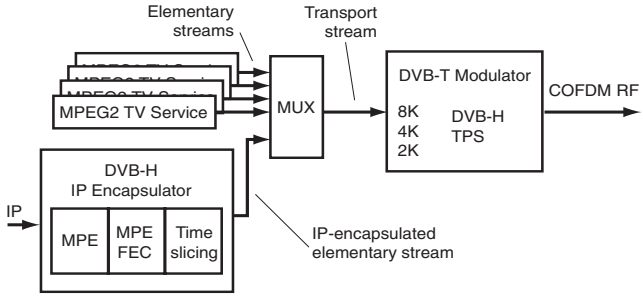


Fig. 3. DVB-H transmitter

information. MPE-FEC-ignorant – but MPE capable – receivers will be able to receive the data stream in a fully backwards-compatible way.

The enhanced FEC, the MPE, and the time slicing technique are directly aligned with each other. The IP input streams provided by different sources as individual elementary streams are multiplexed according to the time slicing method.

MPE-FEC error protection is calculated separately for each individual elementary stream. This is followed by encapsulating the IP packets and embedding them into the transport stream. As can be seen, all relevant data processing is carried out before the transport stream interface in order to guarantee compatibility to a DVB-T transmission network.

Enhanced signalling

At the physical layer, DVB-H introduces three extensions to satisfy the demands of hand-held sets, namely an enhanced signalling, a new 4K mode option and in-depth interleaving.

In DVB-T, one of the COFDM channel is reserved for Transmitter Parameter Signalling (TPS) to carry information such as the mode (2K or 8K), guard interval length, modulation type and code rate within the transmitted frame, **Fig. 3**.

TPS information is carried by specified carriers spread over the entire COFDM frame. One carrier in each symbol is allocated to carry one bit of TPS using simple BPSK, or Binary PSK.

With DVB-H, additional information related to time-slicing and whether MPE-FEC protection is used is included as an extension to the TPS channel. The purpose of the DVB-H signalling is to provide a robust and easy-to-access signalling to the DVB-H receivers, thus enhancing and speeding up service discovery.

TPS also provides a faster way to access signalling than demodulating and decoding the Service Information (SI) or the MPE-section header.

4K transmission mode

As is detailed further in my book, DVB-T provides two OFDM modes; 2K and 8K. These have 2048 and 8192 carriers respectively. specifications for DVB-H provide for an additional mode, namely 4K with 4096 carriers, **Table 1**.

The 4K mode is a compromise solution between the two other modes designed to double the SFN coverage area compared with the 2K mode. The SFN coverage area or size, known as a cell, is determined by the number of carriers of the OFDM mode used. By doubling the number of carriers, say from 2K to 4K, the cell size also doubles, but in doing so, it also makes the network more susceptible to the effects of the Doppler frequency shifts. Conversely, a decrease in the number of carriers from say 8K to 4K, improves its effectiveness to deal with the Doppler effect. In short, the 4K mode allows for a doubling of the transmitter distance in single frequency networks (SFNs) compared to the 2K mode and, when compared to the 8K mode, it is less susceptible to the effects of Doppler shifts. It offers a new degree of network planning flexibility: 8K mode for small, medium and large SFNs with high speed reception, 4K mode for small and medium SFNs with very high speed reception and 2K mode for small SFNs with extremely high speed reception.

In-depth interleaving

The in-depth interleaving may be viewed as a spin off of the fact that DVB-H terminals would incorporate 8K symbol interleaving capability as a standard.

The type of interleaving requires a large memory size in the terminal in order to process the data transmitted in one complete 8K OFDM symbol. However, if a 4K mode is used, the size of the 8K mode memory is able to process two 4K frames or alternatively four 2K OFDM symbols.

The new scheme results in an increased interleaving depth for the 2K and 4K modes and in improved performance. If the full amount of the available memory is used, the resulting method is called in-depth interleaving. In-depth interleaving provides an extra level of protection against short noise impulses caused by, e.g. ignition interference and interference from various electrical appliances.

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	Mode		
OFDM parameter	2K	4K	8K
Overall carriers	2048	4096	8192
Modulated carriers	1705	3409	6817
Useful carriers	1512	3024	6048
OFDM symbol duration (μs)	224	448	896
Guard interval duration (μs)	7,14,28,56	14,28,56,112	28,56,112,224
Carrier spacing (kHz)	4.464	2.232	1.116
Maximum distance of transmitters (km)	17	33	67

Table 1. Parameters of the three OFDM modes supported by DVB-H

Every month AD Lyon sums up the highs and lows of life in the Oxford TV service trenches

The Lyon's Den

Times are changing so rapidly this time last year we had about thirty to forty conventional CRT sets coming through the door each week, with maybe three to four LCD screens over the same period of time. Last week for the first time ever we never had a single CRT set in for repair but we did get over thirty LCD screens.

What hasn't changed however is customers attitudes on the amount of money they feel is reasonable to pay for a repair, well I say it hasn't changed, it has really; our customers seem even less willing to pay for a repair on one of these sets. Maybe its because they are still fairly new and the customer doesn't feel he has had his money's worth yet, I don't know but whatever the reason they don't seem willing to part with their money for a repair. Below is an actual week of scenarios.

Mon 4-02-08

In comes our first customer of the day at 9:30am with a wharfedale wdf660 integrated LCD TV. He had a face that looked like a bulldog sucking a wasp and a personality to match. He crashed the TV down menacingly on the front desk and said "what a load of c—p this has been, fix it for me would you as long as the bill doesn't come to more than a fiver." When I explained that the bill would be more than a fiver and that our inspection fee on LCD TVs is £40.00 which is non refundable the air turned well ….blue I think would describe it. He stormed out shouting at me to "bin the bl---y thing."

Tue 5-02-08

In came a young lady, unusual in itself because most of our customers are of the older variety she said she had a TV in the car that she needed a hand in with. I went out to her car to fetch the set, which turned out to be another LCD screen, this time a Toshiba 30WL46B. The volume on this set was stuck on full, no adjustment could be made either via the control buttons or the handset, she too took some persuading that it was worth parting with the £40.00 fee, the only thing that swung the decision in our favour was that she could put it on her credit card.

After she had gone we took the back off and discovered the by now common Vestel Chassis inside; experience told us that the fault was almost certainly the eprom. I rang

the girl with a quote of £85.00 to put the set right. "How much," she said in disbelief "£85.00 oh no I won't bother then, I was going to upgrade my mobile this afternoon but I think I'll upgrade the TV instead. Can you just dispose of it for me?"

Weds 6-02-08

In waltzed a man who I would say was in his early 30s "I'm just off to the dump with this," he said "thought I would see if you wanted it for spares". It was a Beko NR20lb450. I don't normally take in sets that other people are throwing out but it just so happened about an hour earlier one of my rental customers had asked me if I could get them a smallish LCD screen for their bedroom, so just in case I could sort this one out I thanked him and said goodbye.

Thurs 7-02-08

Late in the day in came another chap again in his late 30s carrying another Toshiba set, this time model no 27WLT56B. "The picture has shifted over to the left and I can't get a menu up, I'm not happy at all, I paid £600 for this only about 18 months ago". I managed heroically again to prise £40.00 from his wallet and set about work on the set again, it was a Vestel Chassis and again the eprom was at fault and yet again the estimate of £85.00 was turned down and I was asked to get rid of the set or use it for spares.

Fri 8-02-08

In came a Bush 26" LCD again a vestel chassis and again an eprom fault again the customer did not want to pay £85.00 but said I could keep the set, he wanted a bigger one anyway.

Well, what a disastrous week!! Well actually no, it was a pretty good week for us. The first set the Wharfedale f660 was intermittently switching to standby, this was cured by changing c867 and c868 after which we were rewarded with a good picture the set was sold for £285.00 two days later.

After fitting a new eprom to the 30WL46B everything functioned well and a sale was secured for £325.00

The NR20 Beko seemed to run OK and I couldn't find any faults at all, this set has now been out on rent for a month, no faults have been reported to us so I guess this customer may also have been "upgrading".

The story on the other two sets is just the same, replacing eproms cured the problems one of them is out on rent and the other sold for £325.00

Victory from the jaws of defeat really. Reminds me of a poem we were taught in English at school:

Success is failure turned inside out the silver tint of the clouds of doubt

And you never can tell how close you are

It may be near when it seems afar

So stick to the fight when you're hardest hit

Its when things seem worst that you mustn't quit.

Finally I would like to say goodbye to my mum who died last month. Mum had been a part of our business for many years and will be so sorely missed by us, by customers and reps many of whom used to pop in for a cup of tea and a chat with her. We are only just beginning to find out just how much work she did here.She seemed to be the calming influence on our customers after I had managed to upset them. Kathleen Lyon 1939-2008.

The TV Man

by Arthur Jackson

A popular rental set in the eighty's was the ITT model fitted with the CVC32 chassis, it commonly suffered from tripler/transformer and associated component failure and involved a fairly lengthy repair.

The symptom of this failure was the slow pump-pump sound and almost every customer presumed it was just a simple problem as 'it nearly comes on,' so many times my heart sank when I heard this familiar sound and I knew it was going to be another late night.

Often midway through the repair the tip would snap off my Weller soldering gun and just as often I had forgotten to carry a spare so a temporary repair of wrapping the two broken ends together and filing a makeshift tip for temporary use had to be done, I'm sure this didn't just happen to me!

I remember one terrible wet day that I got a flat wheel on a quiet road when I seemed to be miles from anywhere, naturally the car as always was loaded to its limits with at least five large TV sets plus parts, tools etc. I still had a good days work of calls ahead of me, the rain was quite obviously on for the day so the sooner I got things sorted out and back on the road again the better.

As I drove an estate car and the rear seats were usually folded down I had cut (cleverly I thought) a sheet of plywood to make a full floor in the back in a bid to ease loading and unloading. This had been a great idea up until now, when I suddenly realised that the spare wheel and jack etc were in the housing underneath the floor! (Where's the clever-dick now?). Needless to say the next half hour was to say the least, quite eventful!

As I had to unload everything from inside the car and cover it in the best manner I could with the plywood floor and my coat while I changed the wheel, once again my language would not have been suitable for use during Sunday afternoon tea at my granny's but it was temporarily comforting at the time!

I thought it was a much better idea when the next estate car I got had the spare wheel in a rack under the chassis and indeed most of the time it was fine; until one day coming down one of the many country lanes with the car fully loaded the wheel rack caught on a large stone and fell down throwing the spare wheel out and somewhere into the hedge in the dark and twisting the rack so badly that it wouldn't bolt up again.

When I eventually found the wheel I discovered the car was so full of things that I couldn't get it inside with the boot lid fully closed and I had to cut the mains lead from two of the TVs inside, one to tie the boot lid down and one to tie the wheel rack up, oh, and as I'm sure I don't need to mention, it was of course raining uncontrollably at the time.

Another call I well remember was to a notorious customer who complained constantly about his viewing quality, to be honest barely one in ten of his requests for service were ever necessary. On this particular day his complaint was of a snowy picture on all channels.

When I arrived at the house I looked up at the aerial before going in and saw a badly weather and smoke damaged array with no reflector plate, the downlead was also unsecured and looked poor so I assumed that this was obviously the problem and when I saw the snowy display on the TV inside I was confident my initial suspicions had been accurate.

I proceeded to describe the aerial condition to the customer and advised him to install a new one complete with downlead.

At this point he blew his top and accused me of using this as an excuse to charge him, and he then went on to say "TV MEN ALWAYS BLAME THE AERIAL." I then decided to prove my point by connecting a loan set to his aerial to make him realise where the fault really lay.

A few minutes later I had another set in from the car and connected up, I then stood back confidently with my arms folded as it warmed up, thinking to myself, "the things I have to do to prove a point" but I nearly fell through the floor when the loan set produced a perfect picture on all channels and in fact the problem turned out to be a fault within the tuner in the TV!

The signal was so strong in that area that a finger placed on the aerial socket produced a colour picture, it was pointless trying to explain my initial suspicion to this customer, after all they're always right!

...story continues in the next issue!

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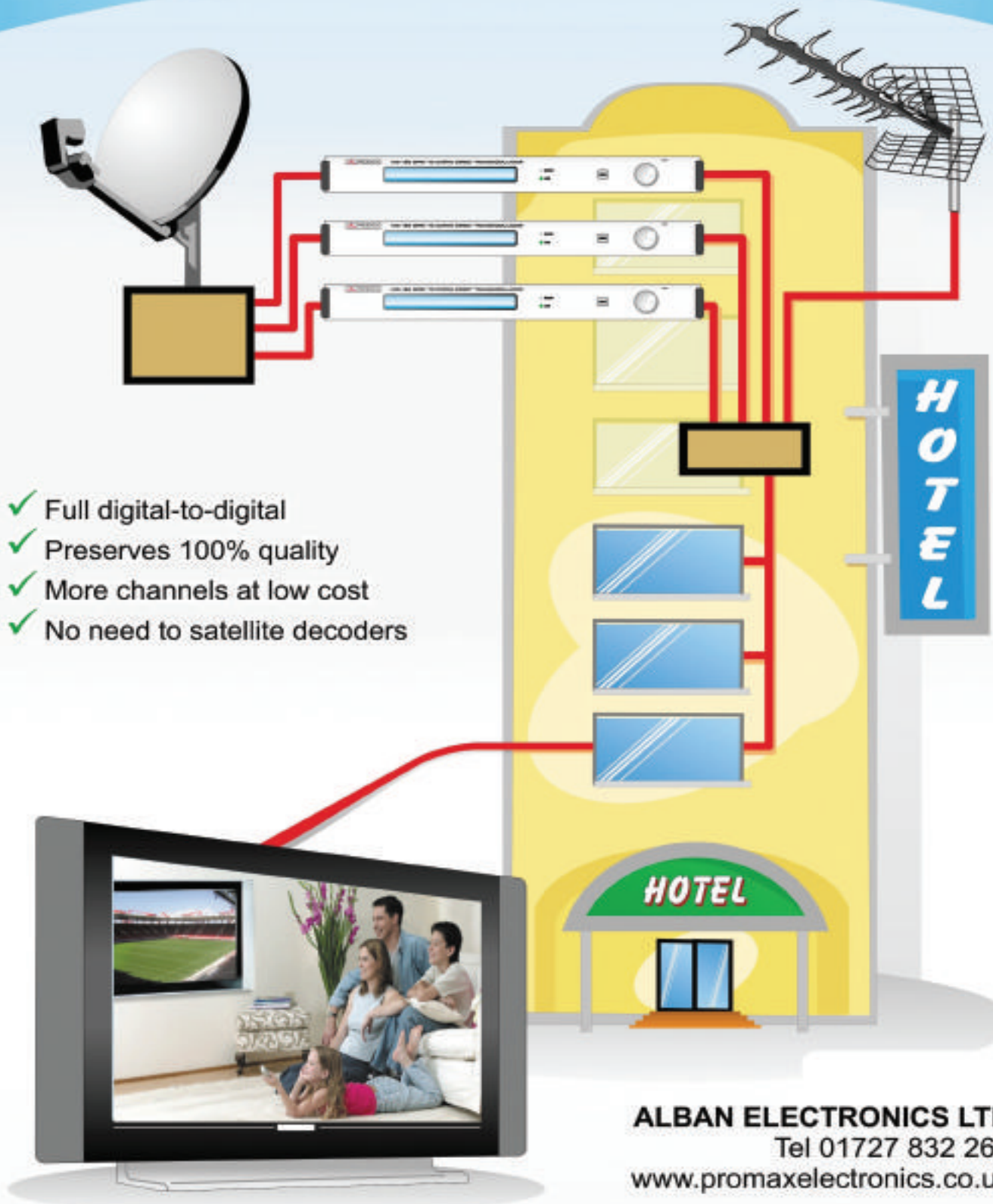

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