ENG INF

SUMMER 1990 No. 41

LIVE FROM ROME – HDTV

The BBC recently hosted, on behalf of Eureka 95, three live HDTV demonstrations of World Cup football from the Olympic Stadium in Rome, including the final match on the 8th July. Several hundred guests attended the demonstrations in Studio 4 at Television Centre, including MPs, journalists, manufacturers of Broadcasting equipment, and senior members of BBC staff.

The live pictures from Rome were provided by the Italian state broadcaster, RAI, using six BTS Eureka HDTV cameras and two Eureka HDTV outside broadcast units. The sound consisted of stereo ground effects, for background atmosphere, along with four separate commentaries in Italian, French, German and English. The vision and sound signals were encoded in the HD-MAC transmission standard and relayed via the Olympus and French TDF satellites to special receiving installations in Italy, France, Germany and the UK. These were the first HD-MAC transmissions of a live HDTV broadcast.

In the UK, the transmissions were received via a BT mobile 2.4m dish, parked adjacent to Studio 4 at Television Centre. The HD-MAC signals were fed to a Thomson decoder and Philips and Thomson receivers. The output from these provided both a 625-line compatible picture and the full 1250-line HDTV picture for viewing in the studio: for the HDTV demonstrations, front and rear projection displays were used as well as a conventional crt monitor.

HDTV also went on display live at Wimbledon this year. Using two BTS cameras, continuous HDTV coverage of the Centre Court action - including HDTV graphics - was relayed via a specially-designed fibre-optic link to the Club House. From there, the signals were separately fed to the Royal Box Guest Area, the Press Restaurant and the Players Lounge, where the HDTV pictures were displayed on crt monitors. A separate feed to the Octagon gave every ticket holder the opportunity to view the HDTV action on a 50-inch rear projection display.

For the first time, a quarter-picture inlay facility was demonstrated. This enabled a 625-line picture from any of the regular cameras at Wimbledon to be inserted into the corner of the HDTV picture. Thus, play from other courts could be viewed simultaneously on the high definition monitors covering the Centre Court action.

Earlier this year, HDTV was demonstrated to the public at the Ideal Home exhibition in London. The demands placed on the HDTV playback equipment are described on page 18.

John Barrett, R.D.

Off-screen HDTV photograph: Italy taking a penalty against the USA.

CONTENTS

BANGOR
- Improved facilities for News 13

DESIGN GROUP
- New chip design capability 4

DIGITAL BROADCASTING (Part III)
- Bit-rate reduction 14

ENERGY MANAGEMENT 10

ENTERPRISES
- Ceefax/Mercury Paging agreement 5

GLASGOW
- Computing the Local Election results 5

HDTV
- At the Ideal Home Exhibition 18

LEEDS
- Logica's DPA system 7

NETWORK RADIO
- A New Pattern of Broadcasting 2
- A tasteful refurbishment 19

NETWORK TELEVISION
- Electronic stills system for Presentation 8

RADIO TRAINING
- Studio 3 refurbished 20

SUTTON COLDFIELD
- The first forty years 6

TRANSMITTER NEWS 2

VERTICAL BLANKING INTERVAL
- New usage from 8th June 3

ENG INF

Edited, designed and typeset by EID, Room 707A, HWH. Tel: LBH 4316

Printed by ETD, Woodnorton

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The closing date for stories to be included in the autumn issue is 24th August.

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Friends and colleagues were shocked to hear that Derek Robinson of EID had passed away. Among other things, Derek was responsible for organising the annual EsIC Conference and the visits by outsiders to BBC technical premises in the London area. He also led a very active life outside the BBC.

Derek is greatly missed by all those who worked with him and our heartfelt sympathies go to Sybil and the rest of the family.

Mike Meyer

NETWORK RADIO:

In the light of the forthcoming Broadcasting Bill, the BBC will have to surrender some of its medium-wave frequencies for use by national commercial broadcasters. Consequently, the top priority in Network Radio is to reorganise our services to accommodate the end of *simulcasting* - the simultaneous broadcasting of a radio service on more than one waveband.

The move to single-waveband broadcasting will, of course, put an end to the practice of *network-splitting* - the broadcasting of different programmes on a network's FM and its medium-wave (or long-wave) outlets.

The end of simulcasting and network-splitting will substantially alter the pattern of national radio broadcasting by the BBC, as explained here.

Over the years, network-splitting has enabled us to offer our listeners a wider choice of programmes. Depending on programme schedules, the ***four*** national services have been able to broadcast up to ***seven*** different programmes simultaneously - Radio 1, Radio 2 (FM), Radio 2 Sport (MW), Radio 3 (FM), Radio 3 Cricket (MW), Radio 4 (LW) and Radio 4 Education (FM). However, network-splitting is not popular with many of our listeners; it causes considerable confusion (and annoyance) when listeners are asked to change wavebands in order to hear the programme they want.

BBC RADIO TWO 88-91 FM

Before this major switch to FM takes place it has been necessary to discontinue Radio 1's periodic use of the Radio 2 FM network (10pm to midnight on weekdays, and on Saturday afternoons and Sunday evenings). This practice stopped in April 1990 when about three quarters of the UK population had access to Radio 1's new FM network.

BBC RADIO five

Radio 5 — which starts on 27 August — will overcome much of the need to split networks. It will use Radio 2's medium-wave frequencies to provide a varied schedule of sports, educational and youth programmes. During weekdays, Radio 5 will also carry certain World Service programmes in the early morning and late at night.

With the introduction of Radio 5, Radio 2 will become an FM-only service.

Much effort is already going into encouraging Radio 2 listeners to switch to FM, including over-air trails and meet-the-public events such as ***Radio Goes To Town*** and EID's mobile ***Tuning Clinic***. Furthermore, a special telephone linkline into EID has been provided and the number is trailed frequently by Radio 2. This enables listeners, at the cost of a local call, to obtain tuning and reception advice on Radio 2 FM from trained staff.

BBC RADIO one 97-99 FM

The Radio 1 FM network (97.6 to 99.8 MHz) is now developing as fast as resources will allow: transmitters are being installed at all existing FM sites (on a population-priority basis) and, by the end of this year, coverage will be greater than 90% of the population.

Radio 1 will lose its medium-wave transmitter network to a commercial operator in the next few years. Thus, it too will become an FM-only service.

TRANSMITTER NEWS

The following services opened between 17th March and 22nd June:

Television

Long Compton	West Midlands
Penrhiwceiber	Mid Glamorgan
Redbrook	Gloucestershire
Roose	Cumbria
Uplawmoor	Strathclyde

FM Radio

Eitshal	Western Isles
Walsden South	W. Yorkshire

Radio 1 FM

Londonderry	Co. Londonderry
Pontop Pike	Co. Durham
Rowridge	Isle of Wight

On 2nd May, the Oxford Radio 1 FM transmitter changed frequency to 99.1 MHz, substantially increasing its power at the same time.

Radio 4 FM

The Radio 4 FM transmitter at Ballycastle (Co. Antrim) was converted to stereo on 10th April.

Local Radio

The BBC's thirty-seventh local station - *BBC Radio Suffolk* - opened on 12th April, with FM transmitters at Manningtree and Great Barton.

A New Pattern of Broadcasting

BBC RADIO THREE

Ball-by-ball cricket commentaries on Radio 3 medium-wave will transfer to Radio 5, when it starts in August. Open University programmes will also be moved to Radio 5 but, during the night, Radio 3 FM will carry repeats of educational programmes - for the benefit of the few schools, OU students, etc, that cannot receive Radio 5 satisfactorily.

Radio 3 will lose its medium-wave outlet to a commercial operator in the next two to three years. Thus, it will also become an FM-only service.

BBC RADIO FOUR

Radio 4 FM, until recently only available in England, is now being extended to Scotland, Northern Ireland and Wales as quickly as resources will allow. Educational programmes (Schools, Options and the Open University) will be transferred from Radio 4 FM to Radio 5, when it opens in August. All Radio 4 programmes will then become available on FM and listeners will no longer have to retune to long-wave in order to hear the programme they want.

Radio 4 will be retained on the long-wave band but, on occasions, this outlet may carry 'national events'(such as running news stories, Elections, etc) while scheduled Radio 4 programmes continue on FM.

Thus, as the new pattern develops over the next few years, FM will become the main outlet for Radio 4 and the only outlet for Radio 1, Radio 2 and Radio 3. A sizeable number of new transmitting stations will be built, to extend Network Radio to areas where FM reception is inadequate at present.

On the medium-wave band, Radio 5 will be the only UK-wide service provided by the BBC. The Radio 4 long-wave service will be retained but, on occasions, may cover national events while the regular programmes continue on FM.

The end of network-splitting will enable each network to present a clearer identity to the listener.

A three-waveband radio will still be necessary to receive the full range of BBC Radio programmes. However, because the majority of BBC Radio will ***only*** be available on FM, good reception performance on this wave-band will become an essential feature to consider when buying a new radio.

Controller Radio 5, Pat Ewing, explains the role of the new network at a Presentation for Staff in BH, London.

VERTICAL BLANKING INTERVAL

Since Friday 8th June, the Vertical Blanking Interval (VBI) on both BBC1 and BBC2 has been used as follows:

6 + 319	Local Noise
7 + 320	Network Noise
8 + 321	Datacast
9 + 322	Datacast
10 + 323	Ceefax
11 + 324	Ceefax
12 + 325	Ceefax
13 + 326	Ceefax
14 + 327	Ceefax
15 + 328	Ceefax
16 + 329	Ceefax
17 + 330	Ceefax
18 + 331	Ceefax Subtitles
19 + 332	ITS
20 + 333	ITS
21 + 334	ICE
22 + 335	One-Line ITS (test)

The additional Ceefax lines have been provided to improve its flexibility; for example, pages which are in great demand (such as the recent World Cup football) can now be accessed more quickly.

DESIGN GROUP New chip design capability

Design Group has added VLSI (Very Large Scale Integration) chip design to its repertoire of techniques for the cost-effective engineering of equipment. The Group's Audio Section has now taken delivery of working samples of its first major design - a chip called AESIC - which is described here by Simon Wegerif.

AESIC implements the AES/EBU standard for the serial transmission of digital audio signals - a format intended to convey two channels of sound along a twisted-pair cable, for short to medium distances of up to a few hundred metres. The chip comprises a receiver and a transmitter for the standard, and has been implemented in around 15,000 gates (60,000 transistors). It was manufactured by LSI Logic at its Foots Cray plant in Kent, using 1.5μm CMOS logic as a gate array.

The primary aims of designing the chip were (i) to reduce the cost of ownership of digital audio equipment which makes extensive use of the AES/EBU Interface and (ii) to provide a good quality hardware implementation which is suitable for professional audio use, both within and external to the BBC. The size and cost savings per unit are potentially very large, when you consider that previous hardware versions of the Interface circuitry have required a printed circuit board of about 250 x 150mm, for each of the transmit and receive functions.

The specification phase of the project involved collecting together both Design Group's and Research Department's ideas and experience in the use of the AES/EBU Interface, which has been in existence and under development since 1985. The Audio Industry, both at home and abroad, is very interested in the resulting design and we are actively pursuing licensing agreements which will make the chip widely available to equipment manufacturers.

Simulation software

AESIC was designed without hardware breadboarding of the digital logic which makes up the chip. This meant that there was no prototype to evaluate in the laboratory. Instead, simulation software supplied by the silicon vendor, LSI Logic, was used to assess both the functional and the timing performance of the proposed design. This kind of simulation is very compute-intensive, as delay and functional behaviour must be calculated for every gate in the system at each clock cycle. In the case of AESIC, which contains 15,000 gates and runs at a master clock of 50MHz, simulation of an entire block of AES/EBU data (4ms) required some seventeen hours on a relatively powerful Sun 3/60 workstation.

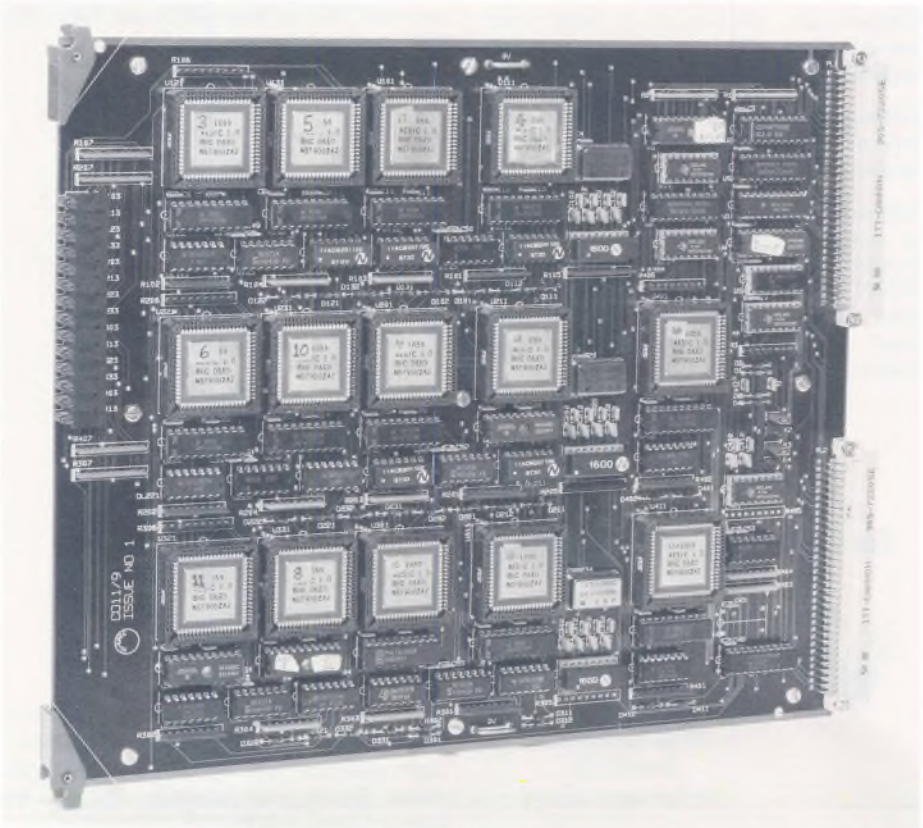
To carry out a simulation, the designer is given a display on a computer monitor which resembles that found on a laboratory logic analyser. This allows input and output waveforms to be edited and viewed. The software then simulates the performance of the chip by first calculating the delays of all the logic under a specified set of temperature, voltage, and silicon processing conditions, and then by applying the input waveforms to the circuit. The waveforms used to excite the design have to be chosen judiciously, as an exhaustive test of all permutations of the 24 audio bits in the AES/EBU Interface structure would require a simulation time of some 160 years!

Once the design has been properly reviewed (mistakes are costly at around £30k for a rework!), a list which contains all the essential interconnection information is submitted to the silicon vendor for fabrication. The designers must also produce a set of test vectors which specify inputs to the chip, along with the expected responses from its outputs. This data allows the vendor to determine whether or not each sample of the chip is behaving as it should, albeit operating at a much slower rate than in real life. Around four to six weeks after the design has been signed off, the first prototypes arrive for evaluation. If all is well, as in the case of AESIC, production quantities can then be ordered.

Audio Section, in conjunction with Research Department, is developing an experimental multiplexed digital audio routeing system, for initial installation in Broadcasting House, which uses 150 of the AESIC chips. This project would not have been practical using discrete implementations of the Interface.

Design Group is now able to provide advice on VLSI design and manufacture, in the expectation that more economic, compact and advanced broadcast equipment will result.

For further information on AESIC pricing and availability, please contact Richard Lawrence on AH264, and for advice on possible chip designs, Bill Fletcher on AH258.



Multiple AES/EBU receiver card featuring fourteen AESIC chips.

Simon Wegerif,
Audio Section,
Design Group.

GLASGOW
Computing the Local Election results

The recent Local Elections enabled staff around the country to try out the latest computer techniques to correlate and display the results as they came in. Here, Iain Gilchrist describes the arrangement used in Glasgow.

Thursday 3rd May was the climax to many weeks of software writing for Glasgow CTA staff, Peter McArthur and Douglas Haffenden. This was the night when BBC Scotland would transmit 'The Regional Vote' and the night where we hoped that we would have nothing to do but sit and watch the furious activity of the programme staff.

Discussions began in November 1989 with News and Current Affairs about the method to be used to collect voting results from all 524 wards in Scotland and display relevent statistics to the programme presenters and the viewers.

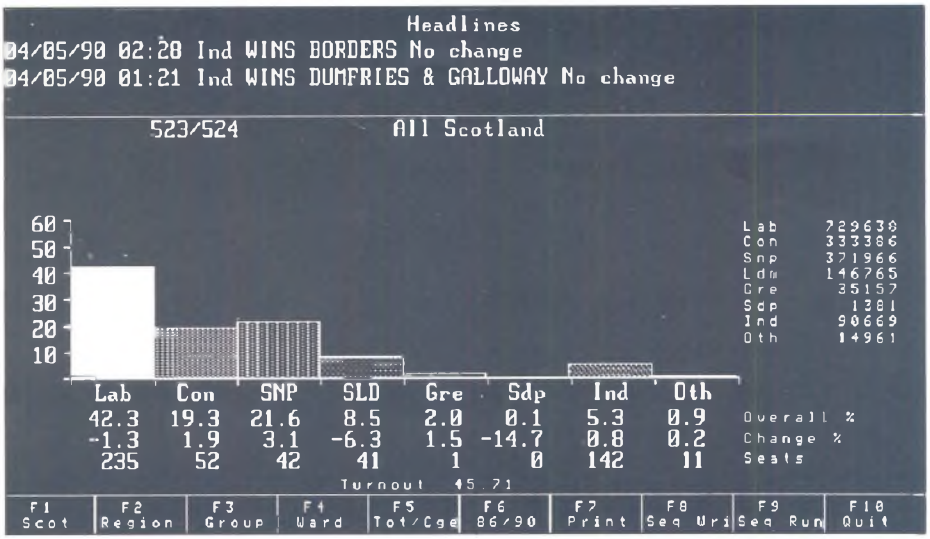
The voting results were entered by ten telephonists on Studio A floor. These results immediately produced a range of regional and all-Scotland statistics on computers operated by the editor in the production gallery, the psephologist, and presenters Kirsty Wark and John Milne on the studio floor. Enquiry terminals were also installed in Studios 5 and 6 for Radio 4 and Radio Scotland. A remote system was provided in Studio 2 at Television Centre in London.

The computer hardware, which was rented from Micro Rent, consisted of eighteen IBM PC AT compatible computers, connected to a Compaq 386/33 fileserver by thinwire ethernet cabling.

The software was written using the dBase compiler, Clipper, and was run under the control of a Novell network operating system, also supplied by Micro Rent.

Animated results for transmission were produced by a Spaceward Matisse, using statistics from the database over backgrounds produced by graphic designer, Colin Comrie. Animation and statistics options were selected by designers in Electronic Graphics, from two menu screens displayed on the Matisse pc. Software for the Matisse was written in Microsoft C, with the aid of a library of functions provided by Spaceward. An animation editor was initially written to simplify the compilation of the animated sequences. This will considerably reduce the programming effort required for Elections in the future.

Iain M Gilchrist
Technical Duty Manager,
Scotland



Studio enquiry terminal: the screen display after 523 of the 524 Local Election results had been entered.

ENTERPRISES
Ceefax/Mercury Paging agreement

Earlier this year, Enterprises and Mercury Paging signed an agreement representing a unique development in personal mobile communications. It enables Mercury to broadcast Ceefax newsflashes to their Messenger One pager. This, it is claimed, is the smallest and lightest message pager in the country, measuring 78 x 54 x 18 mm and weighing under 4 ozs with its AA size battery.

Messenger One can accept and store up to sixteen messages, totalling nearly two thousand characters of data or text (three hundred words of text). Users can tell the difference between Ceefax newsflashes and personal messages by the tone of the alert. Ceefax updates, which average around twelve a day, come with a single 'chirp' while personal messages arrive after the traditional two seconds of rapid 'bleeps'.

In situations where the user would prefer not to be chirped or bleeped, Messenger One - wait for it - comes with a 'vibrator option'. In this mode, the unit is attached to the user's arm, waist or leg, via an appropriate harness, and starts to vibrate gently as a newsflash or message comes through.

Messenger One comes complete with all these features for £36 per month during 1990. After that, the Ceefax newsflash service will cost an extra £2 per month.

"Through this novel and useful extension of the Ceefax newsflash, you need never be out of touch with world events as they happen. Enterprises is delighted that the agreement with Mercury Paging represents a first in the commercial development of the Ceefax service" said Gerry Clark, Sales & Marketing Manager of Enterprises' Broadcasting Services department.

"The Mercury Pager is rather like having a BBC newscaster in your pocket, or your handbag. It means that to stay in touch and know what's happening of importance around the world, you need only carry a Mercury Pager," added Mike Marrs, Marketing Director of Mercury Paging.

SUTTON COLDFIELD
The first forty years

The transmitting station at Sutton Coldfield recently celebrated its fortieth anniversary. Here, George Bath takes us on a short trip down memory lane.

With the opening of Sutton Coldfield on the 17th December, 1949, 405-line television on vhf Band I became available to six million viewers in the Midlands. The station was declared open by the then Postmaster-General, Mr Wilfred Paling, in the presence of the Director General, Sir William Haley, and the Vice-Chairman of the BBC, Lady Reading.

Although built primarily as a television station, the main building was extended in 1957 to accommodate FM transmitters for the Home, Light and Third programmes. And further changes were required to both the mast and the buildings before uhf 625-line television could start.

625-line television begins

The first 625-line transmissions for the Midlands started on the 6th December 1964, on BBC2. These were at reduced power, using a temporary aerial system which was mounted on a 46 metre tower. To accommodate the uhf aerials on the original 229 metre mast, the vhf tv aerials had to be replaced by a new array, mounted below the vhf radio aerials. This allowed the permanent uhf aerials to be mounted at the top of the mast, protected by the familiar white glass-fibre cylinder. The new uhf aerial was brought into service at full power (1000kW erp) on the 4th October 1965.

The next improvement was the introduction of colour transmissions to BBC2 (2nd December 1967) followed by the start of the BBC1 uhf service, in colour, on the 15th November 1969.

In the mid 1970s, Gates 1kW vhf transmitters were installed for local radio - Radio Birmingham (now Radio WM) and Radio Derby.

405-line television ends

A period of stability remained at Sutton Coldfield until 1981 when the original 50kW 405-line tv transmitter was removed and replaced by two temporary STC 500kW ones, working on a main and reserve basis. These transmitters would continue in service until the 405-line transmissions ceased (which was in January 1985).

Re-engineering for the Nineties

The original mast by now was over thirty years old and was not capable of carrying the new mixed-polarised aerials required for FM radio. A new mast was therefore built alongside the original mast during 1983 and the FM and uhf transmissions transferred to it.

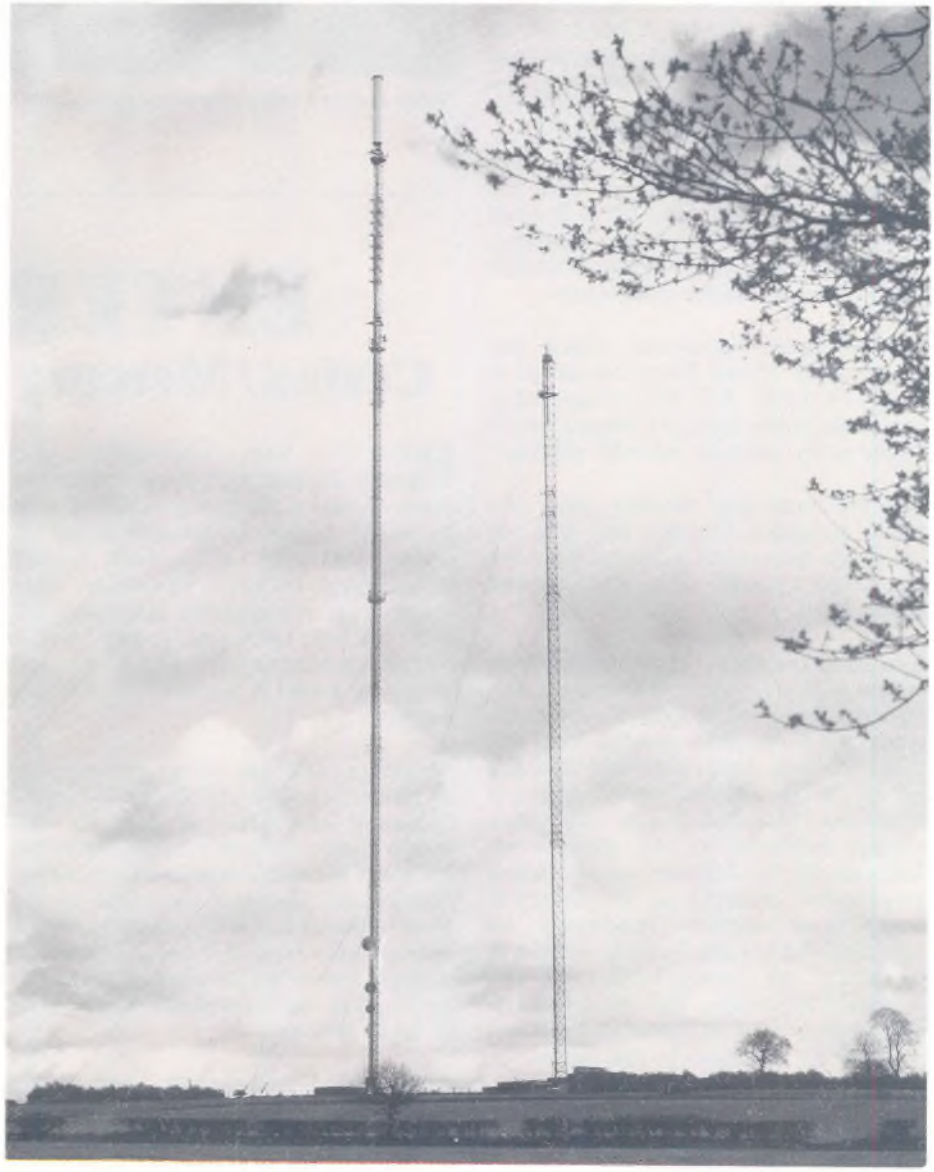
The space vacated by the original 50kW 405-line transmitter was used to allow new Varian vhf radio transmitters to be installed. After they had been commissioned, the old STC radio equipment was removed, allowing new Varian uhf television transmitters to be fitted in their place.

This period of re-engineering and building refurbishment was completed in December 1988.

As well as operating and maintaining the transmitters at Sutton Coldfield itself, the staff also maintain some 44 transmitting stations in the area, while the Sutton Coldfield Monitoring and Information Centre (MIC) is responsible for the monitoring of 160 transmitting station within the Midlands and Northern Ireland Area.

Thanks are due to Phil Morrison at Sutton Coldfield for researching the historical information.

George Bath
Transmitter Manager (Operations)
Sutton Coldfield



The old and new masts at Sutton Coldfield. The new mast, on the left, carries the uhf cylinder at the top and eight tiers of mixed-polarised Band II aerials immediately below.

LEEDS Logica's DPA system

Leeds is one of the first BBC areas to use Logica's Digital Picture Archive system. It is described here by Nigel Jackson.

Logica's Gallery 2000 stills library system, as used by News and Current Affairs, was described in Eng Inf 32. The company is now manufacturing a reduced facilities version called ***Digital Picture Archive*** (DPA) which BBC Leeds is using to create a library of electronic stills for local use. They have also installed a ***Digital Video Gateway*** with the DPA, to allow pictures to be directly exchanged between the library and other digital sources, without going via Slide File.

The DPA system has had a number of effects on the graphics operation in Leeds. When the BA10 slide scanner was replaced by Slide File as the main graphics output device, nothing replaced the filing cabinets full of slides. Now the DPA provides an electronic filing cabinet with a built-in index system.

The DPA terminal in the Graphics Area.

The process of using stills 'grabbed' from psc cassettes is very time consuming for both staff and hardware: the librarian has to identify the correct psc cassette, it then has to be replayed and the correct picture grabbed by Slide File and cleaned up. With the DPA now allowing these images to be archived, this process has only to be carried out once per still. The main effect is seen on the screen during early morning and late evening news bulletins from Leeds: these operate with minimum crewing and it is now possible to use a greater number of stills and to react more quickly to a developing news story.

Both Gallery 2000 and DPA allow for the storage of still pictures and a comprehensive 'index card' of information about the still. Searches of the index database can be made using all or part of the information on the index card, the more specific the information the faster the search. The DPA system is fully compatible with the Gallery 2000 system installed in the Central Stills Library; the index card and the format of the still on disc are the same, which allows for interchange of discs between libraries. The main difference between the two systems is that the Gallery 2000 can produce programme lists and download these selected stills into the Slide Files connected to the library system.

The Leeds DPA system is a basic system consisting of the micro PDP computer and one optical worm (write once read many) drive. The worm packs hold approximately 1100 pictures per side. There are two Slide Files and the Logica Digital Video Gateway connected to the system. The Gateway contains a framestore which can either be used to input or output a parallel REC 656 digital video picture, which is the method used to get pictures to and from the Spaceward Matisse painting system.

Two DPA terminals have been installed - one in the graphics area and the other with the Matisse. These terminals can be used to research and output pictures from the library, or to input pictures to the library. A further feature of the Leeds installation is its link to the Basys system, allowing the Newsroom terminals to research the Stills Library index. At present no means of viewing the pictures is available at the Basys terminals. If this proves a problem then a possible solution would be to add another framestore to the Gateway (one crate can hold up to 5 framestores) and use a monitoring-quality digital-to-analogue converter to provide a picture feed.

The DPA system and Matisse have been in service since the end of last year and the Gateway was installed in March this year. The installation work was carried out by Nick Langley of BBC Leeds.

The system in Leeds is one of a number of DPA systems recently purchased by the BBC. A system has been bought for Sport and installed in Studio 5 at Television Centre. It was purchased and installed by Chris Przeslak of P&ID Tel, to allow fast access to pictures of stills during sports programmes. It will also allow greater use of grabbed images, instead of copyright specially-shot photographic images. Another two systems have been installed in BBC Elstree and BBC Cardiff, while two further systems are on order for Glasgow and Northern Ireland.

Anyone wishing to see the system in operation should contact Peter Scallon, MPSE Leeds, on extension 227.

Nigel Jackson
Senior Project Engineer, CSG
P&ID Tel

NETWORK TELEVISION

Electronic stills system for Presentation

Over recent years there has been a dramatic increase in the volume of graphics material produced and stored electronically. P&ID Tel has just completed a trio of related installations at Television Centre in London which, together, provide a system for the preparation and transmission of electronically produced stills, for use by Presentation in the Network Controls.

The three areas are: the Network Stills Library; the Presentation Electronic Graphics Area, which forms part of Graphic Design in the Scenery Block, and the Presentation Auxiliary Mixing Area.

Here, Bruce Roberts and Nigel Jackson describe the new areas.

The production of trails and other promotional material relies heavily on the use of captioned stills from programmes. A large team from Graphic Design is dedicated to producing stills for Presentation and, until recently, these were always produced photographically. The slides were then replayed directly from a slide scanner in the Network Control. The first change was to take the slide scanners off-line and use Rank Cintel Slide Files as the on-air devices.

The Network Stills Library

After the decision was taken to create an electronic Network Stills Library, there was then a long process of evaluation before a suitable library was chosen.

Presentation was already using a Quantel DLS 6001 stills store, for the local preparation of stills, as well as the Slide Files for transmission. In the end, the Quantel Central Lending Library (CLL) was chosen because it was felt to be operationally more suitable than the Logica Gallery 2000 system, which is based on using Slide Files. The Network Controls now use Quantel DLS 6001 stills stores as the on-air devices, with material stored locally and downloaded as required from the CLL.

The Network Stills Library was installed with a capacity of some 5000 pictures, but this has already been substantially increased. The system was designed by the Central Systems Group (CSG) of P&ID Tel and installed under contract by Quantel Link. The P&ID Tel Project Engineer was Alastair Knights.

The Presentation Electronic Graphics Area (PEGA).

The Presentation Electronic Graphics Area (PEGA)

At about the same time, two Quantel Paintboxes were installed in a new Presentation Electronic Graphics Area in the Scenery Block. This equipment is dedicated to Presentation use, but has links to other Graphic Design areas for back-up purposes. The PEGA also houses an IFF System 1000 copy stand with a Sony DXC3000 camera, a character generator and a linear keyer.

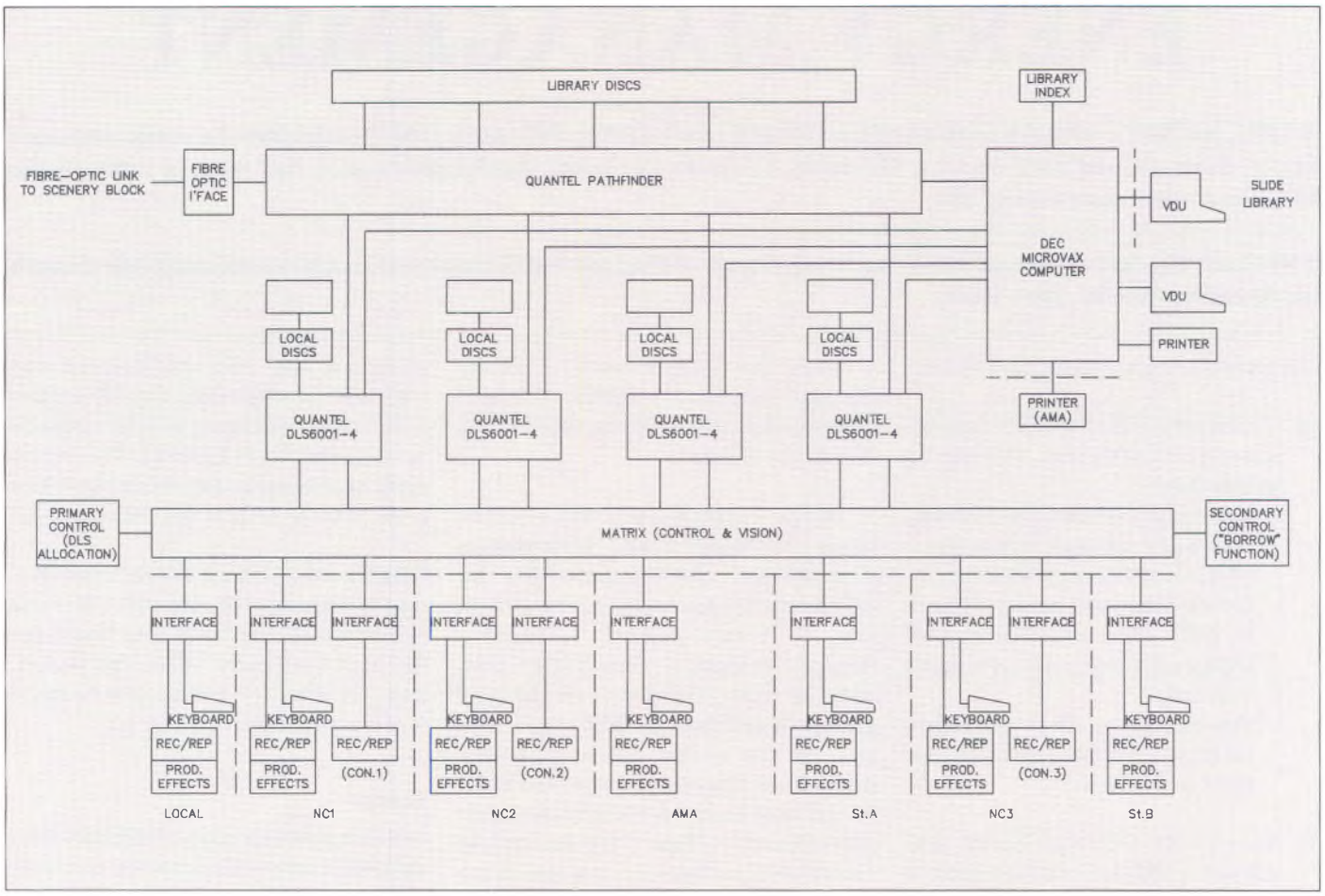
A further development has been the addition of a DLS 6001 stills store in the PEGA, and there will shortly be a fibre-optic connection between this and the Network Stills Library. This will enable graphic designers to download finished artwork direct to the library without the assistance of Presentation staff.

The PEGA was designed and built by CSG with the installation under the supervision of Chris Przeslak.

The Presentation Auxiliary Mixing Area (AMA)

The final link in the chain has been the construction of the Presentation Auxiliary Mixing Area. This had been planned some time ago, and was originally intended as a sub-mixer area for BBC2. Then along came electronic graphics, and the plans became ever more ambitious. It was felt in the end that there was just not enough room for a dedicated graphics area in the already over-crowded central wedge (on the fourth floor of the main block at TVC). Thus PEGA was created and the AMA became essentially a studio gallery.

The AMA is equipped with a Grass Valley 200 vision mixer, Questech Charisma



Schematic diagram of the Network Stills Library at Television Centre.

DVE, Aston caption character generator and an IFF System copy stand with a Sony DXC-M7 camera. In addition, the area has access to the Network Stills Library and is also fully equipped for stereo sound operations, with an Amek BCII sound mixer and connections to voice booths.

The AMA is used for three main purposes:

1) the preparation of stills, other than original artwork, and the management of the Network Stills Library
2) the preparation of trails and promotions for recording, including voice-overs
3) as a live studio into either Network, using outside sources and local sound sources

The AMA was built in-house by a team from CSG - Peter Matthews, Dave Clarkson and Mario Georgiou.

With an increasing reliance on electronic graphics and stills storage, the key to this whole set of projects has been to provide a secure, flexible and reliable system for the transmission of the hundreds of stills required for both networks every week. The Network Stills Library is designed to enable any Network Control, Studios A and B, and AMA to control any of the four DLS 6001 stills stores on the system, plus the Central Lending Library. In addition, it is possible for a librarian to "borrow" control of a network stills store, in order to manage the library without taking transmission control from the continuity announcer.

For the future, it is intended that the Network Stills Library will be fully integrated into the new Network Transmission Area, now under construction at TV Centre. This will include linking the stills replay devices into the computer system, allowing the use of electronic stills under the control of the automation.

Bruce Roberts
Senior Resource Planning Engineer

Nigel Jackson
Senior Project Engineer

ENERGY MANAGEMENT

In 1985, the BBC - with the support of the Government's Energy Efficiency Office - established a small corporate Energy Management Section, on a trial basis. Located in London, its objective was to find ways of reducing the BBC's ever-increasing energy bill.

It has been a great success and is now an integral part of Engineering Directorate. Its objectives and achievements are described here by John Ross.

The section's objectives are as follows:

(a) To reduce the BBC's utility expenditure by £100,000/year. This may be achieved by:
- Continually reviewing purchasing costs and ensuring the most cost-effective options are selected.
- Conducting joint energy surveys at BBC sites, with the aim of reducing energy consumption and costs.
- Ensuring the payback term is less than 3 years, where capital investment is required.

(b) To provide technical advice and support to BBC staff on energy matters.

(c) To make visits and presentations to external organisations in the promotion of Energy Management.

(d) To be the BBC's corporate point of contact on all matters relating to Energy Management.

UTILITY SUPPLIES

One of the greatest areas for making savings is in the purchase of utility supplies (gas, electricity, water and oil).

Gas

Prior to the privatisation of British Gas, users of this utility had little say in negotiating a good price. British Gas simply declared a selling price and, unless a site had the capability of switching to an alternative fuel, you paid up!

Since privatisation, the situation has improved: each district is now willing to discuss the selling price, based on certain criteria that exist at each specific BBC site. A major success in this area was the competitive price negotiated for an uninterruptible supply at Glasgow. Using this experience, Energy Management Section (EMS) managed to secure a better gas price deal for BH and TC in London.

A major breakthrough has resulted from the Mergers and Monopolies Commission investigation into the pricing structures operated by British Gas. It is now possible to reach a national agreement with British Gas, with the price being based on the ***total gas consumption of the BBC***, not on the site by site usage. Other payment options are also possible now and EMS has selected a number of different multi-site contracts. These have resulted in substantial savings on gas purchase costs, when compared with single/individual agreements.

Electricity

Selecting the most cost-effective tariff continues to reap financial benefits. On April 1 1990, due to privatisation of the electricity industry, the rules surrounding the purchase of this utility changed substantially.

Previously, regardless of the site consumption, the BBC was tied to the local area board for the purchase of electricity. Following privatisation, any site with a maximum demand in excess of 1MW can now purchase electricity from any of the fourteen distribution companies or the two new generators - National Power and Powergen. Recognising the opportunity this presented, EMS has invited tenders for the supply of electricity to the sixteen sites in this high-consumption category. Under normal published tariff costs, a total annual bill of some £10.2m could have been expected at these sites in 1990/91.

Following detailed analysis, and consultation with the representatives of the various Directorates, DE's Finance Meeting has now authorised the purchase of electricity for all sixteen sites from Powergen, with a resultant saving of £2.3m in 1990/91. This represents an average reduction in electricity costs of some 24%, at the sites involved.

Smaller sites - whose annual consumption is between 100 and 999 kW - will still be tied to the local area board for the next four years. After this period, however, they too will be able to invite tenders from other suppliers.

Water

Over the past four years, EMS staff have acquired expertise, knowledge and technical measuring equipment which has resulted in major cost savings in respect of water consumption and removal. The section has been able to identify sites where charges were proved to be invalid or where available allowances had not been claimed.

One transmitting site recently obtained a rebate of around £2400 when EMS discovered that it was wrongly paying for its water supply, based on rateable value. A water meter was available on this low-consumption site!

With the recent privatisation of the water industry, future charges will rise in the years ahead - probably well above the rate of inflation. Hence, it is the section's intention to continue to investigate water charges, with a view to keeping these to a minimum at all BBC premises.

Oil

Advising on the best oil deals is currently outside the scope of the section, although a more aggressive purchasing stance can still pay dividends. Most BBC sites are switching to gas, during refurbishment.

Following a review of buying procedures at BH Belfast, the introduction of a 'spot buying' system helped to reduce costs by around 25%.

COMPUTER SUPPORT

The section relies greatly on a three-terminal computer system. Without it, EMS would be incapable of answering questions such as:-

> "How many sites, with North Thames gas, consumed more than 25,000 therms last year?"
>
> "How many London Electricity Board sites are on a day/night maximum-demand tariff?"

The computer system provide three main functions, as follows:

The Corporate Energy Database

A multi-user system called the ***Energy Reporting Operating System*** (EROS) captures all utility consumption information, including costs, for all sites throughout the Corporation. This data can be manipulated to provide a wide-ranging number of reports such as: year-to-year electricity consumption profiles for each site (either numerical or graphic output); comparison of actual against targetted consumption; dates when tariffs changed last, etc.

The system now has a sophisticated graphics capability as well as improved data entry techniques.

EMS has been approached by two external companies with a view to this package being sold commercially. If this goes ahead, the BBC would of course receive licence payments.

Remote Plant Monitoring

At each site where an energy survey has been undertaken, the installation of a computer plant control system has been financially justified. Such systems offer: remote control of timeswitching equipment; energy consumption and other useful statistics; notification of faults, etc. This facility is invaluable in monitoring the effect of an Energy Reduction programme and helps to establish the most cost-effective control strategies.

Trials are currently underway at various transmitting stations to provide a simpler and more accurate means of billing other users of the site, such as the IBA and mobile radio operators.

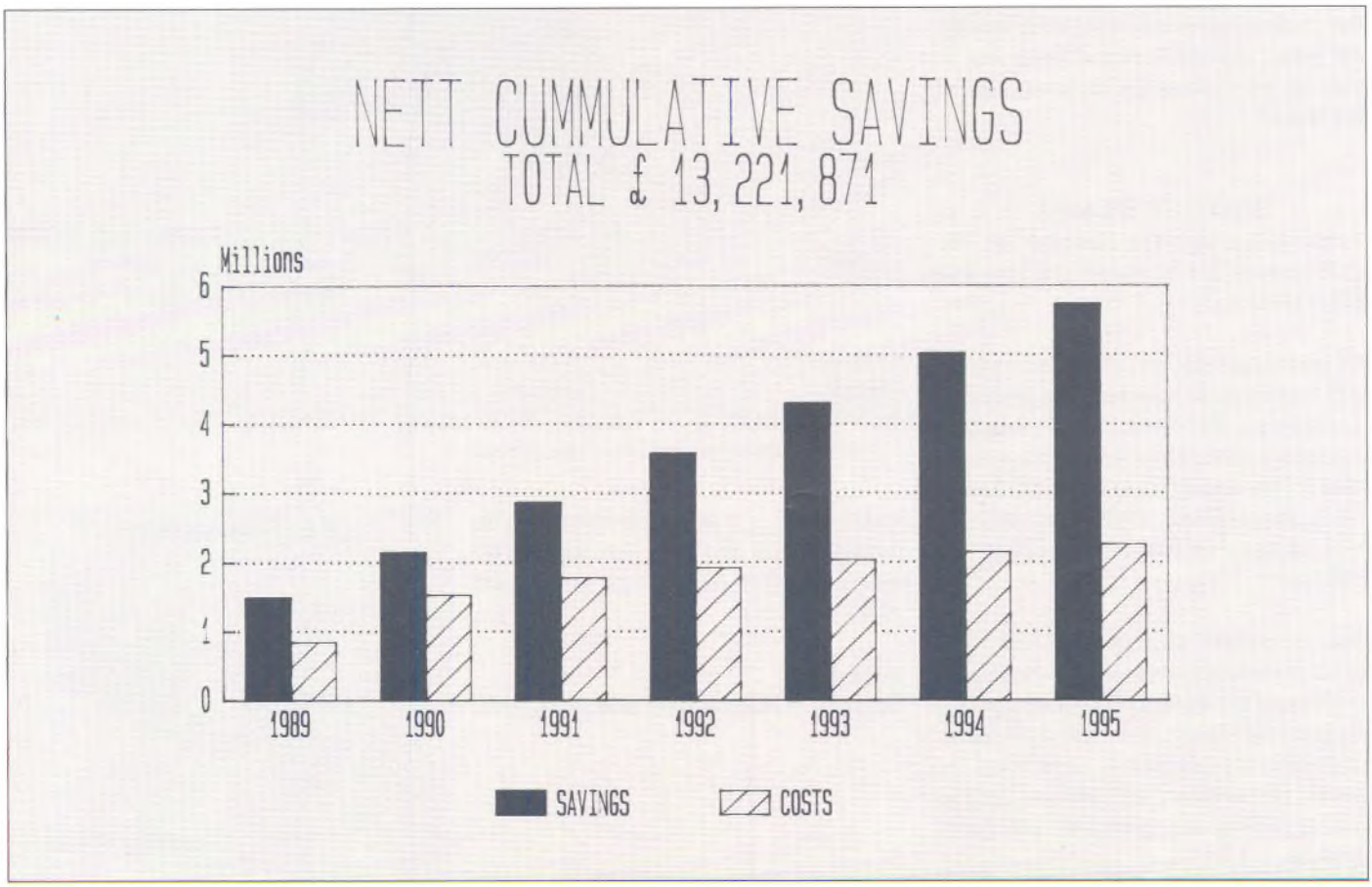
Office Support Systems

Each of the three terminals has the capability of running IBM-compatible software packages. Those in current use include graphics, word processing, spreadsheet, project management (PERT) and an office diary system.

SOME RECENT ACHIEVEMENTS APRIL 88 TO APRIL 90

In the last two years, the section has achieved savings of around £1.1m and by the financial year 1991/2, the accumulated savings are expected to be around £3m gross; £2m net when capital and operating costs have been deducted.

During the reporting period, major energy surveys were completed and



The BBC's projected energy savings over the next five years.

Finance Cases approved for BH London, BH Belfast and Pebble Mill. Other survey reports have been or are being compiled for BH Bristol, BH Leeds, Sutton Coldfield and BH Cardiff. Following an earlier EMS survey, BH Glasgow received an external award for the efficient use of electrical energy for lighting. In all these studies, the importance of local staff involvement must be emphasised.

Substantial savings have again been achieved by the selection of multi-site corporate contracts with British Gas. Major financial recoveries have also been obtained from the use of other utilities, as a result of incorrect tariff charges, etc.

The average savings at oil sites ranged from 20 to 25% of the total annual utility expenditure. The principles behind the cost-reduction programme are (i) to reduce fuel purchasing costs, (ii) to only provide utility services when staff are occupying areas (without affecting staff safety, comfort or programme output) and (iii) to ensure that we only pay once for services actually provided.

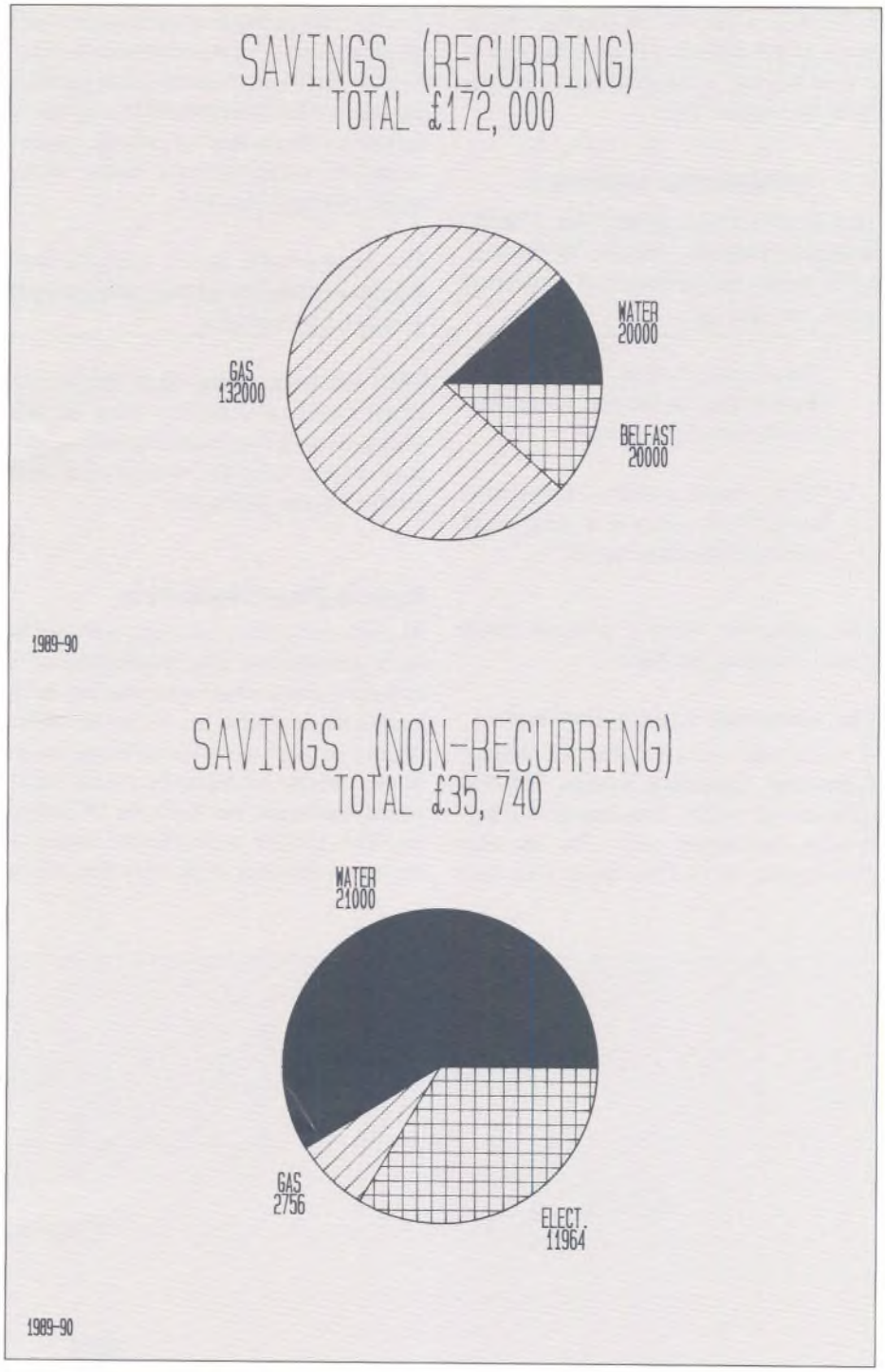
Solutions to specific problems (such as the control of studio air conditioning) are being carried forward from site to site, so preventing the 're-invention of the wheel'.

FUTURE PLANS

Joint energy surveys planned for this year include Local Radio stations and Bush House.

As mentioned earlier, the section's staff will continue to negotiate aggressively - using our corporate strength - to reduce electricity costs at all sites with greater than 1 MW annual consumption. Later, when appropriate, EMS will seek the best purchasing deal for the 100 to 999 kW sites.

The corporate multi-site British Gas contracts will be monitored continuously, to ensure that the best financial options are selected. The section will also ensure that the Corporation continues to obtain the best deal on utilities (such as water) which are presently on tariff options.



The total utility savings in the last financial year.

Lastly, the section will continue to consider and develop the use of hi-tech/computer technology to support all its activities.

John Ross
Head of Energy Management Section

BANGOR Improved facilities for News

The Director General recently opened a replacement tv news studio and newsroom complex on the BBC's Bryn Meirion site in Bangor. It is described here by Julian Stone and Mike Taylor.

The new facilities comprise a tv news studio, with associated production and sound control rooms, and on the floor above, a newsroom and two radio news preparation areas. These are housed in a two storey extension to the existing building, with which it shares access, air conditioning plant and the Central Technical Area.

All the architectural design services for the new building were provided by external consultants. It has been constructed of dense cavity blockwork, for acoustic purposes, and is finished externally with a high build coloured render, facing brickwork plinth and a pitch roof with Penrhyn Blue slate.

The technical facilities were provided by Philip Drake Electronics under a contract managed by P&ID Tel. The overall project was managed by Radio Projects.

Vision Facilities

The studio is fitted with two Sony DXC M7P cameras, complete with studio 5-inch monochrome viewfinders, Portapromt cueing systems, and Vinten MkIV pan-and-tilt heads, mounted on redeployed Mobile Eclair pedestals.

The positioning of these cameras is remotely controlled from the adjacent Production Control Room (PCR) by means of a Vinten Microswift control system. This allows the operator to pan, tilt, zoom and focus the cameras, and to store and recall shot changes for the cameras, as demanded for use during the programme.

The PCR has two modes of operation:

1. A single person operation, to replay pre-edited tapes into a programme being compiled in Cardiff.
2. A multi person operation, utilising all the facilities provided in the production of a programme.

To this end, the PCR contains a basic desk which houses the video control surfaces, a simple monitor stack and a video tape trolley, containing two tape transports with their associated timebase correctors.

The desk has positions for four operators:

- A studio engineer who controls the camera remotes, a Strand Tempus 2 lighting control console, and the tape transports
- A director/vision mixer, who controls an Echolab DV5 vision mixer
- A production assistant
- An operator for the Aston 3 character generator

The vision equipment associated with the studio is housed within the existing Central Technical Area on the Bryn Meirion site.

Sound Facilities

The Sound Control Room (SCR) is situated directly behind and slightly above the PCR. This enables the sound operator to view the PCR monitor stack through a double-paned window.

The equipment includes an Audix MXT 1200, 24-channel, 8-group mixer (redeployed from the 1986 Commonwealth Games), a pair of LS5/9 loudspeakers, a simple three monitor stack, a Studer A810 tape trolley fitted with an ASC CM200 synchroniser, an ASC SP10 record deck and two half-height equipment bays.

The communications equipment is based on a Philip Drake Compact 6 system, modified to meet local needs.

News Preparation Areas

The two News Preparation Areas are self-contained, self-operated, sound studios - situated above the PCR on the first floor of the new building, adjacent to the Newsroom. They are similar to those provided in the Newsroom and Sports Newsroom at Llandaff, in Cardiff.

Each area contains: an MBI Series 12, self-operate console; two Revox PR99 ¼-inch tape trolleys; a Sonifex Micro HS200 RX cartridge machine; monitoring and phone-in facilities, etc.

The area enables a journalist to compile multi-input pieces onto audio tape, for later radio transmission. Additionally, in conjunction with the psc suites in the old building and the new SCR, journalists can also carry out simple post production audio dubbing to pre-recorded video.

Julian Stone, P&ID Tel
Bangor Technical Project Engineer

Mike Taylor, HPM Radio Projects
Bangor Project Manager

The Production Control Room.

DIGITAL BROADCASTING (PART III)

Bit-rate reduction techniques

In this third part to the series on Digital Broadcasting, Tim Shelton describes current research activity into bit-rate reduction techniques, as applied to the transmission path.

The first stage of the long signal path to the customer is the link through the national telecommunications network. Whatever the medium chosen for this stage, it is reasonable to assume that bit-rate, as with gain-bandwidth, will predominate in the factors determining the cost that is charged. There is thus an incentive to reduce, by eliminating redundancy, the bit-rates inherent in the linear pcm coding of signal sources, described in Part I.

VIDEO BIT-RATE REDUCTION

Two main approaches have been exploited for reducing the bit rate of digital video: ***Differential Pulse Code Modulation*** coding and ***Discrete Cosine Transform*** coding. The video source is of course the 4:2:2 interface standard, which gives a total of 216 Mbit/s for the serial multiplexed luminance and colour components. Composite PAL, SECAM and NTSC are decoded into component signals before bit-rate reduction can take place.

Differential PCM

In Differential Pulse Code Modulation coding (DPCM), a prediction of each input sample is made. This consists of a weighted sum of previous sample values from:

- the same line
- previous lines
- lines in the previous field or frame

The prediction must be derived from previously-decoded information by the coder, and the decoder must retrace the process forming the same prediction. Fig 1 illustrates the procedure. Commonly, the prediction switches between two or more predictors, depending on the picture content. The difference between the prediction and the input is passed through a nonlinear quantiser. It is this difference which is transmitted and used by the decoder to reconstruct the original.

Discrete Cosine Transform

The alternative technique is to use transform coding, in particular the Discrete Cosine Transform (DCT) which redefines the signal in the frequency domain (similar to the action of a Fourier transform). A block of N picture samples is transformed to give N coefficients which can be later converted back to the N original samples. The amplitudes of the N coefficients relate closely to the amplitudes of the spatial frequencies present in each block.

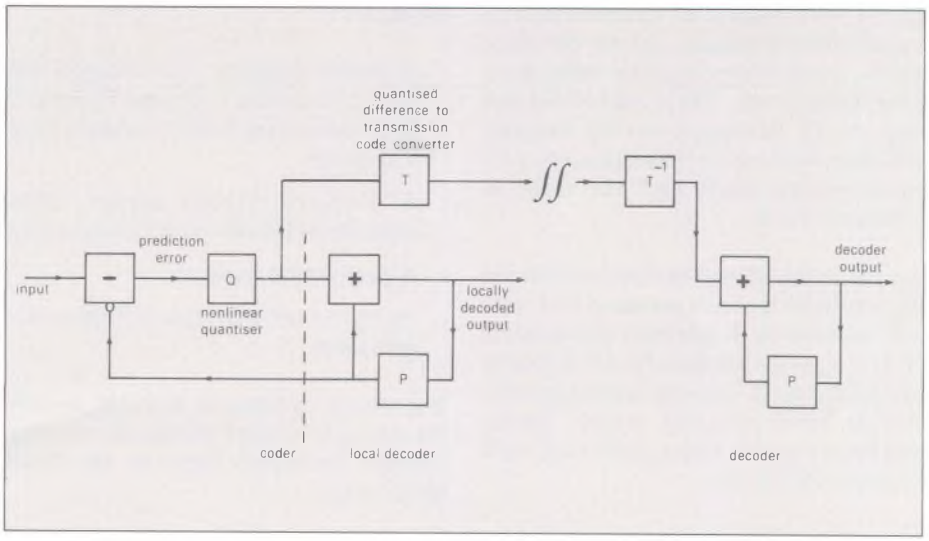


Fig 1. Block diagram of a DPCM coder and decoder.

Bit-rate reduction in the transform domain is effective because, in the majority of blocks, only a few coefficients have an amplitude which is significantly different from zero, and only these need be transmitted. The number of significant coefficients varies from block to block and therefore, some smoothing out of the bit-rate is required for sending over a fixed bit-rate channel.

Entropy Coding

Variable length or ***entropy coding*** is used to augment DPCM and DCT coding. Rather than having a fixed number of bits per sample or per coefficient, the number of bits assigned to a given quantised value depends on the probability of occurrence of that value. Sample or coefficient values which occur most often are assigned short code words and values which occur less often are assigned longer code words.

A standard for 625-line signals

The BBC is working towards an internationally-agreed standard codec for 625-line signals. The system uses transform techniques tc reduce the bit-rate to 34 Mbit/s and is being developed by collaborative research with partners in a European consortium. Much ingenuity has been used in eliminating non-essential data from the transmission stage. A block diagram of the system is shown in fig 2.

The transform is applied to rectangular blocks of 8 pixels by 8 lines (of a field). There are three modes of operation: the ***intra-field*** mode, the ***inter-frame*** mode and the ***inter-field*** mode.

In the intra-field mode, the block consists of information taken from the current field of the input picture. In the inter-frame (and inter-field) mode, the DCT is applied to blocks obtained by taking the difference between the current intra-field block and a prediction of the block derived from the previous frame (or previous field). As in DPCM coding, the prediction of the block must be derived from previously-decoded information, in order that the coder and decoder can make the same prediction.

The improvement in performance given by introducing the inter-frame mode is dependent on the accuracy of the prediction of the current block, as derived from the previous frame. For pictures containing movement, this means that the prediction must be computed using ***motion compensation*** techniques. Typically, the motion is estimated by 'block matching' in which the current block is compared with several blocks in the previous frame, shifted relative to the current block by an appropriate motion vector. In the inter-field mode, the prediction of the input samples is formed by taking an average of the appropriate samples on the adjacent field lines, i.e. without motion compensation.

In the proposed 34 Mbit/s codec, a single motion vector is specified for each 'macro-block'. A macro-block consists of two adjacent luminance blocks and the two co-positioned chrominance blocks. The coder has to decide in which of the three modes to code the current block. Ideally, the mode which gives the lowest bit-rate for that macro-block

should be chosen. However, it is almost as efficient to choose the mode which results in the smallest mean square deviation from the mean luminance. This can be measured before application of the DCT.

After a block has been transformed, the transform coefficients are quantised. Different quantisation is applied to each coefficient, depending on its position in a block. More quantisation error can be tolerated in the high-frequency coefficients, because hf noise is less visible than low-frequency quantisation noise. Also, quantisation noise is less visible in the chrominance components than in the luminance component.

Quantisation noise is more visible in some blocks than in others. In these critical blocks, containing for example a single edge in a plain area, the quantisation parameters are altered to reduce the overall quantisation error and to limit in such cases, the maximum quantisation error introduced into the high-frequency coefficients.

The numbers corresponding to the quantised coefficients are passed to the ***variable length coder*** (VLC). The order in which the coefficients of a block are passed to the VLC is such that those corresponding to lower spatial frequencies are sent first. This has the effect that several quantised coefficients in succession often have zero value. By coding these run lengths of zeros with a single code word, a useful saving in bit-rate can be obtained. The macro-block is then assembled with the prediction mode information, the 'block criticality measure' and one motion vector. Synchronising words are added once per strip of blocks, and once per field.

Finally, error correction is applied to the video multiplex before combination with the sound signal and data, etc, in the final transmission multiplex. The final framing structure has not yet been agreed. However, framing structure for the hierarchical bit rates of 32.064 Mbit/s (Japan), 34.368 Mbit/s (Europe) and 44.736 Mbit/s (America) are under study. For sound and data, the capacity which will be available is 2048 kbit/s for a 34.368 Mbit/s channel, and 1544 kbit/s for 32.064 Mbit/s and 44.736 Mbit/s channels.

AUDIO BIT-RATE REDUCTION

The approaches described above can also be applied to reducing the data rate for audio programme. The principal difference relates to the exploitation of the characteristics of hearing.

What is required is a coding system which takes account of the masking of, for example, noise components by relatively loud sounds, or the way that a particular frequency can mask the perception of lower-amplitude adjacent frequencies. A sound signal which is below the 'masking threshold' of the predominant component will not be heard, and hence does not need to be coded. The techniques which will be described for audio are ***adaptive pulse code modulation*** and ***sub-band coding***.

Adaptive PCM

An example of this technique is ***Predictive Nicam*** (P-Nicam), which is being researched as offering a worthwhile, though modest, bit-saving extension to existing Nicam 3 and Nicam 728 - without a loss of quality or the introduction of excessive signal delay, which can be operationally inconvenient. The system is illustrated in Fig 3.

Prediction is applied in both the coder and the decoder so that the only information that needs to be sent to the decoder is the difference between the input sample and the value that can be predicted by the decoder - the prediction error. The figure shows the structure of the coder and decoder. The Nicam requantiser compresses the error signal, further reducing the number of bits, and regulates the bit-rate to make it acceptable for output to a transmission network.

The prediction stage is the key to achieving lower data rates from the coder, without lowering the potential quality of the reconstruction at the decoder. The more accurate the prediction, the fewer the bits which need to be sent to the decoder, since the prediction error will have a smaller range of values. Thus one of the main aims has been to find optimum techniques for prediction.

A prediction of the current sample is formed by taking a linear combination of the previous input samples. The more previous samples that are used, the more accurate the prediction. In practice, with real audio, significant increases in accuracy occur from

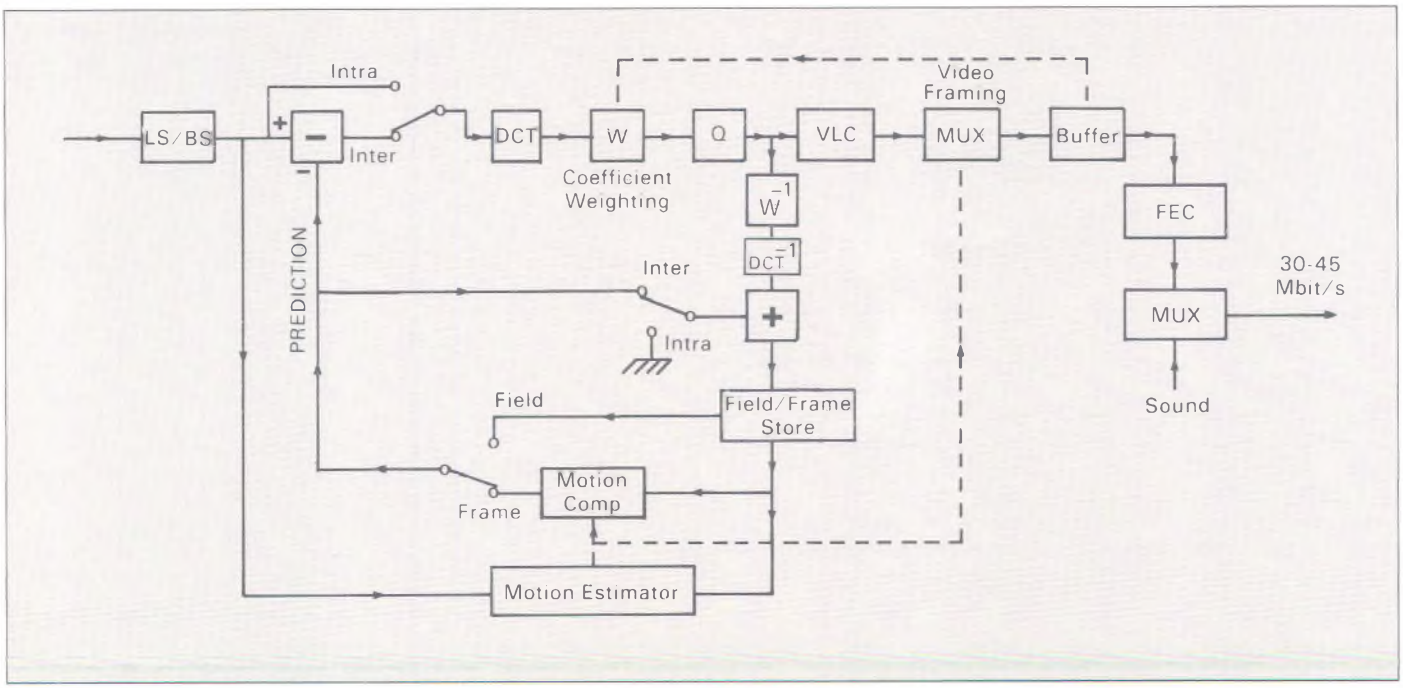


Fig 2. Block diagram of the 625-line Tranform Codec described.

one up to four previous input samples. The other major factor determining success is the choice of weighting coefficients applied to the sample values.

The accuracy of coefficients becomes less significant as they apply to more distant previous samples. Predictor coefficients are calculated by analysis of typical programme material, such as speech, solo instruments, orchestral music, etc. A set of predictor coefficients generated in this way is called a ***predictor***. Depending on the range of material used, it is possible to calculate a predictor which is either optimum for a narrow range of material or less so for a wider range. Clearly, a predictor specific to a particular item will always give the best performance, being calculated as the material arrives at the coder. However, the improvement may be judged to be insufficient to warrant the extra bit-rate necessary to send the calculated preditor values to the decoder.

Up to this stage, no information has been lost from the signal. However, the predictor varies in its ability to reduce the number of bits that need to be sent and in general, does not make a sufficient reduction to be useful by itself. To reduce and equalise the number of bits used to code each prediction error sample, the destruction of some information in the signal is necessary. The ***requantiser*** must carry out the reduction in such a way that the loss is masked by what remains. This process is called ***irrelevance reduction***, since the ear should not be able to notice the loss.

As a reminder, bits are saved in the Nicam system by packaging samples in blocks of 32, for compression with a range code for the whole block. Each sample is represented by a constant number of bits which is smaller than that required by the original. The degree of compression needed is signalled by the range code, so indicating significance of the bits in each block.

At first sight this would seem to be an unlikely technique for requantising the prediction error, since in the ideal case the residue of errors are uncorrelated. In practice, because of the use of predictors with small numbers of elements, the prediction error is not random, but retains characteristics of the original signal, tending to be a high-pass filtered version of the input signal.

Error feedback is applied to the requantiser to reduce further the noise and distortion in the output from the coder. This technique consists of adding the requantisation error for each sample to the next sample, before that sample is requantised. The requantisation error is the difference between the requantised sample value and the original value. Error feedback has the effect of tilting the spectrum of the requantisation error signal so that it has less power at low frequencies and more at higher frequencies. It is also possible to filter the error before feeding it back, to shape further its distribution in the frequency domain. This spectral shaping reduces the audibility of the noise-like quantisation errors in the output audio.

A local decoder is used to help select the best predictor for each block of input samples. The requantised error from each predictor is fed to the local decoder where it is added to the value produced by the corresponding decoder prediction function. The results are compared with the original input samples for each predictor and then the predictor giving the lowest rms error over a block of samples is chosen. Finally, the requantised prediction errors are sent for transmission along with the identity of the selected predictor.

Sub-band coding

Sub-band coding is the technique most specifically developed for audio bit-rate reduction. Like transform coding, it analyses the signal in terms of its frequency components over fixed intervals of time. For each interval, the signals in each of the resulting sub-bands are given scale factors appropriate to the signal amplitude, and quantised with the number of bits relevant to its subjective audibility within the total signal.

The most extensively-developed system is ***Musicam*** (formerly Mascam) and this is well documented. Here, the input signal is split into 24 sub-bands with sample frequencies matched to the various sub-bands.

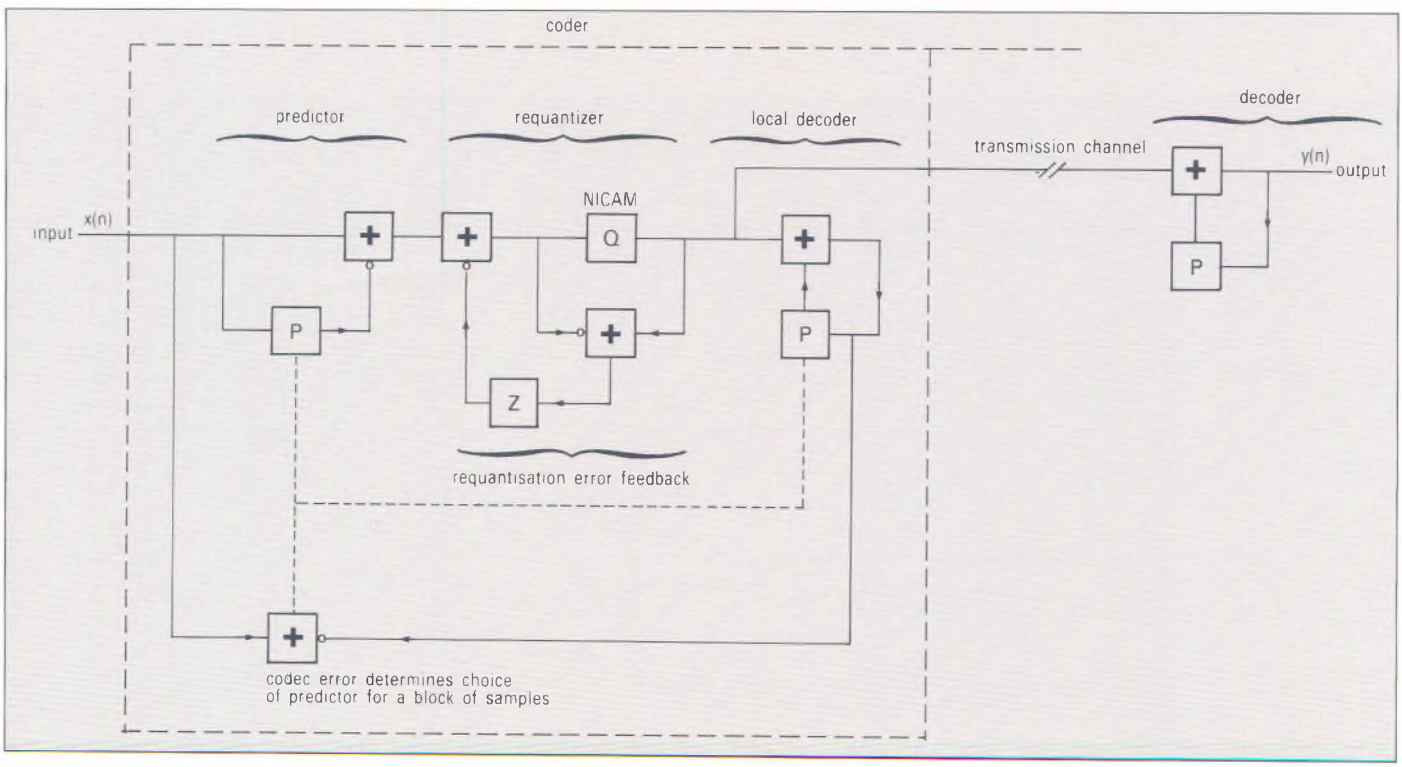


Fig 3. Structure of the P-Nicam coder and decoder.

– DIGITAL BROADCASTING (PART III) –

There are additional temporal components to the masking effect. Firstly, masking is observed for a short period outside the overlap of the masked and masking components. Secondly, the considerable data-rate required to transmit the twenty four scale factors to the decoder may be bit-rate reduced, according to the subjective importance of their accuracy. Other refinements include measures which take account of transient characteristics to effect further bit-rate reduction dynamically. Similarly, the degree of error-protection may be varied according to the number of significant bits needing to be protected in the different sub-bands. For more details, reference should be made to the bibliography. The functions are interlinked according to the schematic given in Figure 4.

ACKNOWLEDGEMENTS

This article is largely drawn from the writings of others. In particular, I am very grateful for the use of lucid accounts by Andrew Stirling and Dr Nick Wells of their audio and video research studies. To them and others also, my thanks for help in compiling this piece.

Tim Shelton
Head of Baseband Systems Section
Research Department

This concludes our short series on the basics of Digital Broadcasting. However, we hope to publish other related articles in forthcoming issues, including topics such as Digital Audio Broadcasting (DAB), Digital Television and Digital Routeing Using Optical Fibres. The editor would welcome contributions from readers on these and other topics involving digital systems.

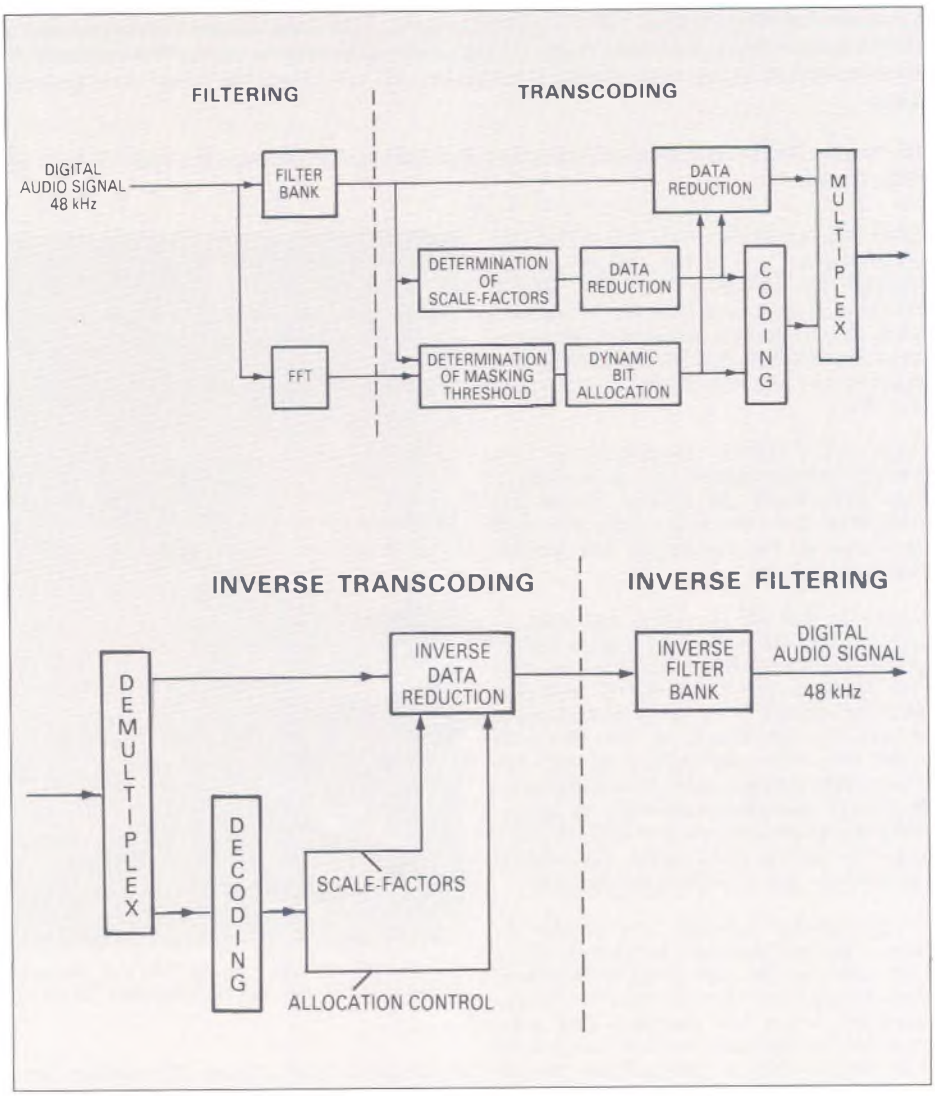


Fig 4. Block diagram of the Musicam encoder (above) and decoder (below).

– FURTHER READING –

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HDTV At the Ideal Home Exhibition

At somewhat short notice, HDTV went on show at the Ideal Home Exhibition earlier this year. It was the BBC's most rigorous public demonstration of the Eureka 95 high definition system so far. Over the entire twenty four days of the exhibition, HDTV demonstration tapes were played continually for ten hours each day, in a specially-constructed viewing booth on the BBC stand.

The most critical equipment supporting the demonstration was the HDTV tape playback facility, which is described here by Mike Croll.

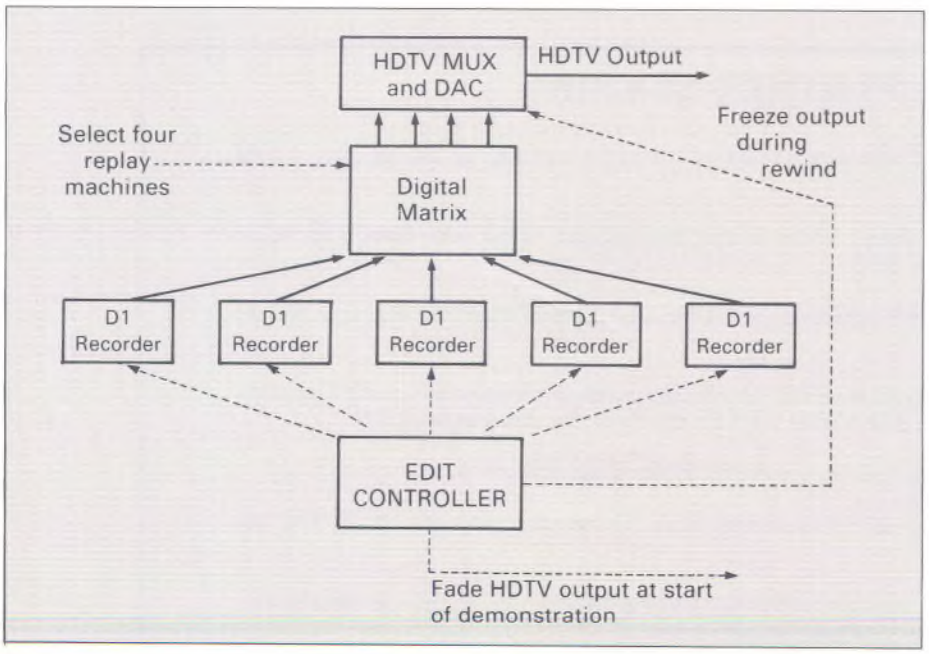
Given the total duration for which the demonstration should be available, it was decided that our four D1-based HDTV recording system (see Eng Inf 34 and 37) would require some additional redundancy: it was not expected that full reliability would be achieved using solely one set of four D1 recorders.

There was a further requirement to programme as much automation as possible so that, given brief instructions, technically competent but otherwise untrained staff could operate the equipment and quickly identify any faults.

A total of five D1 recorders was used, as shown in the diagram. The digital matrix and edit controller were programmed so that four different combinations of recorders could be selected using programmed push-buttons and function keys. The edit controller was also programmed to run continuous demonstrations for an entire day. At the end of each demonstration, an appropriate still picture was frozen in the HDTV multiplex output store, while the demonstration tape was re-wound and re-cued.

A maintenance schedule was applied to ensure that each machine was cleaned twice a week and that any difficulties arising were cured during these visits. Despite the intense operation which the recorders had been subjected to, they achieved a very high level of reliability with no specific faults causing the continuous demonstrations to be interrupted. Had a spare D1 recorder not been present, there would have been substantial interruptions for cleaning and maintenance.

The Duchess of Kent is shown HDTV at the Ideal Home Exhibition by DDE, Charlie Sandbank, with Director of Finance, Ian Phillips (second from right) looking on.



In the course of the exhibition, the equipment ran a total of 1,017 D1 machine-head hours (which is equal to about four months of average operation of the quad-D1 recording system). One demonstration tape was worn out completely, after about 240 replays, and two other tapes were partially worn, having been replayed about 150 times each.

Whilst some members of the public understood the HDTV demonstrations (and were enthusiastic to obtain such facilities even if they were initially very expensive), many people could not relate to them. The main difficulty stemmed from the stark difference between the simple booth used to present the high definition pictures, and the normal domestic environment. Perhaps next time round we should install the HDTV monitor in the living room of one of the 'Ideal Homes' on show!

Mike Croll
Head of Storage & Recording Section
Research Department

NETWORK RADIO
A tasteful refurbishment

Staff in Central London will have been pleased to see the Lounge restaurant reopen in February after a major refurbishment. Situated on the lower ground floor of Broadcasting House, it is described here by Norman Lucey.

The Lounge had always been a popular eating place but had became too small for the numbers who wanted to use it. It had been accepted for some time that additional staff catering facilities were a necessity at BH. There was also a requirement for a more suitable environment for business guests, and somewhere that could also be used as an evening hospitality venue.

Several alternative areas were investigated but to construct a completely new facility would have been prohibitively expensive. As the existing basement kitchen was capable of serving larger numbers than the seating allowed, it was decided to find a way of extending and improving the existing capacity.

This work was project-led by ACED who had sole responsibility for design and implementation. The complete package encompassed everything from air-conditioning and electrical house wiring to furniture and carpeting. As you are probably aware, BH is a Grade II listed building, of architectural and historic interest, so all details of alterations had to be approved by English Heritage before work could commence.

The area was a main intake for BT circuits, fire risers and water mains: the removal and diversion of these was very time-consuming and involved. Full air-conditioning has now been installed, and this necessitated a new plant room and distribution ductwork, which had to be fitted into the limited space available.

The refurbished Lounge can accommodate ninety-five diners (instead of fifty-five as previously) and access to the area has been greatly improved. The use of pastel shades, uplighters, mirrors, soft landscaping and other devices have transformed a cramped, below-ground area into a spacious and less formal environment. The decor has been colour co-ordinated to include such details as place settings, napkins and even matching 'silk' flowers, set in vases on each table. New duty rooms and toilets have also been provided.

The Lounge is the first of several large contracts in Broadcasting House to run concurrently over the next few years. The improvements to working conditions will also include the modernisation of electrical, heating, plumbing and other services, as well as the refurbishment of office accommodation.

Norman Lucey, Architect
Senior Project Leader
ACED

The first few customers arrive for lunch.

RADIO TRAINING
Studio 3 refurbished

Radio Training is based in Grafton House, a few hundred metres north of Broadcasting House in London. Courses are held there for the training of production staff in Network Radio, Local Radio and World Service, as well as studio managers in World Service. Here, Nick Jennings briefly describes the recently refurbished Studio 3.

The work on the first floor at Grafton House started in June of last year with the demolition of dividing walls between five rooms which previously formed part of three very small studios. This area has been reconfigured to form a cubicle and studio which is capable of producing small drama, music and talks programmes, as well as being a lecture room. The studio colour scheme was chosen to represent the BBC regional colours.

The control desk is a Series 24P, 22-channel, 4-group console, manufactured by MBI Broadcast Systems who also carried out the technical installation. The studio is capable of standard, one man and self operation. Included are six grams, four tape and two cartridge machines, two CD players, cassette and DAT machines, as well as outside source and phone-in facilities.

Emphasis was placed on flexibility to enable several modes of operation. The result is a studio which will cater for the wide range of training courses but also has all the facilities required for transmission. The project architect was Jane Macfarlane of ACED.

Nick Jennings, Project Leader
London Studio Group
Radio Projects

Partial view of the Studio with the Cubicle beyond.