

# ENG INF

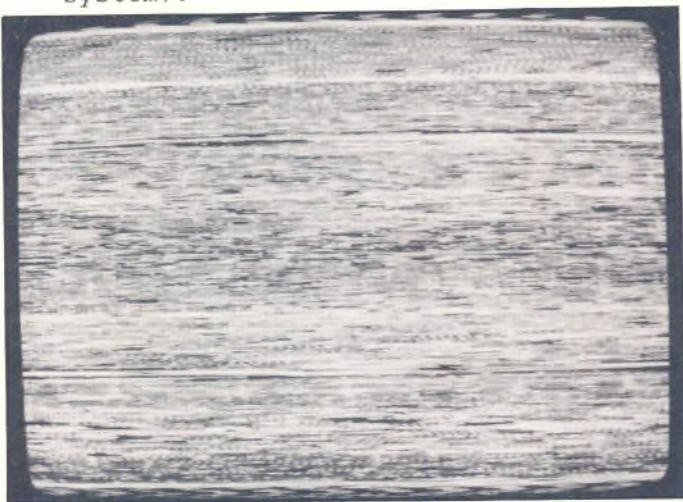
Winter 1988/89 No. 35

## THE BROADCASTING WHITE PAPER

Broadcasting in the UK is likely to change rapidly in the 1990s due to technological and other developments. The Government's plans for broadcasting legislation were published in early November in a White Paper entitled "Broadcasting in the 90's: Competition, Choice and Quality". The aim of the Government's proposals is to change the framework of regulations to allow a much wider range of programmes and services on both television and radio.

The BBC is seen in the White Paper as being "for the foreseeable future, the cornerstone of British broadcasting". Nevertheless, the Government proposes a number of significant changes which will affect the BBC in the coming decade. The following changes are most likely to affect us on the technical side although the timing of many of the proposals are not defined in any great detail:

- The BBC will continue to be financed by the licence fee, but the Government looks forward to its eventual replacement (by a subscription system).



A picture scrambled by active line rotation - a possible system for future subscription services (see page 3).

- The BBC will be encouraged to develop further night-time subscription services.
- The night hours on one of the BBC's television channels will be assigned to the new Independent Television Commission (ITC).
- BBC Radio will have to surrender the MW services of Radios 1 and 3, which will be re-assigned for two national commercial channels.
- Transmission arrangements for both television and radio will be reformed to give scope for greater private sector involvement.

Some of the Government's other proposals, although not directly aimed at the BBC, are also likely to affect us.

- A fifth television channel will start up by 1993 with a coverage of 65-70% of the population. It will be a national service (not regional), but different companies will provide the programmes at different times of day. It will be transmitted on UHF. If technically feasible, a limited coverage 6th channel will follow.
- Radio listeners will be offered more choice. Eventually, there could be three new national services (two on MW and one on FM) and several hundred new local independent stations.

The Government has asked for comments on its proposals and the BBC will be submitting its formal response in February 1989. It is anticipated that the Bill will be brought to Parliament in the 1989/90 session.

Henry Price, HEID

## LICENCE AGREEMENTS

The following agreements have been struck since the autumn issue of 'Eng Inf' went to print:

### MINIATURE LOUDSPEAKER, LS3/5A

The evergreen LS3/5A miniature loudspeaker is once again the subject of a licensing agreement, this time with Harbeth Acoustics of Haywards Heath, Sussex. This unit has now come full-circle as Dudley Harwood - who worked on the original design while at Research Department - founded Harbeth Acoustics in 1977 and remains associated with the company today.

This agreement means that the BBC still maintains at three, the number of licensees for the LS3/5A, the other two being Rogers (Swisstone) and Spendor.

### BAND II IF BANDPASS FILTER, FL2/28

This 10.7 MHz bandpass filter, licensed to Eddystone Radio Ltd of Birmingham, can be employed as an alternative to the original IF filter of the RC5/9 Band II re-broadcast receiver. It mounts inside the chassis of the host receiver, and includes a low noise 2.5 dB amplifier.

It is particularly useful in applications where the link might otherwise suffer from excessive adjacent channel interference.

### SHOT-CHANGE DETECTOR, RP3/511

Digi-Grade Systems Ltd of Farningham has become the third licensee for the Digiscan shot-change detector, following Rank Cintel and Digi-Tel Systems (UK) Ltd. This card, which mounts inside the electronics rack of a Cintel Mk. III Digiscan telecine, detects changes of shot and outputs a logic pulse to other equipment - for example, a colour corrector.

### DIGITAL VISION MIXER, EP5M/529

Vistek Electronic Ltd of Bourne End has agreed to the terms of a licence for D&ED's digital vision mixer. The deal was made in September, just in time for IBC 88 and includes not only the complete mixer (with the associated analogue conversion sub-system), but also the chromakey (cso)

extension, currently being developed at Avenue House.

There are now four of these mixers in BBC service - in TV News Graphics (two units), TC5 Sports Graphics, and the Electronic Caption Preparation Area (ECPA). The TV News facility, described in 'Eng Inf' issue 28, uses the most recent variant of the mixer and it is this type which has been licensed to Vistek.

For further details of these and other licence agreements, please contact the D&ED Liaison Engineer, Peter Jefferson, on Avenue House 375.

## TRANSMITTER NEWS

The following stations/services have opened since 1 October:

### Television

Berrynarbor	N. Devon
Dromore	Co. Down
Ederny	Co. Fermaragh
Kelvindale	Glasgow
Luscombe Valley	near Poole
Trefor	near Caernarvon
Upper Killay	near Swansea

### FM Radio

Keighley	W. Yorkshire
Newhaven	E. Sussex

Stereo radio finally reached NW Scotland on 1 December (the Melvaig and Skriaig FM sites). The areas covered include West Ross, Skye and the Outer Hebrides.

(Ton Pentre, in the Rhondda Valley, opened on 26 August and, regrettably, was omitted from Transmitter News in our previous issue.)

### Radio 1 FM

Black Mountain	near Belfast
Oxford	Beckley, Oxon

### Local Radio

Radio Gloucestershire opened on 11 October with FM transmitters at Churchdown Hill (104.7 MHz) and Stroud (95.0 MHz) and an MF transmitter at Gloucester (603 kHz).

GLR's FM transmitter at Crystal Palace doubled its ERP on 2 December.

# TELEVISION DOWNLOADING

'Downloading' is the name for a new commercial venture being developed and marketed by BBC Enterprises. In the spirit of the new competitive philosophy of making the maximum possible use of broadcasting resources, BBC Enterprises is able to offer, on a wholly commercial basis, the use of night-time television broadcasting hours.

The use of BBC transmission facilities is paid for by a Service Provider who makes pre-recorded programme material which the BBC transmits in a scrambled form to be 'downloaded' (received, descrambled and recorded) by subscribers to the service.

## The Present Situation

The Home Office has approved an experimental two year trial period for British Medical Television (BMTV), of Woking, to provide an information service for the medical profession, mainly General Practitioners. The 'Medical Downloading' information comprises the latest medical news, data and developments and is available on subscription from BMTV.

BMTV provides the programme information to the BBC on U-matic video cassettes for transmission on BBC2 during the night. On transmission, the video and sound are scrambled by the Discret 12 system which is similar to that in use by the French pay-TV channel, Canal-Plus. The scrambling inverts the audio spectrum and imposes a pseudo-random jitter sequence on the video (after the blanking and colour burst) whilst rigorously maintaining the timing of the line sync pulses.

At the subscriber's premises the recording



*A picture scrambled by Discret 12*

process is automated. The present generation of descrambler recognises a code, initiates an automatic power-up, and sets the subscriber's vcr into Record mode. At the end of the transmission, the descrambler initiates a power-down sequence. The programmes are then ready to view the following morning.

## What Of The Future?

A fully automated system is currently being installed in TV Centre by Central Systems Section, of P&ID Tel, to provide the sequential playing of a number of cassettes. At present, the U-matic tape is replayed by manually operating the machine.

A new generation of scrambler, which will have a number of encryption algorithms, is being developed by BBC Engineering Research Department. The algorithms scramble the video using the technique of active line rotation which was demonstrated at IBC88.

Each programme on a source cassette will be intended for a particular subscriber group - identified by a unique combination of user bits in a time-code sequence laid down on a time-code track. The user bits determine which encryption algorithm is employed for the transmission of that programme. In this way, a number of service providers could be offered a completely secure service. In addition each provider could address a particular section of its subscriber group - if the material was to be of interest to a limited number of subscribers only.

An invaluable contribution to this project has been made by TV Network department which has devised techniques to ensure that Downloading programmes are transmitted to schedule, prior to automation early in 1989. TV Network department has also played a major part in the design of a practical system which had to be carefully integrated with the existing facilities in CAR.

The author gratefully acknowledges the excellent working cooperation and liaison with Jim Day of BBC Enterprises.

Jon Melmoth  
Project Manager; P&ID Tel

# PSC EDITING AND CONFORMING

For more than 20 years, 16mm film has been the main format for shooting television productions on location. Today, video cameras, recorders and electronic production techniques are increasingly taking over from film on many types of programme. Television Film Department, based in Ealing, currently performs some 20% of its location work using video and this has led to the conversion of film cutting rooms into psc editing suites at Lime Grove, Woodstock Grove and in the East Tower at Television Centre.



*A simple psc editing suite*

The simplest suites consist of a playback machine connected to a recorder via an edit controller; the edited tape simply comprises blocks of material assembled from the master tape(s). This arrangement permits editing in the CTDM (compressed time division multiplex) mode. More sophisticated editing, including wipes and dissolves, requires two playback machines, one recorder and a vision mixer, which means that editing must take place in the component (Y,U,V) mode rather than CTDM.

Film Department currently has four two-machine suites, one simple three-machine suite and five dual-gauge (Betacam and U-matic) suites. Betacam, and more recently, Betacam SP machines are replacing U-matics in these areas; a few U-matics have been retained for replaying archive material.

The type of editing just described is known as 'on-line'. This refers to a system where editing takes place in one of the broadcast formats - the resulting edited tape being the one which is actually transmitted. It is an expensive approach, as broadcast quality equipment

is needed, and there is little opportunity for producers/editors to try out different ways of putting the programme together.

With film editing, an 'off-line' technique is employed where a 'work print' or 'cutting copy' is made from the original negative. The copy inevitably gets dirty and scratched in the cutting room, yet the viewer doesn't see this, as it is not used for transmission. Instead, it is sent for 'negative cutting', where the positions of all its cuts are matched (cut for cut) on the original negative, by means of the key numbers at the edge of the film. Thus, the negative undergoes 'conforming' to become an accurate representation of the edited print.

Film Department has recently opened a new video editing suite, in the East Tower, which to some extent mimics the aforementioned off-line technique for film. The new suite is known as PECA, an acronym for 'PSC Editing and Conforming Area'. The original video recordings (picture and sound) are copied to the VHS format, which enables relatively cheap equipment to be used for editing. Although the edited VHS tapes are not good enough for transmission, information derived from time-code is used to conform the original broadcast-quality tape(s).

## The Off-Line Editing Equipment

JVC recently introduced the 'Editmaster' VHS system which claims good frame accuracy during editing. It relies on VITC (Vertical Interval Time-Code) whereby a code is generated to identify every single frame and is inserted digitally in the field-blanking (vertical) interval, in much the same way as teletext.



*PECA's tape machines and control desk*

The code specifies time in hours, minutes, seconds and frames and is very robust - it can survive many generations of copying.

In PECA, by using a combination of a VHS player, a VITC reader and a computer, cuts made during off-line editing can be logged automatically. The resultant data is formulated into an Edit Decision List (EDL) which can be stored on floppy disc to be used later for conforming the broadcast version of the tape.

#### The On-Line Editing Equipment

In PECA, the on-line programme path is entirely component (Y,U,V). The system uses three Betacam SP machines; two for playing back the 'camera original' master tapes and one for recording the conformed programme. A U-matic is also available for replaying archive material.

By using two playback machines, wipes, dissolves, etc, can be introduced via the vision mixer. However, the editors working off-line only have a single VHS playback machine and have to represent a dissolve by means of a cut at the centre point (as they would in a film work print). By noting down the time-code, they can inform PECA of the duration of an effect, up to a maximum of 999 frames.

All the machines in PECA are controlled by a Sony BVE 9000 Edit Controller, which can memorise up to 999 edit points. The EDL can be read into it from floppy disc, making it relatively simple to conform the programme, edit by edit. However, being a computerised system, the data in the EDL can easily be re-arranged for maximum convenience, known as 'Edit List Management'.

To proceed through a programme chronologically, shot by shot, might mean that each master cassette had to be inserted into the player many times. With edit list management, all the required shots from a particular tape can be put in at one go, leaving blank spaces in between on the record tape - the computer works out how big a gap to leave and the blanks get filled in, as conforming proceeds.

In film, the laboratory grader and telecine Tarif are used for making colour corrections (for example, to scenes which are too dark or have colour bias, etc). In PECA, these functions are performed by (1) a Cox colour corrector, which gives joystick operation under the control of time-code and the computer, and

(2) a Sony colour corrector which gives preset adjustment - intended to deal with overall colour casts. PECA also has an Aston capgen, for adding titles, 'name supers', etc, and a Sony DXC-3000 copy camera.



*A general view of PECA*

On the sound side, PECA has a Sony 12-channel audio mixer with full equalisation facilities. This is fed with audio from the U-matic, the three Betacam SP machines and from two Nagra T  $\frac{1}{4}$ " machines - controlled from the BVE 9000 and synchronised using centre-track time-code. Audio can be recorded onto the conformed Betacam tape or onto the  $\frac{1}{4}$ " tape machines - track laying and building in overlaps as the session proceeds. The dubbing theatre nearby (offering a studio, grams and effects discs) allows full sound dubbing to be performed.

PECA is staffed by two specialists - one from a film editing background, the other from sound dubbing. The VHS editor who worked on the programme off-line will normally attend, as will the producer and perhaps a PA or other person associated with the production. The control desk has been designed with a 'production wing' so that production staff can maintain eye contact with the operational staff.

The BBC project leader was Barry Porter of P&ID Tel (Rec & Film Section) while the main installation work was carried out by FWO Bauch Ltd, of Borehamwood, Herts. Martin Sharpe, Film Editor, and John Richards of Film Engineering Services, represented Film Resources on the project.

Many thanks to Walt Denning (Head of Services, Film) and Bill Lovell (Film Technical Manager) for their assistance in preparing this article.

# A TALE OF THREE CITIES

Our field experts have sent us these reports on recent developments in Southampton, Glasgow and Belfast:

## A HORSEY TALE...

There are many occasions where programme makers say "if only...". Usually the next few words call for the near-impossible, which we all know takes time and money to achieve.



*A horse-box conversion!*

About a year ago, Regional TV Manager, Ian Masters, was heard to say "if only we could fit some very basic kit into a horse-box, we could...". And about six months later, a director in the Newsroom was heard to mutter darkly that she was always impressed in America by the way engineers seemed to take boxes off the shelves at base, put them in a trailer and go and do an OB for next to nothing.

A challenge, we thought. Not a new one, though, after all we've all had to improvise for programmes and we do have Type 6 scanners. But if only we had a horse-box...

The New Forest has always been a horsey area, but the trade was taken aback by a sudden enormous interest in horse-boxes. The operations and engineering groups had really got the bit between their teeth by now (sorry). All the attic and basement rooms of South Western House were ransacked and those "don't-throw-those-away, they're-only-30 years-old-and-might-come-in-useful" heirlooms were examined

anew. Bits and pieces acquired over the years for various programmes were adapted, holes appeared mysteriously in equipment racks all over BBC...

Clearly, Southampton isn't the first to build a vehicle for OBs. However, we do now have a trailer with sufficient space for a director, PA, vision operator and sound supervisor and, if the weather is inclement enough, there is room for a hanger-on (EM, producer, etc) as well.

The Southampton Insert & Recording Trailer (SIRT for short) can take 2/3 cameras, is fitted with a vision cutter and 8-channel stereo desk and has sufficient comms. to do a full blown OB for Children in Need from Ocean Village. However, its principal use will be as an extension of existing psc facilities.

Mike Cox,  
MPSE, Southampton

## ...ABOUT AN ATTIC CONVERSION...

The first weekend in September was a hair-raising experience for Glasgow's Senior Graphic Designer, Ian Roan, and his design staff. This was the weekend when facilities previously scattered around BBC Scotland's Glasgow studios were moved to a new integrated electronic Graphics suite in the ex-television Continuity area.

The transfer of equipment was accomplished by a tremendous effort from the contractor



*A Glasgow attic awaiting conversion!*

- Television Systems Ltd - along with staff from P&ID Tel and BBC Scotland Engineering; in particular, Ian Gilchrist, Jim Neale and John Bainbridge. The move was so successful that the weekday News opt-out programme, Reporting Scotland, was transmitted without a hitch on the Monday evening.

The new area provides on-line text operation from Aston 3's and pre/post production images from Paintbox and Slide File to studios and vt.

Operational control of all the equipment is housed in one room and experience gained since September has amply justified the one room principle. Simultaneous operations using talkback, via the four comms. stations, have not been a problem due to the effectiveness of the acoustic treatment and the occasional use of 'cans'. Thus, with all equipment controls and the CAL combiner system in easy reach, effective use can be made of design staff time.

A particular feature of the area is that Graphic Designers have access to any of the four studio Slide Files. Images can be assembled and exchanged via an RGBS router in the Central Technical Area. The same router also allows the selected studio Slide File to be controlled from a panel in the Graphics area.

Building work was completed under a contract managed by supervisors from BBC Scotland's Building Engineering Services. The technical installation was undertaken by Television Systems Limited, to a specification written by Nigel Jackson of P&ID Tel and Ian Gilchrist of Communications and Engineering Services, Scotland.

Nigel Jackson  
Central Systems Section, P&ID Tel

### ...IN GRAPHIC DETAIL!

A three machine VT Editing and electronic Graphics area has just been commissioned in Broadcasting House, Belfast.

Located in what was the old Newsroom area, this facility greatly enhances the post production capabilities in the region; in the past, complex editing had to go else-



*The finished attic conversion in Glasgow*

where in the BBC. This is Phase I of a major post production development which, in one year's time, will include a new Dubbing and Sypher suite.

The fully air-conditioned suite has two Ampex VPR6 and one Ampex VPR2B video tape machines, with provision for a third 'Play-In' machine located either in the machine room or simply placed on the Edit Suite desk. The Ampex Ace Micro Edit system is the first of its kind in the BBC and has suitable interfaces for controlling four VTRs, a T8 vision mixer and a Nagra T audio tape machine. The edit desk holds the keyboard of the latest Aston Caption machine, and is also the alternative location for the 'E' Flex digital effects panel, which is shared with Studio B, the region's main studio. Audio is handled by a twelve-channel stereo Glensound MX6 Mixer.

The Graphics area next door is equipped with Art File/Slide File and shares the caption equipment with the Edit suite. There is also available a Sony DXC 3000 rostrum camera.

A Probel 6310 16 x 4 matrix, situated separately in the technical area of the TV Block, feeds both the Graphics and Edit suites, the Edit suite having control of three destinations and the Graphics, one destination for Slide File 'grab' purposes.

The main contractor for the installation was Windmill Munroe Design while the P&ID Tel project leader was Keith Spooner, with Bob Head (also of P&ID Tel) providing the expertise for the Graphics area.

Fred Wylie  
MCES, Northern Ireland

# BUSH SOUNDS OUT THE NINETIES

An exhibition of new technology and engineering progress was held at Bush House on 14 and 15 November - mainly for the benefit of local production staff. Displays were mounted by various sections including Projects and Planning, Transmission Planning Unit and Operational Resources.

This brief review describes some of the equipment which was on display, together with the main functions of the various sections which participated (some by means of graphics displays).

## PROJECTS AND PLANNING

This department is responsible for providing all technical plant for World Service, with the exception of transmission plant which is commissioned from Engineering Division. The department is divided into five engineering sections:

### Studio Section

This section is responsible for capital expenditure on broadcast equipment within Bush House, Queens House and the Transcription Service, but not the Central Technical Area (see below). The section is responsible for the equipping and refurbishment of studios and editing channels, and the bulk purchase of equipment such as tape machines, cartridge machines, CD players and, in the future, DAT machines.

Among the various items on display was a small selection of professional and semi-pro DAT machines, as well as a Sony Auto Disc Loader for CDs (which can stack up to sixty CDs and offers random access play).

### Central Technical Areas

World Service broadcasts in thirty-seven languages to all parts of the globe and Bush House is 'on-air' with up to twelve programmes simultaneously, through day and night. The production of these programmes involves the use of fifty-six studios while just over one hundred transmitters currently provide worldwide coverage. Without the Control Room, a microphone signal leaving studio S7 would have great difficulty in finding its way to a transmitter in Hong Kong!

The Control Room is currently undergoing modernisation, due for completion in 1990.

This major redevelopment is being handled largely by subcontract methods for detailed design and manufacture, but under the direct control of CTA section.

### Caversham

Modernisation at Caversham began in 1984 and this section is involved in, among other things, the design and installation of new technical facilities for the Listening Room, where foreign language broadcasts are monitored twenty-four hours a day. The section also specifies the work to be carried out at nearby Crowsley Park, by other specialist engineering departments in Engineering Division; for example, the recently installed satellite reception facilities.

The team is also involved in purchasing test equipment, tape recorders, etc, and the refurbishment of other monitoring sites (such as the one on Cyprus).

### Transmission Section

Engineering Division project manages all transmission work on behalf of World Service and this section represents the latter on the technical and operational requirements of the plant.

The section works closely with Transmission Planning Unit and was recently involved in the new stations at Hong Kong and on the Seychelles. Current work includes the planning of the Orfordnes replacement (ie Skelton C); developments at Rampisham and Cyprus; finalising the specification, budget and timescales for Daventry's new masts and aerials, and ordering and installing monitoring equipment at overseas locations.



*The display of midgets*



### Computer Section

This section deals with the acquisition and installation of all stand-alone computers, network terminals, etc, and is currently involved in two major projects:

- 1) EDS II which will extend the penetration and facilities offered by the current news database system. The ultimate aim is to put terminals into every office: these will fulfil all general office computing functions (wordprocessing, etc), allowing all offices to communicate with each other, as well as giving access to the news (and any other) database.
- 2) The Caversham Computer. This is a text database system, where the emphasis is on feeding in news stories heard on the radio: the raw information can be edited and streamed into the various 'agency' services offered by the Monitoring Service.

### TRANSMISSION PLANNING UNIT (TPU)

This unit is responsible for maintaining and improving World Service's audibility world-wide.

Operationally, this involves the strategic layout of transmission schedules: these have to match day-to-day broadcast requirements with equipment availability (including programme distribution lines and transmitters) and must take into account the predicted ionospheric performance at different times of the day and year. The Operations section is also responsible for preparing all publicity documents on transmission frequencies.

Another section - Frequency Management and Reception Reporting - deals with maintaining audibility through detailed frequency planning, in conjunction with other international broadcasters. It is also responsible for the collection and analysis of reception data on World Service and is involved in the collation of information on the occupancy of world-wide broadcast bands.

A third section of TPU - Liaison and Planning - is involved more with mid and long term engineering transmission requirements; this requires active involvement in international conferences, such as WARC HF, and technical appraisal of their proposals. The section also provides computer support for the unit as a whole.

### OPERATIONAL RESOURCES

This department has three main sections - Operations, Resource Facilities and Technical Services.

Operations is the largest section with 178 SMS, five DOMs and sixteen staff looking after SM and Studio Bookings. A further sixteen engineers, four ATOMs and four TOMs operate a shift system in the Control Room. The Resource Facilities section looks after the gram and recorded programmes libraries, as well as recruitment and training, while the Technical Services section provides shift maintenance around the clock and Test Room facilities during office hours.



*The AMS Audiofile*

The department had a sizeable range of equipment on display including Optimod, a Racal logging recorder, the in-house developed cassette-to-open-reel copying trolley, Intelfax (for producing the in-house 'Bushfax' service) together with a selection of office listening and viewing equipment. The recently updated studio boasted brand-new cartridge, CD and cassette facilities.

There was also an impressive display of midget recorders, microphones, mixers and short-wave receivers while Studio Operations demonstrated a selection of Digital Effects Units, including the highly-regarded Yamaha SPX 90 and, in a separate room, the AMS Audiofile. Also of interest was the Tandy 200 portable computer, with built-in telephone modem, which foreign correspondents can use to fax their stories back to Bush House.

Nearly three hundred visitors attended over the two days and the exhibition was considered a great success by all concerned.

# SOME MEMORIES OF 1988 . . .

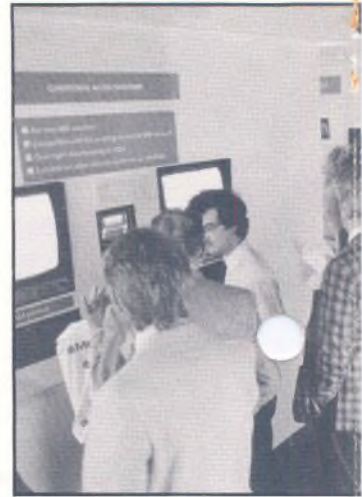
AVENUE HOUSE, JULY

*The formal opening of new D&ED facilities.*



*l to r: Bert Gallon (CET), David Brown (Prototype Services Manager), Bill Denny (DE) and Bert Neale (HD&ED) view items produced on a computer-controlled milling machine.*

**IBC** 1988



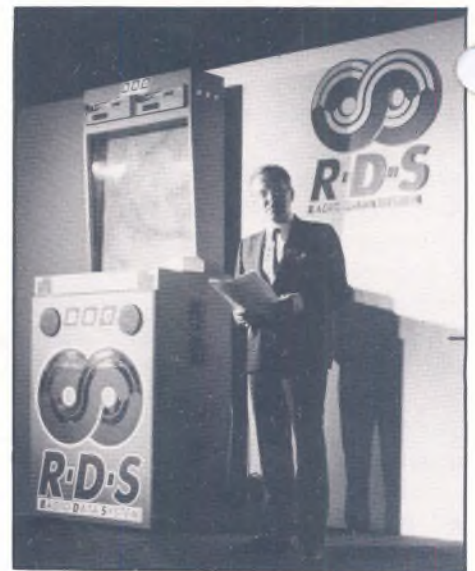
*The busy BBC Stand at IBC 88.*



WESTMINSTER, SEPTEMBER



EARLS COURT, OCTOBER



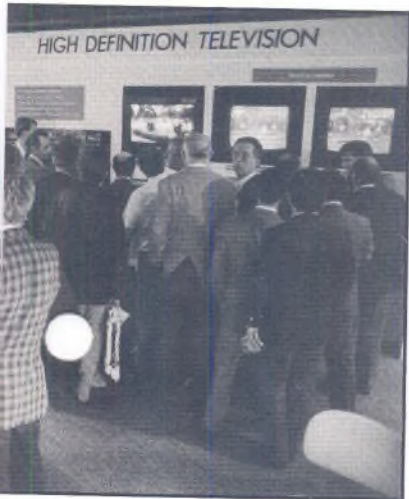
*Johnny Beerling (C.R1) at the official launching ceremony for RDS.*

*RDS and Radio 1 FM were among many items featured in the 'Story of Radio' at the BBC Radio Show.*



*The Eureka HDTV pavilion at IBC 88 with BBC and ITV HDTV OB Scanners.*

BRIGHTON, SEPTEMBER



FARADAY  
LECTURES

CARDIFF, NOVEMBER



*Robert Digings and Anne Roland present the BBC's IEE Faraday Lecture.*

MILTON KEYNES, AUGUST



*The team involved in the first commissioned electronic HDTV programme in the Eureka standard.*

**... VERY BEST WISHES FOR 1989**

*Mike Meyer, Mandy, Si, Roger and David*

# THE BBC RADIO SHOW

## — AN OB NIGHTMARE!

The BBC Radio Show, held in October at Earls Court, London, was a celebration of the 21st anniversary of the four Radio networks in their present form, the Coming of Age of Radio 1, and the birth of Local Radio. It was the biggest show ever undertaken by Radio OBs, and occurred around the same time as the Seoul Olympics and the Party Conferences. The pressure on staff and resources was enormous.

Our first meeting to outline the basic ideas was held on 29 July 1987, while the first site visit took place on 10 August 1987. Earls Court was a venue that was totally unsuitable for the type of programmes that we were attempting to stage and at best, a compromise between an Exhibition and a Broadcast venue.

In general the show consisted of:-

### 1 Four broadcast areas:

- (a) The main stage, which was designed to look like a ghetto blaster radio with large video walls on either side and provision for a standing audience of around 3000.
- (b) The Warwick Hall studio, a separate hall on the 3rd level, for more intimate types of show and provision for a seated audience of about 400.
- (c) A News/R4/WS Goldfish Bowl studio, among the exhibitors' stands.
- (d) A Local Radio stand with an enclosed studio and an open stage.

### 2 The exhibitors' stands



*The Show's main stage*

### 3 An enclosed exhibition area entitled 'The Story of Radio'

This area depicted decades of the history of radio, with displays for R1, R2, R3, R4, WS, LR and RDS.

The technical areas to be equipped were:

- Two control points, adjacent to the main and Warwick Hall stages, which would handle the less complex programmes from these areas.
- Stereo Control Vehicle 3, parked outside the building, to handle larger and more complex shows from the main stage.
- A separate control point, adjacent to the Warwick Hall, which would handle the more complex programmes in that area, and would enable us to have two stage rig-ups simultaneously.
- The studio, control point and newsroom of the Goldfish Bowl area.
- The Local Radio studio and stage area.

The 'get in and cable rig' began on Friday 23 September 1988. The construction of the stages and technical areas were due for completion on the following Monday morning but, unfortunately, like at most exhibitions, there were delays and the areas concerned were not completed till the Wednesday. During this time the ten Radio OB Sound Supervisors were attempting to rig what little they could without light and power and without the areas being secure. Only two days to go now before the opening on Press Day, Friday 30 September. With considerable hard work and long hours, the rig was completed by 0100 hrs on the Friday morning. It had been an exhausting and frustrating period.

The first programme, Simon Bates on Radio 1, went ahead on time at 0930 hrs. The official opening by the Chairman, Marmaduke Hussey, and Radio's Managing Director, David Hatch, was broadcast live into this programme at 1200 hrs, as was the opening of the Story of Radio at 1220



*The Marquesa Marconi opens 'The Story of Radio' live on the Simon Bates show*

hrs by the widow of radio's inventor, the Marquesa Marconi.

At 1100 hrs on Saturday 1 October, the first member of the public passed through the turnstiles and by the close at 2200 hrs on Sunday, 9 October, over 100,000 had visited the show.

Over sixty programmes were produced on the main and Warwick Hall stages, including twenty-five live transmissions. The remainder were closed circuit presentations which helped to provide near to non stop entertainment. The range of programmes included:-

Rock Concerts by T'Pau and Womack and Womack, Chartbusters, the Top Forty and DJ shows for R1. The R2 menu included Friday Night is Music Night, the Gloria Hunniford Show, News Headlines, Sunday Half Hour, Charlie Chester and Brain of Sport. Amongst the R3 presentations were Concert Hall, Random Access Memory, specially imported from France at great expense, John Surmans Jazz Concert, the Jazz Warriors and Los Yuras with music from the Shores of Lake Titicaca. R4 favourites included Any Questions, Gardeners Question Time, With Great Pleasure, Desert Island Discs with Sue Lawley and Terry Wogan and many others too numerous to mention. Among the closed circuit presentation were the ever popular Archers Road Show, News Quiz, Ned Sherrin and various Dramas.

More than seventy programmes came from the Goldfish Bowl, including R2 and R4 news summaries (compiled in the adjacent Newsroom), Womans Hour, Kaleidoscope, Going Places, etc and nine different language programmes from Bush House. Between the programmes, visitors could try their hand at newsreading which was very popular.

The Local Radio stand originated over thirty programmes plus countless closed circuit presentations.

The operational staffing consisted of ten Radio OB Sound Supervisors, led by Julian Walther, who were responsible for the rig, de-rig and a continuous presence on all programmes throughout the show. Sixty-three Studio Managers from BH London, fourteen Studio Managers from Bush House and eight Audio Supervisors from Birmingham, Bristol, Manchester and Glasgow came to Earls Court on one or more occasions, to handle the programmes they were normally responsible for. Tim Donaldson, EiC Radio Bedfordshire, was responsible for the setting up and the running of the Local Radio stand, assisted by two Local Radio engineers. And the Newsroom technical facilities were organised by Paul Evans of News Engineers.

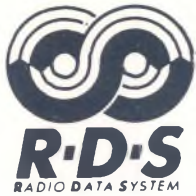


*The busy enquiry desk, manned by staff from Radio, WS, EID and the EBU*

The majority of the technical equipment was supplied by Radio OBs. In fact we practically transferred our stores to Earls Court as there was precious little left behind at Concord Road! Invaluable support was given by Operational Engineering Services, Broadcasting House, in loaning us tape machines, grams and compact disc players. It took two days and three ten-ton vehicle loads to remove the equipment at the end of the show.

In appalling conditions and a hostile environment, the teamwork and exceptional efforts of staff from many and varied areas made this show possible. We were landed with a monster and almost succeeded in taming it. A veritable triumph.

Dick Elsdon  
Manager, Planning & Resources, Radio OBs



# TAKING RADIO INTO THE 21<sup>st</sup> CENTURY!

Many departments were involved in the successful launch of RDS. In this special feature, invited staff from D&ED, TED, RCP, RD and Radio describe their involvement in the project, starting with Simon Parnall of D&ED.

## PRODUCING THE EQUIPMENT

It is always exciting to be involved at the start of something new - challenging yet daunting. Engineers at D&ED have very much felt this excitement while developing and producing a complete range of RDS equipment for transmission, distribution and support.

The system divides neatly into the above three categories and I will give a brief summary of the function of each of the main units:-

### Transmission

The RDS Assembler (CD4S/22) and Modulator (MD2/1) are the most important components of the system. The assembler produces a raw bitstream at 1187.5 Hz which then modulates a subcarrier of 57 kHz before being added to the stereo multiplex. An EPROM in the assembler provides the data that will be formatted and transmitted on a cyclic basis. The assembler can be fed with MSF time received from Rugby, in which case the unit produces a special time packet at every minute edge. We use this facility at every site. The assembler may also be fed with a number of serial data streams which can modify the transmitted data in accordance with the current programme. We use this facility at all main network sites.

### Distribution

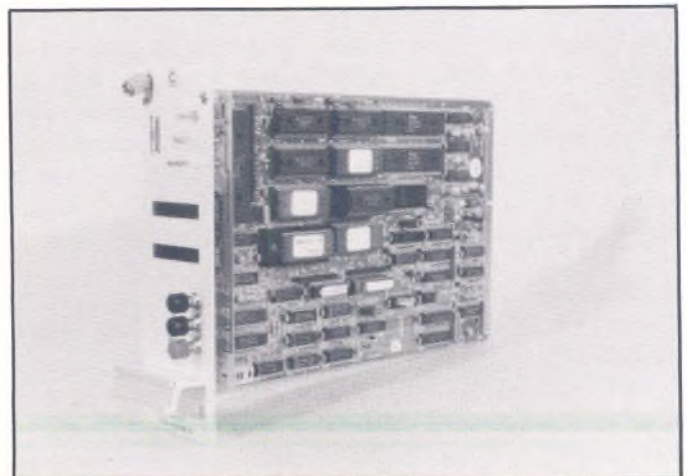
Spare capacity is used within the NICAM distribution system to send a serial data-stream to each main network transmitter, to update the programme-related RDS features. This datastream is called 'Update Data'. Each network distribution channel carries one feed of Update Data which is added to the pcm by a Combiner (CD4S/17) and stripped at each transmitter site by a Splitter (CD4S/18). The maximum rate at which the system will operate is slightly under 2400 baud (bit/s).

### Support

Data is supplied to the assemblers by two routes: firstly, in the form of an EPROM and secondly, by a feed of Update Data. The central computer in Broadcasting House produces both of these. It maintains a large database of all programme services, all transmitters and their frequencies, and uses this to generate an individual EPROM for every transmitter site. It also maintains a schedule of BBC network programmes for up to twelve months in the future and a month in arrears and makes dynamic changes to the RDS output to reflect these changes on a timed basis. A fool-proof (yes we've got him) menu entry system is used to manage these schedule files, requiring no computer literacy and very little understanding of the intricacies of RDS.

D&ED has also designed and produced a monitoring receiver, enabling field engineers to verify the output of the assemblers both at multiplex and rf levels. This unit (RC3SP/21) displays all RDS features on either an lcd panel or a vdu, so that frequency lists, traffic flags, decoder information, etc, can all be checked. This could not be done with a commercial receiver which uses such information for control rather than for indication.

Quite a large number of D&ED engineers have been involved in various stages of the project: Rhys Lewis, John Robinson, Brian Wright, Ken Chapman, Gerry Wimpenny, Kim Popat, Colin Foddering and Neale



RDS Assembler, CD4S/22

Davidson all deserve special thanks. We have enjoyed a very good working relationship with BBC Radio, RCP, TED and RD during this project and particular thanks must go to Bev Marks of RCP for his understanding, tolerance, and support during some of the more difficult moments.

As is usual in such pioneering ventures, the exact specification for the performance of each component, and indeed the system as a whole, was not known at the outset. As design and production progressed, so changes to software and hardware have been required to meet new needs, and solve problems hitherto unknown. This is the price we pay for being at the coalface. I wouldn't be anywhere else.

Simon Parnall  
Control Section, D&ED

## INSTALLING THE EQUIPMENT

In 1987, Monitoring and Control Section of TED started the installation of RDS equipment at transmitting sites. In Phase I, all main and local radio sites in England were fitted with RDS equipment. Black Hill (Scotland) and Wenvoe (Wales) have also been equipped.

At the time of writing, the installation of RDS equipment is under way in Northern Ireland, with the remainder of Scotland and Wales to follow very soon. These installations should be rapid, as the pattern of work has already been established at the English sites.

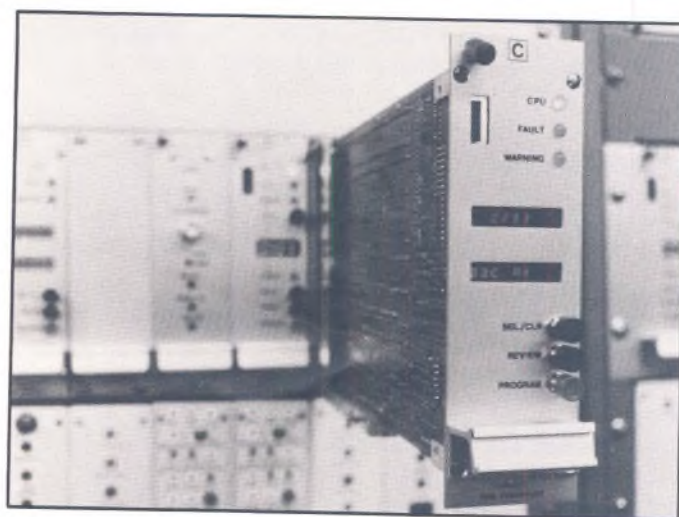
The main RDS items required in the T.I.E. consist of the following:

- (a) NICAM splitter. This unit provides two serial RS232 outputs. One is required to distribute Update Data via the NICAM network while the other is available for future requirements. In addition to the serial outputs, a 16 bit control word is available at the splitter output. The individual bits of this word are used to control transmitter functions, such as Mono/Stereo switching, at any selected transmitter or at all transmitters in the network.
- (b) Assembler. This unit is capable of generating its own data (default

data) from an internal store of up to eight sets of data, eg R1 or R2 etc. Where dynamic Update Data is available, the unit takes an RS232 bitstream from the NICAM splitter to add to the internally stored data. The unit has its own time clock, the accuracy of which is greatly improved by regular updates from either MSF Rugby or the dynamic data stream.

- (c) Modulator. This unit takes data from the assembler and modulates it on a 57 kHz carrier using DSBSC. The RDS signal is taken from the modulator and fed to the stereo coder of the transmitter drive.

Another option is to use an Off-Air receiver with an RDS decoder to provide dynamic update. This system is used at local radio sites which are not provided with a NICAM feed.



*An RDS Assembler at Wrotham*

The installation work has progressed well to date, especially when one considers that it has effectively been a retrofit to existing equipment, already in service. The RDS equipment has proved reliable and hopefully will continue to give good service in the years to come.

Those of us in Monitoring and Control Section who have worked on RDS installations would like to thank all those people whose help and advice have made the job so much easier. If we haven't been to your part of the country yet, we'll get there soon!

John Porter and Sandy Peet  
Monitoring & Control Section, TED  
Continued on next page

### THE CENTRAL COMPUTER

The easy decision about RDS was that a computer would be needed and it was mentioned in the earliest discussions on how RDS would be engineered. It would handle 'scheduling' of event changes within RDS and maybe a few housekeeping activities. The first guess was that the ubiquitous BBC micro could handle the job. How wrong can you be!

Perhaps I should not admit it, but the requirement grew in size to a point where it was obvious that a fairly sophisticated installation would be required to carry out the control of a whole range of dynamic RDS features. (To save time here I would suggest that you read my article in the November edition of Electronics and Wireless World which describes the concept of both 'Static' and 'Dynamic' RDS features and a good deal more also).

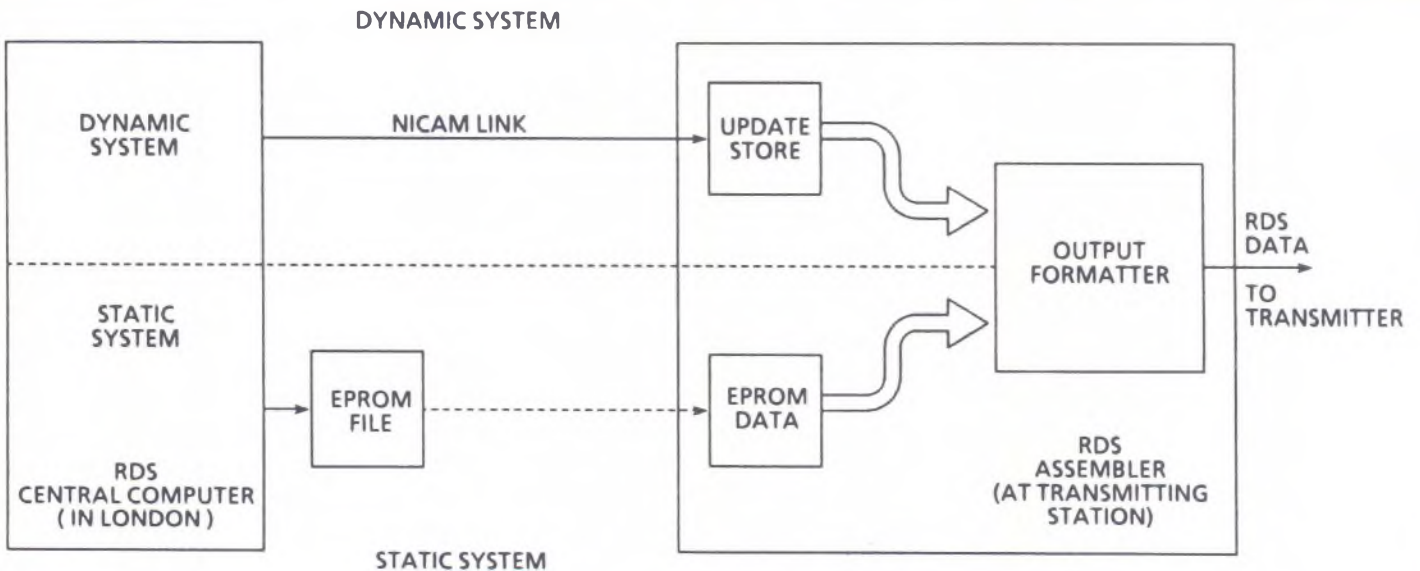
Dynamic features require continuous control and this is now done from the Central RDS Computer, which is directly connected to the RDS encoders at all network transmitters, via the NICAM signalling channel. The diagram shows in simple form how this is configured.

Because of other broadcast control computer installations already in service in Broadcasting House, London, it looked sensible for maintenance reasons to consider using another DEC PDP 11 system.

The NCA Routeing Control Computer uses two computers with an add-on watchdog system to monitor them and control changeover from one to the other. In the RDS evaluation of requirements, complete reliability was considered to be even more important: if things went wrong then four networks could be affected. Furthermore, this computer was going to have to look after itself: there would be no operational staff keeping it happy, but in time there would be a wide range of presentation staff logging on to carry out their scheduling work.

At just the right time, we were notified that DEC was about to introduce a new PDP 11 configuration intended for process control applications where high reliability is crucial. Luckily DEC chose us as a field test site and we were able to take delivery of a MIRA system, comprising two micro PDP 11/73 computers, just in time for our software development programme which was undertaken by D&ED. The photograph shows the two computers in the left-hand half bay with the watchdog controller and in the right-hand bay there are modems to connect to the NICAM equipment and the radio-code clock, which gives the system updates of time synchronised to MSF 60kHz from Rugby. Two console printers are used to log all significant transactions and faults, so that an engineer arriving in the normally unattended room can establish the status/history of the system.

The difficult decision about the Central RDS Computer was where to put it. It is not that large but space is always very



STATIC AND DYNAMIC RDS SYSTEMS  
(FOR ONE NETWORK ONLY)



much at a premium in Broadcasting House. No one wants to move if you require their office; no one wants the hassle of providing an adequate environment for your relatively delicate computer, if a store room is suggested. We encountered both these problems but fortunately an interim home was found for the equipment in the old Con B area. The computer bays, console printers, and local VT220 terminals all reside in the 'studio', whilst the Uninterruptible Power Supply (UPS) is located in the 'cubicle'.

With all the protection to power supplies in a building like Broadcasting House, it may seem strange to use an UPS. Restarting after a power failure would require manual attendance, just at the time when studios need to be revitalised, so the small UPS overcame that problem and is considered a norm for process control applications because it makes the watchdog functions much more predictable. Of course we know now that all this equipment could have gone into one room, but at the time we were planning this work, the size of computers was uncertain and UPS sizes have reduced considerably, in recent times. The installation will move to a new location in 1989, when a slightly more compact layout can be achieved.

So far I have not mentioned that the housekeeping aspects of the system - RDS reliability, at large - should be as good as that of audio broadcasts, so each RDS encoder has been designed to run entirely on its own from data held in PROM. Data link failures between the Central RDS Computer and a particular transmitter site will simply cause the locally radiated RDS to reduce from a dynamic to a static service. The PROM contains data originated from the Network Source File held in the Central RDS Computer, which has complete information on the whole transmitter network.

This concept is important because radiated RDS from one site will provide information about another and vice versa, so a central data base allows cross-checking of any changes or additions well before a PROM is 'blown' and sent to the appropriate site. For example, one additional Local Radio transmitter, apart from requiring a PROM itself, could well cause eight or nine other sites to require new PROMs (to enable their radiated RDS to correctly reference the new LR transmitter).

The system has been operational since June

1988 and gradually working harder and harder as more schedules are activated. Since the RDS service was launched in September, the system is controlling RDS encoders as far afield as North Hessary Tor and Sandale, where they provide dynamically changing Service Names to reflect the network configuration changes involving, for example, OU and Schools Broadcasts. Several other features, like Programme Type labelling, are also being transmitted according to the schedules.



*The RDS central computer*

At the Motor Show in Birmingham, the system was used to provide trade testing of Traffic Announcement flags; Radio WM had a temporary travel service provided from a terminal at the NEC which 'talked' direct to the Central RDS Computer. This, in turn, sent commands via the NICAM signalling channel for Radio 2, to Sutton Coldfield where a data bridge was inserted to carry the data across to the Radio WM RDS encoder.

Bev Marks  
RDS Technical Project Manager

## DEVELOPING THE SYSTEM

Research Department has been involved in the development of the Radio Data System since the inception of this work in 1976 and has collaborated with other EBU members in developing the agreed system. This has involved, in particular, the development and testing of the modulation and coding systems used in RDS; a major contribution by Research Department has been the development of the novel block and group synchronisation system. RD has also conducted major field-tests of RDS (and its precursors) both in the UK and, Continued on next page

## RDS

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under the auspices of the EBU, in Switzerland.

Since Radio Directorate took the decision in 1986 to provide RDS as a service, Research Department has provided technical support to the Directorate as well as TED, TOD and D&ED in their task of implementing RDS. This has involved work in EBU Specialist Group R/RDS to clarify the RDS specification and assistance in deciding how to use the many features which RDS can offer to provide most benefit for the listeners.

The radio receiver industry was relatively slow to develop prototype RDS receivers and so, in order to be able to demonstrate RDS and to gain experience with the application of RDS in different kinds of receiver, Research Department has over the years built several experimental RDS receivers. The latest of these, our 'Concept Receiver', can be seen in the photograph below, together with one of its principal designers, John Riley. The Concept Receiver is essentially a research tool which enables us to investigate different strategies for using RDS in the receiver and for providing various user interfaces. It also acts as a bench-mark reference receiver, against which we can compare the commercial RDS receivers which are now being launched on the market.



*The RDS Concept Receiver*

The heart of the Concept Receiver is a DC electroluminescent display panel, which can be seen mounted in a replica of a car dashboard in the photograph. This display is made 'touch-sensitive' by an XY-addressed infra-red bezel overlay. The radio fascia is drawn as a graphic on the display, as are the various controls and

push-buttons defined in the software which interpret the touch-sensing on the display. It is therefore very easy to experiment with different fascias or control configurations, simply by changing the software.

After the debut of this Concept Receiver at the RDS Launch, it also featured in an exhibit on the BBC stand at IBC 88 where it was used, in conjunction with RDS source equipment provided by D&ED, to demonstrate a complete RDS system. This IBC demonstration was enhanced by a rolling sequence of computer colour graphics and linked sound commentary, which was developed at Research Department as a Graduate Trainee project.

Although RDS is now a public service, work on future developments continues. The first of these will be the five station travel experiment, beginning later this year, which will enable listeners with suitable, second generation, RDS receivers to listen to say Radio 3 and yet obtain, if they wish, travel news from BBC Local Radio stations. And beyond that, research is in progress concerning the possibility of using RDS itself to deliver travel messages in densely-coded digital form, independently of the audio programme signals. These digital travel messages would be reproduced by a voice-synthesiser or printed out on a small printer.

Bob Ely

Head of Carrier Systems Section, RD  
Chairman of EBU Specialist Group, R/RDS

## PROMOTING THE SERVICE

The considerable efforts in time, money and energy which have been devoted to the technical development of RDS, and the subsequent equipping of the transmitters, would be almost entirely wasted if RDS was to remain a plaything of the cognoscenti - a mere fascination for the enthusiastic amateur or broadcasting professional.

Fortunately, at a relatively early stage, BBC Radio recognised that it would need to allocate comparable resources to the promotion and development of the RDS service as it had invested in the technical system development.

When colour television was introduced as a service twenty years ago, the 'Colour

comes to Town' roadshow sold its wares to the public in a travelling exhibition. The switch from monochrome to colour was something viewers could clearly identify with and they needed little persuasion of the advantages it offered. The Radio Data System, on the other hand, is unlike that as the difference between an ordinary radio and one making use of RDS is not obvious, other than the read-out of the station name.

This on its own is unlikely to convince the public that RDS is worth paying much extra for. The BBC's task therefore, was to persuade listeners of its many other benefits and also, to encourage manufacturers to produce radios for them to buy. However, chronologically, the promotion of RDS needed to be tackled the other way round, ie persuade and aid the manufacturers first, then inform the retailers and suppliers, and finally convince the public.

As a mark of the importance that Radio Directorate attaches to RDS and the vital task of 'selling' the system, it appointed someone from Controller level, (Johnny Beerling, C.R1) as the figurehead in charge of the project.

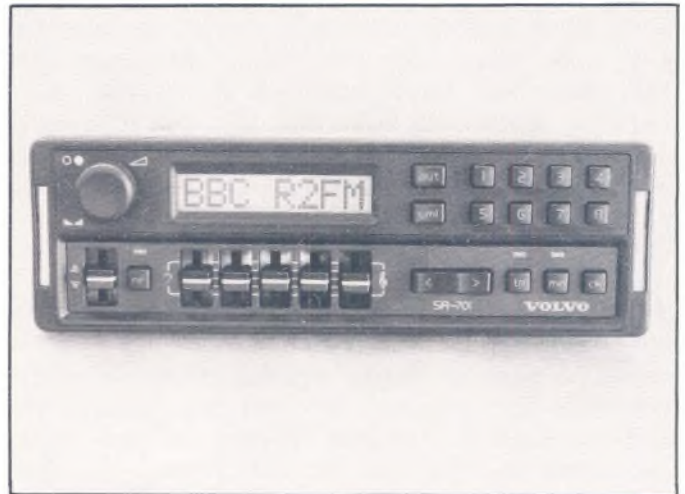
C.R1 soon assembled a Steering Group which comprises members from several disciplines, each able to bring his own particular expertise to the task in hand. The group has been formed from staff in Research Department, Radio Capital Projects, EID and Radio Publicity, together with a full-time RDS co-ordinator from Radio Ops & Eng (the RDS Development Manager). On behalf of Radio Directorate, the group co-ordinates all RDS activities, including the policy for implementation.

Members of this group pursue a regular diet of meetings with radio manufacturers and dealers, car companies, the Press, as well as taking every opportunity to promote RDS to the public at exhibitions and BBC events. The group is supported as the need arises by appropriate experts from Design Group, Broadcasting Research Unit, other BBC areas and an external Marketing and Public Relations company.

Barely a week goes by without a manufacturer wanting to visit the BBC to discuss elements of the specification about which they are unclear; or to present a prototype receiver for evaluation and comment or, unashamedly, to ask for specific help in overcoming a

problem they are experiencing with their prototype radios.

We may know (or think we know) all about our own radio services. However, try explaining to a group of Japanese engineers with limited English why Radio 4 FM in Scotland is not necessarily the same as Radio 4 FM in England or in Northern Ireland, and what the difference is between a 'split' and an 'opt-out' and I think you'll appreciate the type of problem that can arise. These, sometimes apparent, subtle differences may seem unimportant but have considerable consequences as far as coding of the RDS datastream is concerned, and the desired response expected from a radio receiver.



*A production sample of an RDS car radio*

As well as liaising with the R & D sections of manufacturers, increasingly there are meetings with the Sales and Marketing divisions of these companies. This involves supplying them with information and publicity material as well as sharing a platform with them when they proudly launch their new RDS product to the Press.

As part of the general promotion of RDS, adverts appear monthly in several magazines read by the radio retailing trade. This generates an average of about twelve postal or telephone enquiries each day, all demanding either a standard mailshot or a specific reply. These, and a further thirty or so enquiries a week from the general public, the Press and others, contribute to the campaign of awareness in RDS.

The Radio Data System is of course a Europe-wide system and, although other countries are also committed to providing a service, none are as advanced as the

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## RDS

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BBC. Because of this, and the personal enthusiasm of C.R.I, the BBC effectively steers the implementation of RDS across Europe, chairing the 'EBU Programme Experts' as well as the 'EBU R/RDS Technical' groups.

Both groups try to ensure that all the countries of Europe pull in the same direction, not only technically but in the manner of implementation as well, to ensure a common pan-European voice to the receiver industry. An example of uniformity is the agreement reached by all European broadcasters in defining the 'Programme Type' categories (PTY) to be used not only for RDS but also for future satellite radio services. In a similar way, the familiar RDS logo, designed for the BBC, has been adopted in Europe as a service mark for use by all broadcasters in their promotional activities. It is also intended for use on the front panels of radio receivers using RDS, to aid recognition by the buying public.

Manufacturers are now beginning to produce RDS receivers, at least in the car radio market, and by early Spring 1989, I would confidently expect to see at least six models with a further eight or ten being launched by the end of the year. Initial prices are bound to seem high at about £350 for a car radio, as manufacturers attempt to recover the costs of many

months of R & D effort. But as RDS increasingly becomes standard, costs will fall and the premium for a set with RDS, as opposed to one without, will be negligible - assuming that the latter are still available. The chairman of the European manufacturers' association considers that few if any sets will be made without RDS, within eight to ten years.

Although the basic RDS system has now been 'launched' and sets for the mobile environment seem assured, the work of the Steering Group continues. Among the tasks scheduled are: the need to encourage the development of domestic radio sets with the benefits of RDS, possibly leading to a radio carrying the BBC name, and; the planning and installation of the most sophisticated Travel News service ever provided by the BBC, using the unique abilities of RDS.

These, and the adoption of other service features - possibly including data coded travel messages allowing you to receive information in the language of your choice across Europe - will ensure that the coming months working on RDS will be as busy as the previous ones, and the system will take radio proudly into the 21st century and beyond.

Mark Saunders  
RDS Development Manager



*Crowds flock round the RDS exhibition model at The Radio Show*