

# ENGINEERING

SPRING 1989

No. 36

## TRANSMISSION WINS GEC-MARCONI MAINTENANCE CONTRACT

BBC Transmission, based at Warwick, has secured a competitive contract for the exclusive maintenance of GEC-Marconi's National One base stations. The contract will initially run for three years.

National One is a speech and data service which offers subscribers a wide range of facilities such as selective two-party calls, fleet calls (to all users or selected groups), dispatcher facilities, vehicle tracking and security, etc. The network now covers a large area of the country, catering for local, regional and national fleet operators.

Under the terms of the contract, engineers from Transmission Operations Department will be responsible for maintaining National One's base stations. There will be seventy-four in service by the end of this year — some co-sited with BBC transmitters — and other base stations will follow as the National One network develops.

If a fault occurs, GEC-Marconi will telephone the appropriate Monitoring and Information Centre (MIC) to arrange a visit from the designated BBC engineer, who will be on 24 hour call. The BBC is contract-bound to

respond to a GEC-Marconi request within four hours. Faults will be cleared on a module-exchange basis, the BBC retaining a stock of spare GEC-Marconi modules.

According to Bert Gallon, Chief Engineer Transmission: "BBC Transmission is well placed to undertake contracts of this type, given the expertise of staff and the locations of Maintenance Bases throughout the UK. In addition to providing another dimension to the work of staff, the contract will provide a useful addition to the income obtained from Transmission's commercial activities."

## RD HOSTS GOVERNORS' MEETING

Research Department hosted an out-of-town Board of Governors Meeting at Kingswood Warren on Thursday 30th March. The previous evening a number of Governors and several members of the Board of Management were shown conditional access broadcasting techniques, HDTV and RDS — highlighting both the range of work undertaken by RD and the stage that these important projects have reached.

Following the Governors' normal business meeting, RD and Tel OBs jointly demonstrated work on radio-camera antennas,

including Helitrak which had been successfully used, experimentally, at this year's Boat Race.

Some sixty members of Research Department were invited to a buffet lunch with the Governors and Management, which allowed a valuable exchange of views. Both the Chairman, Marmaduke Hussey, and the Director-General, Michael Checkland, gave a brief word of thanks and expressed their confidence and pleasure at the way in which Research Department is assuring the technological future of the BBC.



Chris Gandy explains radio-camera antennas to the Board of Governors. In the front row are: DG, Michael Checkland, and Governors Marmaduke Hussey, Lord Barnett and John Parry. Cameraman is Andrei Austin.

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# ENG INF

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Welcome to our new format. It's not that we've succumbed to the desktop publishing revolution; this issue has been prepared as usual on the office wp but the text has been typeset professionally.

At this stage, we would like to express our gratitude to Dianne Lafferty (nee Fountain) who has contributed a great deal to the layout of 'Eng Inf', since its inception in the summer of 1980. Dianne left the BBC in February for a similar job, not far from her home. Our warmest thanks also go to Roger Foster who worked on 'Eng Inf' layouts over a period of about six years, before leaving the BBC last Christmas (again, for a similar job much closer to his home).

As a result of our new format, we are able to publish more stories for a given number of pages. So please keep those drafts rolling in! And don't forget that a good photograph or two can contribute greatly to your story.

The deadline for our summer issue (no 37) is 26 May.

Mike Meyer

# RADIO PB

The Spring 1989 edition of the pocket booklet 'BBC Radio Transmitting Stations' is now available from EID. Please telephone LBH 5040 to order your free copy(ies).

# LICENCE AGREEMENT

A licence agreement for the new ITS Generator/Inserter, GE4SM/575 & A, has been struck with VG Electronics Ltd of Hastings.

The equipment generates ITS waveforms, including the new one-line waveform, which it inserts into a video signal for transmission. It also generates full field test waveforms, which are available at a separate output, and which can be switched to the main output. The full field waveform may be selected remotely with either tone bursts or a logic input. A current development will allow automatic recognition of this waveform by the ME3SM/502 TV Waveform Analyser (licensed to Avitel Electronics Ltd).

The Studio Generator, GE4SM/575A, is the 'full facilities' version; it includes an output of mixed syncs derived from the video input, and four external signal insertion inputs

for data such as Ceefax or Datacast. The OB version (GE4SM/575) has just one external data input, with no feed of syncs available.

Three options of both units are available, which provide:

- (i) the basic ITS/full field waveforms as above
- (ii) the addition of a digital communications channel
- (iii) the addition of a sound monitoring channel.

Further information on this Generator/Inserter appeared in the Autumn 1988 edition of 'Eng Inf' (Issue 34). For any other news on licensing matters in general, please telephone the D&ED Liaison Engineer, Peter Jefferson, on Avenue House 375.

# TRANSMITTER NEWS

The following stations/services entered service between 1 January and 31 March:

## FM Radio

On 6 January, Radio 4 FM was extended to the Londonderry area of Northern Ireland. And on 20 February, fm reception of Radios 2,3 and 4 was greatly improved in and around Ipswich, when the Manning-tree station entered service.

— Radio Oxford went stereo

— Radio Nottingham was extended on FM to the Mansfield area, when a new relay at Fishponds Hill entered service

Radio Nottingham gained further benefits on 22 February: the FM service for the south of the county, including the city of Nottingham, was transferred from Colwick Park to Mapperley Ridge.

## Television

Three television relays entered service during the quarter:

Alltwen	West Glamorgan
Bridgnorth	Shropshire
Weston Mill	Plymouth

## Local Radio

St Valentine's Day saw the introduction of three improvements to BBC Local Radio:

— our thirty-fourth station entered service, covering the county of Hereford & Worcester

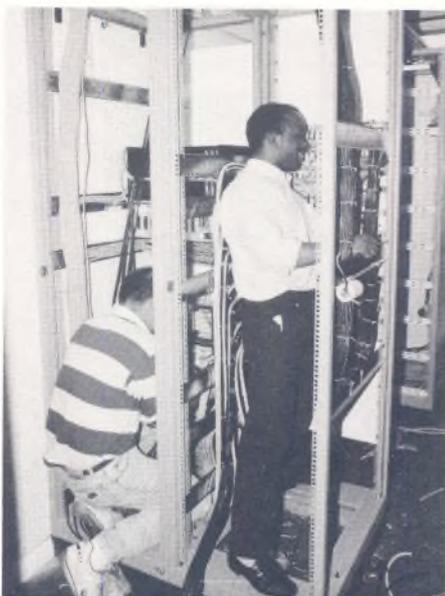
# RADIO SPORT NEW COMPUTER SYSTEM

Installation of a new computer system for Radio Sport has now been completed. A Basys system, similar to the one already in use by News and Current Affairs, is set to revolutionise the way in which sports staff work — providing electronic access to news, word-processing of scripts and a large amount of office automation.

The story really began early in 1988 when Computer Services Radio, in conjunction with staff from Sport and OBs, began the task of producing the system specification. It soon became clear that only two companies were capable of providing a working system and, after some hands-on assessment, Basys International Ltd were chosen as the main system supplier.

At the heart of the chosen system are two DEC Micro Vax 2000 mini-computers, each looking after a 159 MB hard disc. All information is mirrored to both discs, to automatically ensure back-up should a problem arise with either drive unit. Similarly, either MV2000 is capable of sustaining the system in the event of a processor failure.

Connected to the processors, via an Ethernet, are eight Communication Concentrator Units or CCUs. These



*Giles and Delroy installing the new computer*



*Sports journalists using the new system*

units provide the link through which the computers communicate with all other devices. The system has thirty-five terminals and nine printers, as well as links to Manchester, Birmingham, MSS (Message Switching System), portable dial-in terminals and the ten main wire agencies. In total, the eight CCUs provide sixty-four ports to the outside world.

The basic source of input into the system comes from the wire agencies. Information from around the world is provided by ten independent services, in electronic form, and is stored in the system for immediate retrieval on any terminal. Central to the effective management of this flood of data is the system's ability to filter stories, by searching for key words, before storing them in users' pigeon holes. Key words, such as Arsenal, Bruno, Golf or Wimbledon, are set up on an individual basis; the system then scans the various wire inputs for them, continuously, even when the user is logged out.

Scripts are written at the terminals using normal word processing techniques. However, it is also possible to split the screen — allowing scripts and wire stories to be viewed at the same time. Blocks of text can be copied across, if required, and when a story is completed, it is saved in the

system which automatically provides a read time for the story. This is invaluable at the stage where a complete programme is being compiled.

An editor may view the running order for a programme and quickly change the order or add items. A total duration for the programme is displayed and also the necessary start times for individual items, to meet a specified finish time for the programme. Any over- or under-run is displayed, allowing accurate slot times to be achieved with great ease.

Although scripts can be printed to a high quality, it is also possible to read the stories on-air, directly from a terminal. The Basys system produces an autocue-style output on a terminal; the double-size characters can be scrolled by the broadcaster himself, if necessary. Using this arrangement, a script will be transmitted without any paper movement being involved. Clearly, the advantages of the system are its speed and flexibility. All information on the system is available to everyone; all changes are instantly shared.

In addition to the Basys system, Computer Services Radio is installing a local area network. Based on an Apricot pc, the Ethernet system will link together eight workstations in

# RESEARCH DEPARTMENT A TALE OF TWO BUSHES

For its coverage of the inaugural speech of President Bush, on 20th January 1989, Bush House was faced with a recurring problem — how to delay a live audio contribution to fit into a programme schedule. A live feed of the ceremony was available from Radio 4, with the inaugural speech expected to start at 5.06 pm. Unfortunately, this would be at least three minutes earlier than the 5.09 pm transmission of the World Service current affairs programme '24 Hours', which was covering the event. The usual set-up in this situation is to use three tape machines in rotation, each recording and then replaying a section up to three minutes long. The editing and cueing of machines makes this a hectic operation during the broadcast!

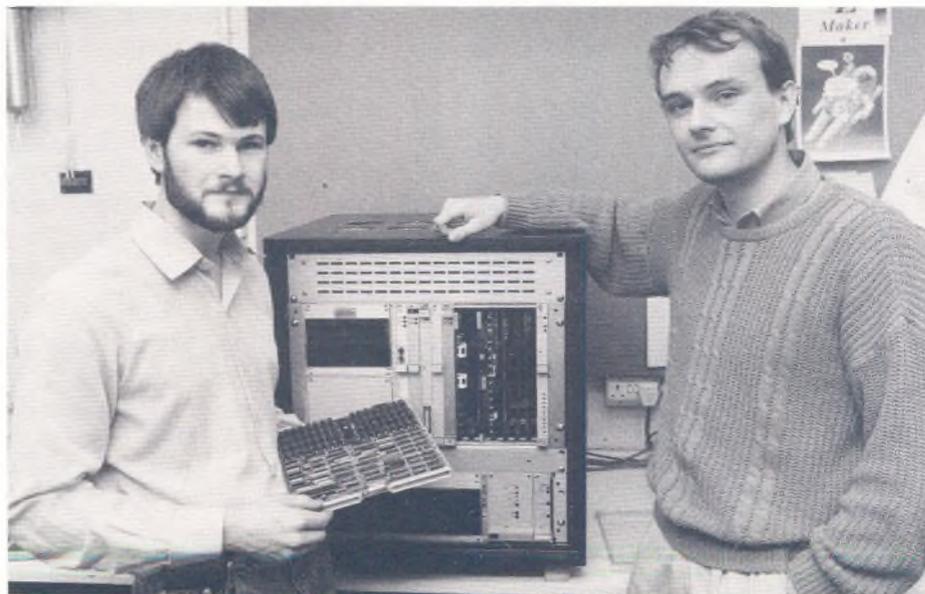
Feeling that there should be a better way of achieving this three minute delay, Reg Butcher of Projects and Planning, World Service, asked several manufacturers whether they could provide this facility. None was able to offer a solution. Knowing about RD's involvement in digital audio editing, he then contacted David Kirby to see if any other system might offer the facility. After discussion with Bruce Gentles and Andrew Mason, it was decided that the BBC's prototype disc-based Digital Audio Editor could provide the

facility but would require additional control software for this new function. On Friday 13th January, World Service decided to go ahead with this option and so the team at Research Department hastily started to write and test the new software for the following Friday.

In its modified form, the disc-based editor would continuously record the incoming audio and independently replay it from a cue point, marked as the recording was made. It would also be possible to start and stop the replay or trim the cue point without stopping the recording to disc. When the recording had filled the disc completely, it would 'wrap-around', starting again at the beginning of the disc, and over-record the material recorded 30 minutes earlier. In this way, any delay up to 30 minutes between recording and replay could be accommodated.

Despite encountering a number of unexpected problems on the way, the system was working by the Wednesday evening and installed in Bush House on the Thursday. The World Service transmission on Friday 20th January went out through the modified Editor faultlessly — albeit delayed by five minutes and forty seconds!

David Kirby, Sound Section  
Research Department



Bruce Gentles (left) and Andrew Mason with the adapted Digital Audio Editor



Phil Bloom tests the Radio Sport computer

Sport and OBs. It will provide further office automation, as well as some specific applications to streamline the department's administrative functions. Each pc will also be able to access the Basys system.

Installation work began in November 1988 with the construction of a Computer Room in the former QCR2 (on the 5th floor of Broadcasting House). This houses all the computer and communications equipment. Extra air-conditioning capacity has been provided, as well as a 7.5kW Uninterrupted Power Supply (UPS).

The UPS batteries can sustain the system for 40 minutes at full load, in the event of a mains failure. Normally this will not be necessary as the auto-maintained supply will have been restored. However, should a total loss of power be experienced, a graceful shutdown of the system will be possible.

Over 4 km of cable has been laid throughout BH to connect the terminals, printers and communication links to the computer room. A team of four wiremen has worked for twelve weeks, some of it at night to minimise disruption in offices and studios, to have everything in place before the arrival of the Basys commissioning team, at the end of January 1989.

Following testing and staff training, the new system entered service as planned on 1 March 1989.

Phil Bloom, Project Engineer  
Computer Services Radio

# INCORPORATED ENGINEER

## A NEW GRADE OF PROFESSIONAL INSTITUTION MEMBERSHIP

The Engineering Council has recently ratified a change to the designation of the senior grades of membership of the non-chartered Institutions.

The new title, *Incorporated Engineer*, is felt to better convey the position and role of the important group of staff who work alongside and complement Chartered Engineers. The previous designation, Technician Engineer, was almost universally misunderstood and generally not liked.

Incorporated Engineers have to be registered with the Engineering Council and are entitled to use the designatory letters *I.Eng.* after their name. Registration can be achieved by joining one of the appropriate Professional Institutions; in the case of electronics, the SERT or IEEIE. (Incidentally, SERT and IEEIE currently have a proposal to amalgamate which will be voted on, early in 1989.)

The grade of membership for Incorporated Engineer status requires:

- a qualification to HNC level or equivalent in appropriate electronics subjects (ETSIs may qualify)
- a job with an appropriate level of responsibility (grade 2W or above as a guideline).

SERT and IEEIE have other grades of membership if you are still working towards HNC or 2W.

If you are thinking about joining a Professional body there is no time like the present. Changes in membership requirements are in the process of being implemented, which are likely to raise the entry standard. For instance; in 1990 the qualification required for Incorporated Engineer membership of an Institution will become HND or equivalent (ETSIs will almost certainly not qualify).

The Director of Engineering, Bill Denny, is a current Vice President of

the SERT and previous Directors, Bryce McCrerrick and Sir James Redmond, have been Presidents in their time.

At the moment, I am Chairman of SERT and if you would like further details of membership of that body, please contact me at Avenue House, on extension 221.

David Walker  
Head of Support Group, D&ED

## VERTICAL BLANKING INTERVAL

On Network Distribution circuits, the television Vertical Blanking Interval (VBI) is set to see some changes over the next few years. The BBC's present usage and future proposals are tabulated below:

LINES	PRESENT USE	FUTURE USE
6 & 319	Local Noise	Local Noise
7 & 320	Network Noise	Network Noise
8 & 321	To be tested Mid 1989	Future Ceefax/Data Services
9 & 322	Available for use	Future Ceefax/Data Services
10 & 323	Available for use	Future Ceefax/Data Services
11 & 324	Datacast (BBC1 only)	Future Ceefax/Data Services
12 & 325	Datacast	Ceefax
13 & 326	Ceefax	Ceefax
14 & 327	Ceefax	Ceefax
15 & 328	Ceefax	Ceefax
16 & 329	Ceefax	Ceefax
17 & 330	Ceefax	Ceefax
18 & 331	Ceefax	Ceefax
19 & 332	ITS A	Future Ceefax/Data Services (1991?)
20 & 333	ITS B	Future Ceefax/Data Services (1991?)
21 & 334	ICE	ITS (Single Line)
22 & 335	Tx Noise/Test Line	Tx Noise/Test Line

# DUNDEE NEW STUDIO CENTRE

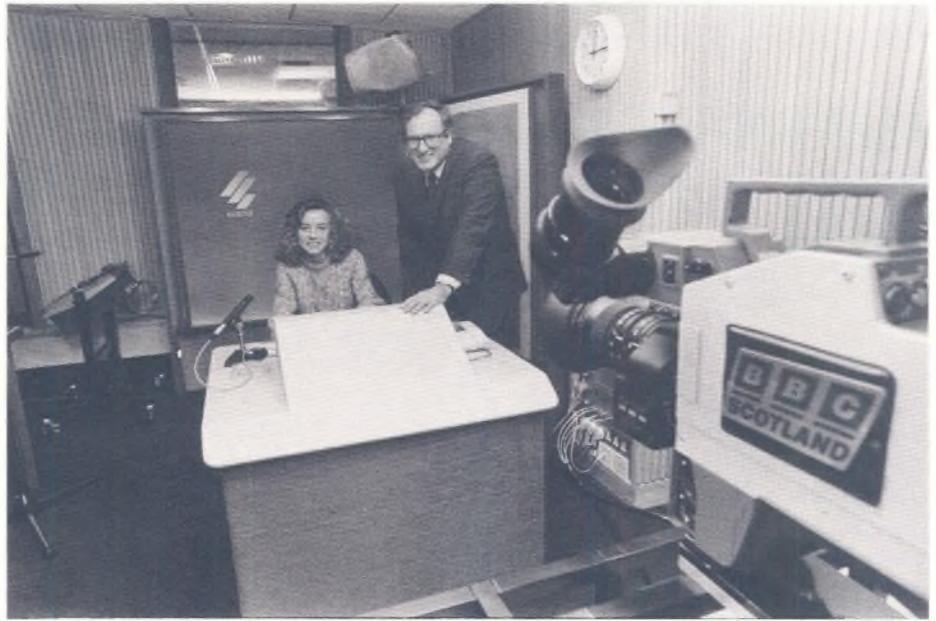
Over the years, the BBC has broadcast from three studio sites in Dundee:

- The original station, 2DE, had a studio in the former boardroom of a jute mill, near Tannadice Park, with the mill chimney used as the aerial mast. 2DE operated from this site between 1924 and 1929, when the regional broadcasting scheme took over from the local stations.
- In 1949, the Scottish Home Service opened a contribution studio in premises in the Coldside Library — to which a monochrome remotely-controlled tv camera was later added.
- Colour was introduced in 1977, when BBC Scotland moved to premises nearer the centre of the city, in Dock Street. Here, the radio equipment included a DK4/24 self-op desk plus an STC 4038 microphone — the original mic transferred from the Coldside Library. It will now receive pride of place in the reception area of the new centre (described below). Television at Dock Street was based on an EMI 2002 four-tube camera, remotely-controlled from Glasgow. This camera had previously seen service in the Aberdeen telecine area!

Broadcasting in Dundee — The City of Discovery — is now preparing for the 1990s by moving to larger and more modern studio premises in the Nethergate Centre, overlooking Dundee Law — an extinct volcano which is the starting point of the tv microwave link to Black Hill and the rest of the BBC network.

The introduction of a permanent Portable Single Camera (psc) crew, based in Dundee, had led to a significant reduction in the use of the Dock Street tv studio. It was therefore decided to reduce the costs of the replacement centre by constructing only one studio, covering both radio and television operations.

The Radio facilities are based on an EP5/22 self-op package, with two D202 microphones for operational flexibility. There is also a small audio



*Patrick Chalmers (Controller, Scotland) and Liz McColgan (Scottish athlete and Dundee resident) open the new studio on St Andrew's Day. Camera cognoscenti will recognise the tubed NEC100, then in use until the Sony CCD camera arrived.*

mixer with gram, cassette, CD and  $\frac{1}{4}$ " tape facilities, for making simple feature 'packages' for topical programmes. This equipment is upstream of the EP5/22, allowing members of the public to still make a straight contribution in the normal way.

The Television facilities are based on a 4-way, married-sound-and-vision switch (capable of expansion to 8-way). This currently gives a choice of sending either test signals (pulse + bar and tone), tv studio signals (camera and mic) or psc replay (BVU150 into BVT810) on to Glasgow or Edinburgh for editing. The fourth input allows for the possible future use of a 5.4 MHz (Sound-in-Vision) sub-carrier modulator. This would enable an external psc inject-point (down in the car park) to be used out of hours, without the need for a time-base corrector.

The studio camera is a Sony DXC3000 CCD, mounted on a fixed stack that also houses the picture monitors. The camera is 'locked off' in a fixed shot, with no remote control (as successfully installed in Scotland's new TV Presentation suite in Glasgow). With a fixed camera, the contributor adjusts the height and position of his chair in 'photo booth' style, until he

sees himself correctly framed — much cheaper than a remote control system! There is a simple fixed lighting rig and an arrangement of hinged flats to give a choice of backings and logos.

The tv sound equipment is in a single unit which is fitted inside the tv studio desk. This unit was designed and built by a local contractor — Clyde Electronics — to our specification, at a time when we also had a requirement for a similar but different self-contained desktop unit, for simple Radio contribution studios. These units were later christened 'SOAP boxes' (for Self Operated Audio Package) by a colleague whose anonymity I will preserve! The unit includes not only mic amp and agc, but also cueing and other miscellaneous functions. It has deliberately been kept separate from the system audio equipment (which is housed in the apparatus room), to allow maintenance and line-up of the tv studio equipment to be independent of the switching system, and vice-versa.

Switching between the four sound-and-vision sources is performed via buttons on the apparatus room bay, on the tv SOAP box and in the psc replay area. These switching panels are simply wired in parallel and the

last selected source from any panel goes to line — since Dundee is a small station, the discipline that this procedure involves is not a problem! Following a similar reasoning, the 4-wire cue circuit is paralleled to the tv SOAP box, the talkback box in the psc replay room and to the conference position in the office, for both Radio and Television daily editorial hookups.

All the tv central equipment is housed in a single FW1/15 bay in the apparatus room. There is minimal radio equipment here, since the EP5/22 is self-contained; the only significant item is the line receive amplifier for the commentary circuit that loops through COOBE (Commentator-Operated Outside Broadcast Equipment) positions at both of Dundee's football grounds, before being brought onto the 'back contacts' of the Radio SEND switch. This allows the music line to Glasgow to be used also for commentaries and hence saves renting a separate line from the football grounds.

Another trick was to bring the 'line listen' (from the tertiary winding of the line sending rep coil in the EP5/22) through to a spare input of the music centre in the office. This not only allows ROT (Recording of Transmissions) cassettes to be made, but also gives early warning of the radio circuit being in use for a football commentary before a potential contributor even enters the studio.

The studio installation was carried out by the Scottish Special Facilities group, including supervisor Andrew Longbottom, engineer Bob Vokes and wiremen Andy Auld and John Caldwell. The communications side was handled by Bill McDowell (Communications Networks Engineer, Scotland) and supervisor Murdo McLennan. The building work was planned and supervised by Gordon Lawrie (Building Engineering Services Manager, Scotland) and his three supervisors (Andy Main, Allan McEwan and Jim Boyce) using local contractors. Finally, the TV studio lighting rig and other metalwork was handled by Mechanical Workshop staff under their manager, Ken McCurdy. The overall project co-ordination was in the hands of Grant McWilliam, Manager Communications and Engineering Services, Scotland.

Andrew Longbottom, Supervisor  
Special Facilities, Scotland

## GLASGOW TWO NEW 'MICRO CONS'

On Monday 23 January, BBC Radio Scotland became the first BBC network to change its continuities over to self-operation by Radio Presentation announcers.

The two 'Micro-Cons' — as they have become known — were designed, built and installed by MBI Broadcast Systems of Brighton, to specifications prepared by John McErlean of Radio Projects, working closely with Audio Manager Scotland, Alan Bunting, and Radio Scotland's Presentation Organiser, Peter Easton. The Project Manager was Roger Ackroyd who, with John McErlean, has already overseen the installation of similar MBI equipment at BBC Highland in Inverness and at Aberdeen.

The original idea was conceived by Alan Bunting three years ago. According to Alan: "When Audio Units were formed some 18 years ago, the biggest complaint was having to take over continuity operations from the Control Rooms in the national regions. I have always considered it rather a waste of the skill and expertise of audio staff, to watch pre-recorded reels of tape going round and to spend time routing already expertly-balanced programmes from studios, OBs and other networks to transmitters, on behalf of an announcer who has to be there anyway. These new areas release audio staff to where they

should be — in the studios, balancing and creating programmes!"

Both Micro-Cons are equipped with two microphone channels, three Studer A807 tape machines, four cartridge machines, two Denon CD players, an EMT turntable and an on-air telephone. The desks are equipped to send and receive cue via telephones as well as by private-wire control-lines.

Each continuity desk has a panel which controls and indicates the status of an MBI transmission switcher, which was developed from a design used in ILR stations. It can route eight sources (continuity desk outputs, 'bypass' outside sources, and 'sustaining network' feeds) to as many as four transmitter networks. The switcher was installed in the CTA and connected into the network feeds by Glasgow technical staff.

The new continuities are part of a plan to replace and rationalise radio studios in Glasgow. The process started with the relocation of two unattended studios early in 1988, to release the areas in which the new continuities have been built. Radio Projects is now working on the next stage — to refurbish the two old continuities and replace their specialised but ageing desks with more flexible equipment for general production use.

Roger Ackroyd, Project Manager  
Radio Projects



L to R: Peter Easton (Presentation Organiser, Radio), Ian Aldred (Announcer) and Alan Bunting (Audio Manager, Scotland) in the new 'Micro-Con'

# TRISTAR TRANSMISSION'S NEW DATA MANAGEMENT SYSTEM

TRISTAR — an acronym for Transmission Information Storage And Retrieval — is a computer-based system giving managers access to a vast range of information about transmission. Comprehensive details of every transmitting station in the UK and overseas are held — covering technical, financial and equipment-performance-related data. In addition, a series of networked databases provides facts on masts and aerials, broadcast circuits and network costing. Applications and users can share common files, and data need only be entered into the system once and then passed between programs as necessary. Decision making for managers, at strategic and day-to-day operational levels, occurs more effectively using facilities within Tristar.

Today, a number of different departments, and all main transmitting sites, contribute to an authoritative database where information is available to users in the UK and abroad. Of special importance to Transmission are the performance checks made on equipment at about a thou-

sand television and radio sites, ensuring a high degree of quality control of the network. Failure to meet equipment reliability targets is highlighted and action can be taken at an early stage.

## FEATURES

### Service Message Analysis and Storage

Service messages provide up-to-the-minute indications of the operational status of BBC transmitting stations everywhere. Mono transmissions or reduced power conditions, for example, are recorded by each Monitoring and Information Centre (MIC) and sent to Tristar. An instant display of network status is available and a daily report is produced for senior headquarters managers at the start of each day.

Often, only preliminary information about the reasons for a fault are known but, as further details come in throughout the day, the new message automatically updates the old one.

It is also possible to produce pie charts, bar charts, etc, of statistics held within Tristar. A sample is shown in the diagram below.

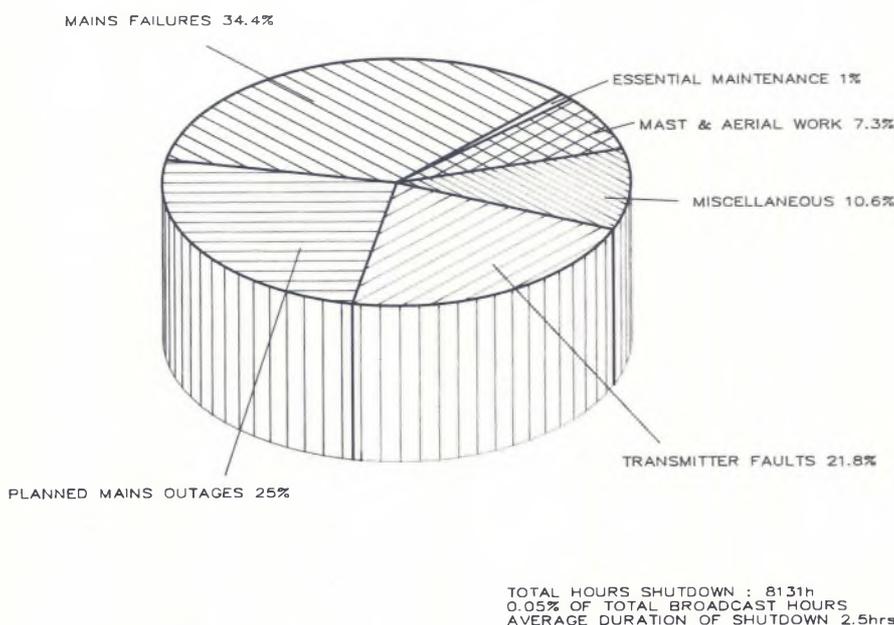
### Fault Analysis and Storage

The collection and monitoring of equipment faults provides early warning of possible future trouble. All manned bases in the UK and overseas record fault and repair details (down to component level) and contribute information monthly to the Tristar database. Users can access this information direct, if they happen to be connected to the network, or simply request a printout to be posted to them. In this way, the reliability of a piece of equipment can be analysed and compared with, for example, its performance in other regions or over a period of time. Data is held on file for five years so major budget decisions regarding the replacement of old plant can be based on strong evidence of reliability rather than inspired guesses!

The following features are also being provided:

- Automatic fault reporting beyond a given MTBF (mean time between faults) trigger level
- Time to repair reporting, shown by team and equipment
- Ad hoc enquiry facility for all users
- Equipment, unit and module type reference library

ALL Maintenance Teams  
UHF Shutdowns  
During 1988



A Tristar plot extracted from the Service Message section of the database

### Station Information

Tristar maintains a wealth of detail about all transmitting stations. Some, such as grid reference or landlord, are fixed while other information (for example, maintenance team responsibilities) may vary. User enquiries regarding the services radiated or the equipment type can

either be answered on a per station or general basis. Area centres continually update changing information, such as local telephone numbers of emergency services but have fast on-line access to details such as main and reserve programme feeds, during fault diagnosis.



*The Tristar terminal at Crystal Palace with on-line access to the central database at Warwick*

Each year a book is produced incorporating this information with conversion from database to laser printed output occurring automatically.

### Site Acquisition

Site Acquisition provides further estate management details regarding each transmitting station. Information on site access, received rents, way-leaves, grazing/agricultural tenancy agreements, etc, are contained within this part of the database. The system permits a review of these agreements to identify licences and/or fees due for renewal, as well as a forecasting program which anticipates future income and expenditure, based on an input inflation factor.

### Site Sharing

Space on BBC masts and towers is rented out to other organisations to

provide income to the BBC — currently over £1.4m/year. The huge growth in communications, particularly in cellular telephones, demands that complete and on-line information is available on antenna types, frequencies, fees and agreements. Cost data is produced on future

revenue (by site, region and company) and an analysis is made of market trends in this field. The calculation of fees — with record update and production of all paperwork to both the customer and the BBC accounts department — is an automated process.

### Structures and Aerials

In addition to holding standard information on all types of structures (masts, towers, poles, etc) and aerials, facilities are provided to record maintenance details and output cost reports, selected by a combination of parameters. An update of insurance valuation by a fixed percentage, is also available.

### Network Costings

Expenditure reports are produced quarterly showing costs apportioned between the various services radiated by each transmitting station.

Data is transferred from the corporate mainframe and, after being vetted, is compared with the costs for the same quarter 12 months previously. Account is taken of power outputs, broadcasting hours and work points held elsewhere on the database. Any significant variation between the current and last year's figures is highlighted.

### Comparative Work Points

CWPs are an effective way of gauging manpower requirements for each transmitting station. The number of visits to a site are recorded, calculated and compared with those at other stations over a similar period. For different types of radio or television equipment, a set number of work points are arrived at which determines the staffing levels at team bases. At the year end, a report is produced for each team area and performance anomalies are shown up for further investigation. An overall revision then takes place, which is sensitive to the increasing reliability of modern transmitting equipment, and adjustments to personnel can be made accordingly.

### Registry

Many questions are commonly asked with regard to the storage of reference documents in Transmission.

- a) What, how many and where are the documents on a specified subject?
- b) What documents are held on a particular file?

Answers to these can now be provided using Tristar. Access to the HQ Library has been simplified and documents can be requested using the electronic mail system.

### Inventory of Equipment

A computerised system has been set up to identify the permanent and temporary locations of office and technical equipment. Items are often loaned to parties outside HQ and the system will automatically record details of an overdue return.

## Planned work

Each year, maintenance work is carried out at transmitting stations which may cause periods of reduced power or temporary close down of a particular service. Typically, a mast may have to be painted or an aerial overhauled. Long-term planned work of this nature is stored in the Tristar database. However, details of emergency work (such as electricity board operations) is added separately; important dates such as major sports fixtures or parliamentary broadcasts are keyed into the system to avoid clashes. Each area is able to contribute to this information, via the network, and users can examine a date window to see what planned work is scheduled.

Monthly reports are compiled by area and department. This provides users with comprehensive details of work carried out on both domestic and overseas transmitters.

## Integrated office environment

In a modern office, it is important that communications run as smoothly as possible. This is helped by using the same office software in all areas in the network and giving different programs a similar look and feel. Training costs are thus reduced and compatibility ensured.

## Electronic Mail

With Email we can:

- type messages at a workstation and send them over communications lines, such as X25, to other Mail users
- attach any files on the system (such as word processor documents, spread sheets or programs) and send them with a message
- forward incoming messages to another Mail user
- print and store incoming and outgoing messages

## BBC Transmission Networking

On-line access to Tristar occurs over an international transmission standard known as X25. Links are available to a number of different departments in BBC Engineering. A connection will soon be made to the Message Switching System (MSS), which will then make it possible to send telexes from any convenient workstation. Access to the ICL corporate mainframe will be by this method, towards the end of 1989.

## Corporate mainframe access — EMIAS

Financial control of individual expenditure can be monitored by senior managers using local workstations. Access is again via the ICL corporate computer.

## Resource planning for managers

This program provides departments with an aid to resource planning and project control. The system will help in allocating and transferring resources so that workload planning can be accomplished efficiently. As well as providing a project or a resource view, progress can be automatically reported. A comparison is available of actual effort against forecast effort and additionally, it is possible to give a breakdown of the time worked on any current project.

## Security

Data integrity is provided through a combination of the following:-

- Hardware used (Unisys multiuser XE500/B20 series)
- Networking software (APTNET)
- Careful management and control of software
- Accounting systems with built-in audit trails

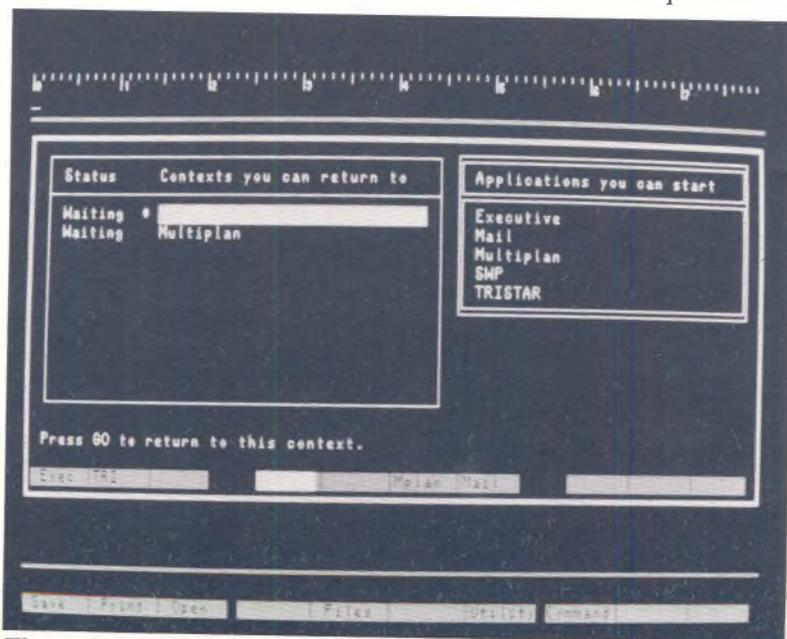
## THE FUTURE

Development has begun on a number of enhancements which include:

- Automatic off-line access by modem at team bases during off peak 'night hours'
- Access by field engineers using personal computers
- Bar code registration of capital equipment
- Establishment, movements and locations file
- Optical reader transfer of library archives
- Desktop publishing
- Voice mail

Anyone wanting further information on Tristar should contact the author via the Operations Room at Warwick.

Kevin Viney  
Transmitter Operations



The start-up menu of Transmission's multi-tasking system.

# CAR CONVERSION TO STEREO

After the closedown of programmes on 2 March, the Central Apparatus Room (CAR) at Television Centre became a stereo routeing area. The project was led by Paul Ballard of CSS (Central Systems Section, in P&ID Tel) who now describes the build up to 'S-night':

In May 1987, a small team from CSS started the mammoth task of converting CAR from a mono to a stereo routeing area. The plan was to use levels 1 & 2 of the uniselector equipment for routeing the A pair and levels 3 & 4 for the B pair of a stereo circuit. Although the cue programme routeing had already been removed from levels 3 & 4 by this stage (to a new cue matrix), levels 1 & 2 were still very much in use for mono routeing. Furthermore, there was no suitable space available for mounting the stereo source and destination jackfields.

The decision was made to convert all the existing mono sources to 'split-mono' (at -3 dB), using a standard BBC transformer as the attenuator — the system used in Radio. The mono sources could then be treated as if they were stereo, with the mono A pair occupying levels 1 & 2 and the mono B pair, levels 3 & 4 of the uniselector. At the output of the routeing system, some destinations would then have to be combined in a stereo-mono amplifier to feed mono destinations. However, it would also be necessary to have a derived mono distribution for feeding to News & Current Affairs, the closed-circuit router, etc.

As CAR uses at least three hundred AM7/12 distribution amplifiers, it was decided after consultation with D&ED that a new version of the AM7/12 was required, which could combine the two legs of a stereo signal and produce a mono output without degrading the stereo source. This amplifier, of which we have now purchased nearly two hundred, is called an AM7/12A and has proved very successful.

The task of converting the existing one hundred source mono jackfield

into a one hundred source stereo/mono jackfield has proved very taxing to the CSS staff involved. The work has been done mainly during normal hours, while broadcasting has continued around us. At the same time, the destination jackfield has also been re-wired to cater for stereo. The assistance of the operational staff in CAR in coping with the occasional hiccup has been much appreciated by the CSS staff involved.

During this period, the Network 1 & 2 audio distribution bays in CAR have been completely rebuilt, in order to cope with the new stereo Network

Controls (described in 'Eng Inf' No 33) and the eventual distribution of stereo to all transmitters.

The change-over to stereo on 'S-night' had to be completed in one go, as the existing mono routeing was required for the A-pair of a stereo signal in the new arrangement. Much careful preparation was required and records had to be frequently updated to ensure that we knew which areas would be ready for stereo and which must continue to receive derived mono feeds. To the relief of all concerned, the change-over went without a hitch and we now look forward to the day when stereo tv sound is the norm.

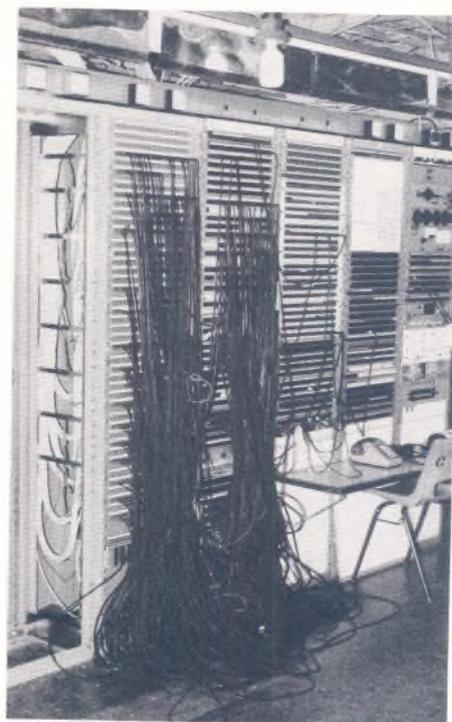
Paul N Ballard, Project Engineer  
Central Systems Section, P&ID Tel

# CAR NEW CONTROL-LINE ROUTER

A new Control-Line Router, with four desk positions, has been installed in the Central Apparatus Room (CAR) at Television Centre. It enables sound and vision engineers at an OB to be connected (via temporary circuits rented from BT) to colleagues in CAR and elsewhere in TVC — a function previously carried out by a 150-subscriber Engineering Manual Exchange (EMX), a 50 x 24 control-line router and a twenty-line switchboard.

The new system uses a pcm digital router to switch the analogue telephone circuits. Conference facilities are provided and the digital signal processing helps to overcome the type of degradation typically found with conferencing of analogue circuits.

The system is based in three cabinets, occupying half the space of the three exchanges it replaced, while providing twice the capacity and increased versatility. Auto diagnostics enables the staff to quickly determine the cause of any failures, while the modular construction permits a faulty pcb to be replaced within minutes and also allows for future expansion of the system, if required.



*Router over-plugging, during the commissioning phase*

The new router is now in continuous use and gets particularly busy at weekends when there are multiple sports OBs incoming. It has been designed to cope with extreme peak workloads such as during the Olympics, an election, Children in Need or, most recently, Comic Relief.

Nigel Phillips of Tel Network now describes the events leading up to the new system entering service:

Communications can be the most troublesome part of OB operations. Control-line handling in CAR was formerly split among the three sets of equipment described above. The EMX was used for communications with the technical areas of the West London complex. In addition, the incoming control-lines also rang into this EMX. When they were established, they were then forwarded to the control-line level of the main routeing system, to be packaged. This was achieved by the control-line router which then had to flag the EMX to prevent further incoming rings to CAR, once the control-lines were extended.

The EMX had 150 subscribers and the control-line router was a 50 x 24 matrix; both used motor uniselectors which dated from the opening of Television Centre in 1959, although the EMX signalling and telephone units were refurbished with CMOS equipment in 1977. The uniselectors have been thoroughly reliable and show no signs of wear but they have suffered from two severe short-comings — the EMX speech path relays were deteriorating and frequently required 'ring wetting' while the control-line router was far too small to handle the present traffic, let alone the traffic increase anticipated with the imminent transfer of the London Control Room tv operation from Broadcasting House to CAR.

The search began for replacement equipment and it was decided early on to have a combined system with about four hundred subscribers; two hundred could ring in to CAR (the old EMX customers) while the other two hundred would form the destination side (replacing the old control-line routeing system). All-to-all routeing would be required and the only difference between the first and last two hundred subscribers would be the inhibition of unsolicited ringing in.

With the Stock Exchange 'Big Bang' providing a boost to small telephone exchanges, it initially seemed likely that there would be many manufacturers interested. In the event, the lack of automatic selection between



*Tim Hardiman (P&ID Tel) at the router's diagnostic terminal*

subscribers made all the manufacturers lose interest. The choice then came down to using some crossbar units (the last available from the manufacturer) which could be married to Probel controlling software. This would have created a Leviathan, some eight bays long and consuming 250A at 50V to energise all the cross-bars!

About this time, a chance conversation between the author and his next door neighbour revealed the possibility of another manufacturer — Dowty Information Systems. Although new to broadcasting, Dowty were manufacturing suitably sized systems for various fire brigade and ambulance services, and for a British Rail signal-post telephone system. These were based on bi-directional solid-state crosspoints.

The next step was the specification. Richard Downs (of Tel Network) started at very much the correct end of the specification — the interface between man and machine. The basic concepts were: a button-per-subscriber; push-two-buttons-to-make-a-route and the maintain-the-operator-tie-circuit concept. All the good features of the old system were to be kept (eg auto answering) and useful new facilities such as 'targeted ringing' and 'ring-back detect' were to be added. Richard carefully

specified each operation of button or key, in all modes. This proved to be a lengthy but precise document.

Tim Hardiman (of P&ID Tel) specified the speech path parameters, the critical ringing threshold (a wary line to be trodden between insensitive ring detection and nuisance ringing) and all the interfacing, including desk panel size and design. What was in the box was to be left to the manufacturer.

From the start, there was close and frequent contact between the BBC and the manufacturer with Tim Hardiman, Nigel Phillips and Richard Downs resolving endless potential problems during development. At an early stage, Dowty offered a new system based on a digital pcm speech path, time-division-multiplexed onto a 2MB bus. This suited them — developing a digital system of this size improved their product range — and it suited the BBC; the equipment size and power requirements came down substantially. A system has now been developed which is probably economical to build for as few as 20 or 30 subscribers.

While the design and development continued, P&ID Tel rewired all the subscribers to a new jackfield. These were then temporarily replugged back into the old system.

Apart from some manufacturing delays (due to a bug in some proprietary development software), production was virtually a text-book operation. The equipment arrived and was commissioned in just a few days, due to careful P&ID Tel preparation. After a few weeks settling down, when no faults were found, the system was put to line in a few hours by simply removing four hundred sound double-enders and changing over the desk panels. It was a tribute to P&ID Tel's detailed panel specification and Dowty's manufacturing that the desk panels were an exact fit. The system is so simple and so similar in operation to the old one that no operational problems have ensued; so far, user reaction has been very favourable. The system has survived the first few diesel power tests and, although there is no speech or ringing path without power, all the routes are memorised in non-volatile memory and are reconfigured on power-up.

Using an outside manufacturer to provide a total system — particularly using one foreign to broadcasting — could have been disastrous but this one fortunately worked. The important things were: a very detailed and precise specification and very frequent manufacturing progress meetings. This particular manufacturer was certainly very cooperative and was determined to provide a good product, which gave us every confidence. Being used to providing facilities for critical applications, such as the fire brigade and ambulance services, set the tone of reliability; so far, this has been borne out. The awful prospect of a total communications failure in CAR gave us all nightmares but, to date, the system has provided all that we had hoped it would.

Nigel Phillips  
Tel Network

## SOUTH & EAST NEW REMOTE STUDIOS

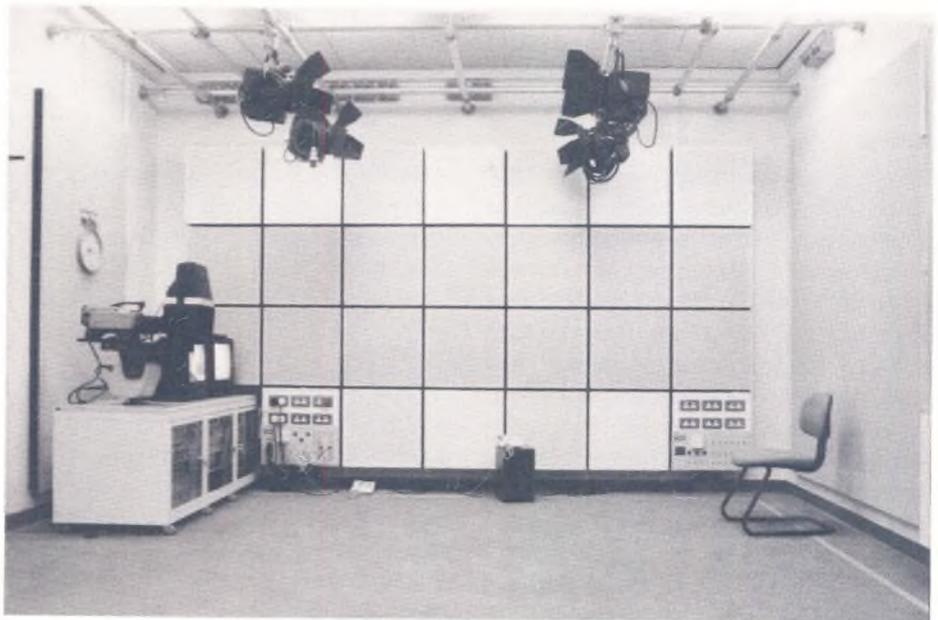
As part of the improvement in regional coverage of South and East, P&ID Tel has provided two small studios. They are approximately 18 sq metres each and have been built in the local radio stations of Radio Kent, at Chatham, and Radio Oxford. Both studios are remotely-controlled from the new Elstree Studio G and they each have a small CCD camera, with autocue, and two wallboxes.

The project comprised three main areas; the building work, the remote

control system and the sound and vision system.

### The Building Work

Local architects in Chatham and Oxford were contracted to prepare building schemes, assisted by Philip Heaps, the Local Radio Liaison Architect in ACED. In Chatham, this has meant forming a new room within the loft space of Radio Kent while, in Oxford, it has involved the conversion of part of Radio Oxford's Studio Two.



*A general view of the Oxford studio*



*The remotely-controlled equipment at the Chatham studio*

## The Control System

A master control panel for each remote studio has been installed in the CTA of Studio G at Elstree. This allows the engineering staff to switch on the studio remotely and perform line-up checks. In the Control Galleries of Studio G, there are assignable panels for the vision operator and the sound supervisor; both panels can be assigned separately.

The control signals are passed via a modem link to the relevant remote studio.

## The Sound And Vision System

Each studio has a camera trolley, three bays wide by twelve 'U' high, on top of which are mounted the camera and the local monitoring equipment. Two wallboxes are also provided, one mounted externally to enable ENG inserts to be fed to Elstree easily.

The electronics equipment rack contains all the local remote-control equipment and has a special BBC Sound and Vision switcher (of the type also used in the Norman Shaw and BH remote tv studios). Under remote control, this switcher provides selection of various sound and vision sources such as the CCD camera, the two wallboxes and the two microphone channels.

The audio output of the station is fed back to Elstree by modulating a 5.4 MHz FM sub-carrier, which is added to the vision circuit. A sound-in-syncs unit can also be used.

The Teleprompter is an Autocue Newsprompter One, with a 9" monitor on the camera unit. The input to the prompter can either be local or from the Elstree Newsroom.

The studio has a simple lighting grid and the ability to remotely select one of three preset lighting plots.

The P&ID Tel project leader was John Reid, of Studio and OB Section, while the lighting and remote control was specified by Robert Gower of Power, Lighting and Mechanical Section. The installation work was carried out under a contract with EPO Radamec of Chertsey.

John Reid, Planning Engineer  
Studio and OB Section, P&ID Tel

# CARDIFF

## STUDIO C2 RE-ENTERS SERVICE

Studio C2 in Cardiff returned to service on 6th February 1989, after a complete refurbishment which has provided it with much enhanced facilities. The technical installation was carried out by the following outside contractors under P&ID Tel supervision:-

- Quantel-Link Systems Group (vision and communications)
- Calrec Audio (sound and telephones)
- Strand Lighting (lighting desk)
- Lee Colortran (mechanical and luminaire refurbishment)
- Desisti (luminaires)
- DEW (dimmers)
- Frazer Nash Electronics (control system)

The P&ID Tel project manager was Gerry Goodhew, of Studio and OB Section, who now describes the new facilities:

### Vision

Three Thomson 1531 full-facility studio cameras with Fujinon 18 x 8 zoom lenses are installed, with a fourth 1531 provided as a maintenance spare. The vision system is designed to handle four cameras, camera line-up being carried out at a single master control position in the Apparatus Room.

The vision mixer is a 24-channel Grass Valley 1680 with two comprehensive mix-effect banks, downstream keyer and E-MEM facility. It has very considerable effects capabilities; it is possible, for instance, to have two layers of CSO plus superimposed captions and to mix or cut between them and still add further captions downstream. The E-MEM function is a means of memorising up to 20 effects states and timed transitions between states, to allow complicated sequences to be pre-set, prior to transmission. Mixer sources include four cameras, Slide File, digital video effects (DVE), character generator, caption scanner and ten outside source lines.

The Slide File is the latest Rank Cintel version with modified Shrink and Move software. Acquisition of stills is via a 16 x 4 RGBS matrix, available sources being cameras, Tarif, decoder for outside sources, the existing Graphics Area or slide scanner. The single port BA10/510 35mm slide scanner is intended primarily for loading slides into Slide File, but is available on the mixer as an emergency back-up in the unlikely event of failure of the electronic graphics system.

The DVE equipment is a 2-channel Questech Charisma with a background channel and single key channel. It can manipulate two entirely separate moving images at the same time, each undergoing different effects, over a background picture. It has the ability to manipulate pictures in three dimensions and can thus add perspective and curvature to originally flat pictures. Source selection is via a 24 x 4 video matrix, a 16 x 1 background matrix and a 16 x 2 key matrix.

The character generator is an Aston 3B which can be controlled either locally in the Production Control Room or remotely from the Graphics Area on the first floor (described in 'Eng Inf' No 31).

The studio has ten outside source lines. Dealing with non-synchronous sources such as Bangor, Norman Shaw, sports OBs, etc, will now be easier as two Quantel synchronisers have been fitted. The sources are selected at a panel in the Production Control Room (PCR) and twenty under-monitor displays are provided in both the PCR and the Sound Control Room to indicate the sources selected.

Comprehensive monitoring is provided by a total of seventy picture monitors (twenty-two colour and forty-eight monochrome) and a Pro-Bel 48 x 24 preview matrix. Forty under-monitor displays are used to indicate selected signals; these 16-character LED displays can be programmed from a keyboard at the Technical Manager's position in the

PCR, and can be used for camera-men's names, location of OBs and similar information.

Other facilities which have been provided include a CCD 'snoop' camera, a digital stop-watch, a Cox 650 VT clock and two Seltech digital clocks. The complete vision system was installed by Quantel-Link Systems Group.

### Sound

A 36-channel, 8-group Calrec sound mixing desk has been installed in a redesigned Sound Control Room.

The desk has two echo chains, one of which is normalised to a Klark Teknik digital reverberation unit. Eight dynamics units, giving limiting and compressing facilities, and two noise gate/expanders are available for insert plugging.

The desk is also equipped with a mix-minus matrix allowing multiway working to a maximum of ten outside sources.

A Grams Operators position has been created with its own stereo eight-channel mixer. The sources available to this are: two Studer A812 twin-track machines with centre-track timecode, an RP2/10 disc reproducer, two Denon CD cart machines, and two stereo triple-stack Sonifer HSX cart machines, one with record facility.

Two sets of Telephone-in-Broadcast equipment have been provided.

Up to six radio microphone receivers, with dual diversity facility, can be accommodated in a unit at the side of the main desk. This unit houses the power supply and rf amplifiers.

Two A/V synchroniser circuits are available so that a speech path may be re-synchronised with its associated video signal. This may be required if, for example, the video has been routed via a satellite circuit but the speech path has been routed over land lines.

A studio EMX enables communication to the outside sources and the Communications Centre from the studio.

### Communications

The studio has been equipped with the usual Omnibus talkback system and comprehensive intercom facilities between the various areas.

In addition, there are four independent talkback circuits, giving direct access to the Presenters from the Director or Editor. Each of these feeds into one of the four Presenters four-way mixers. There are also six switched talkback circuits, controlled by the Sound Supervisor.

Clean feed talkback and 'Speak to Cams' is available to the Director and TM.

The Director has a seven-way mixer feeding a small loudspeaker, the mixer inputs being OS RTB, FM RTB, etc, or pluggable.

A ten channel digital ident unit, RDIM/1, has been provided for the identification of up to ten outgoing circuits from the area.

The audio system and mixing desks were manufactured and installed by Calrec Audio while the communications system was manufactured and installed by Quantel Link.

### Lighting

A ninety-way Rank Strand Galaxy lighting desk and ninety 5kW dimmers in three racks have replaced the old lighting system. An infra-red designer's control system has been installed with the Galaxy desk to enable channels to be selected or altered from the studio floor.

Fifty-six new or refurbished lanterns are suspended from new remotely-controlled motorised pantographs. These pantographs can be moved up, down, or laterally by means of a hand-held rf control unit.

*Guy Morgan, TM, adds:* The newly refurbished studio came back into service, about a year after closing at the end of fifteen years service as one of the busiest studios in the BBC. Having been involved, fifteen years previously, as a vision control engineer in the operational working-up of the original studio, I was delighted to be asked to organise its return to operational service on this occasion.

During the refurbishment, the total programme commitments were transferred to a locally-designed and installed temporary studio, built within a radio studio. This must be the only operational studio to have had its lighting and vision control room in a cloakroom! Much of that story has, however, already been told in a previous 'Eng Inf'.

As described above, the new complex is equipped with the very latest in technology and looks set to have a long and useful second life. The new cameras are identical to those used on the two main BBC Wales OB units,



Adjoining Production Control Room (RHS) and Lighting and Vision Control Room (LHS)

providing a benefit in maintenance and spares and also allowing the studio the occasional use of a lightweight 1624 camera.

The lighting rig is based around fifty-six motorised pantographs in a permanent rig, with additional outlets for extra luminaires and cyc units. Control of the pantographs is by a Frazer Nash rf-linked system. Dimmable outlets have also been provided on two OB boxes, strategically placed to allow some of the regular "can I take a camera out in the scene dock?" requests to be met without extra cable rigging!

A number of alternative luminaires

were tried out prior to the decommissioning of the studio, in the search for a replacement for the Berkey Dual sources then in use. However, none of them pleased the TMs as much as the old and trusted Qwarts. As a result, the studio is now — to the TMs delight — rigged with 40 beautifully refurbished Qwarts. In addition there are 16 new Desisti Leonardo fresnels on the peripheral track panto-graphs. All fresnel luminaires are fitted with 2½kW/1¼kW lamps. This should virtually eliminate the need for fitting 5kW lamps.

The new vision mixer is operationally similar to the Grass Valley 1600 mixers on the OB units. The new DVE

equipment has attracted a great deal of interest from the Graphics department and it has already been used for a number of title sequences in conjunction with Paintbox.

One local addition to the usual installation is an RGB input from the Graphics Area to the studio Slide File. This allows fast transfer of pre-prepared stills for news purposes, without the delay caused by the need to 'clean up' composite stills.

The region wishes to thank everybody associated with the project, but especially Project Manager, Gerry Goodhew, and his team. They have provided us with a studio with which we are extremely pleased.



A BBC Wales production team rehearsing the first programme from Cardiff's refurbished Studio C2.