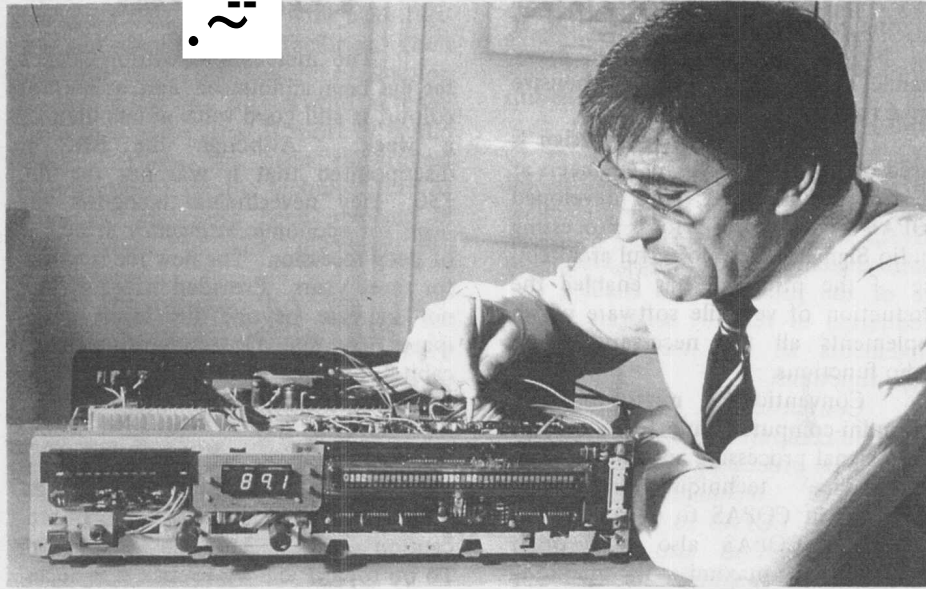


JE£

ENG INF

The Quarterly For BBC Engineering Staff

RADIO - DATA will aid tuning



Mike Buckley, Research Department, checks the operation of the display panel on a prototype radio-data receiver.

Managing Director Radio, Aubrey Singer, recently announced a firm policy of making all services properly audible on vhf by the late 1980s. As well as providing country-wide coverage, it is necessary to help listeners tune to the vhf station and programme that they want; and Research Department has recently unveiled the latest stage in its development of a new experimental system called radio-data. Radio-data could combine with microchip technology in future radio receivers to give a new dimension to radio listening.

In one version of tomorrow's receiver, a small built-in ancillary electronic display would indicate the station to which the receiver was tuned. Another form might use a voice-synthesiser to give the same information. Even portable and car radios could have this facility for little extra cost.

Alternatively, radio-data, combined with electronic intelligence in the form of a microprocessor in the receiver, might completely automate the tuning process. The listener would simply select the desired station or

programme and the receiver would automatically search and find it, without the need for the listener to know anything about frequencies or wavelengths. Car radios would retune automatically as they moved from one area to another.

Although primarily intended as a tuning aid, radio-data also has limited capacity to carry other information, such as programme or music titles or sports scores for display on the receiver.

The system could even give information about future programmes and the listener could pre-select those he wanted. Whenever a chosen programme was broadcast, the receiver would switch itself on and select the right station.

The key to all this is a data signal which is added to the sound-programme signal at the vhf transmitters. These data signals cannot be heard at all by listeners but suitably equipped future radio-receivers could decode the data and use it to drive the display or control the receiver.

The use of vhf for radio-data is preferred because of the much greater information capacity available there, as well as being in line with the BBC's aim 'continued on Page 3'

I~ this edition of ENG INF:

DIGITAL SOUND DESK
Page 2

TRANSMITTERS OPENED
Page 2

EDITORIAL
Page 2

RADIO SCOTLAND
CONTINUITY SUITE
Page 3

TC2 RE-ENTERS SERVICE
Page 4

"SHOWGIRLS" CREATES A
WOW
Page 4

TRANSMITTER NEWS
Page 5

BBC/OPEN UNIVERSITY -
SPECIAL FEATURE
Page 6-8

"C" FORMAT EDITING SUITE
Page 9

FLAIR GRAPHICS COMPUTER
Page 9

REAL-TIME GRAPHICS FROM
DESIGNS DEPARTMENT
Page 10

LESOTHO GETS HELP FROM
THE BBC
Page 11

VALVE SECTION GETS A NEW
COMPUTER
Page 11

ENGINEERS-IN-CHARGE
MEETING
Page 12

All-digital sound mixing desk

A prototype all-digital sound mixing desk has been installed in Broadcasting House for operational assessment. This follows the recent announcement that the BBC intends to place an order for a production version of the desk, which is to be manufactured by Neve Electronics International, of Royston, Herts. When the production version of the desk is

Transmitters Opened

The following uhf tv relay stations have opened since September:

Cilfrew, West Glamorgan
Fishguard, Dyfed
Trefin, Dyfed
Culval, Cornwall
Millbrook, Hampshire
Plymouth (North Road), Devon
Workington, Cumbria
West Lavington, Wiltshire
Burnham, Norfolk
Wells-next-the-sea, Norfolk
Bushmills, Co. Antrim
Belcoo, Co. Fermanagh
Newtownards, Co. Down
Glynn, Co. Antrim
Fintry, Central Scotland
Strathallan, Tayside
Methven, Tayside
Fetlar, Shetland Isles
Dychliemore, Strathclyde
Braemar, Grampian
Dalmally, Strathclyde
Cane Hill, Surrey
Bishop's Stortford, Hertfordshire
Llanrhaedr -ym-Mochnant
Dollar, Central Scotland
Avening, Gloucestershire
Vhf Radio
Llandyfriog, Dyfed
Lethanhill, Strathclyde
Wenvoe - frequency changed
Local Radio
Radio Clwyd
Radio Lincolnshire new mf transmitter
Radio London - vhf transmitter at Crystal Palace
Radio Sheffield - now in stereo
Radio Newcastle - new vhf transmitter at Chatton on trade tests
Radio Manchester - goes stereo
Radio West Midlands (Previously Radio Birmingham) - new mf transmitters at Langley and Sedgley Mill

List of Radio and Television Stations 1982

The 1982 edition of the EID Pocket Booklet will be published in February. Staff requiring copies should ring LBH 2921.

delivered in Autumn 1982 it is believed that it will become the world's first comprehensive all-digital sound mixing desk to enter operational service in broadcasting. The desk follows close collaboration between various departments and Neve over the last three years and is another example of co-operation between the BBC and British Industry that has resulted in high technology products that lead the world.

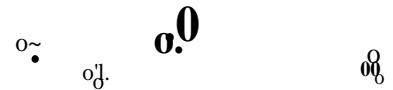
The new 48-channel digital mixing desk can perform all the normal processes such as fading, mixing, filtering or compression. In addition, it can provide real-time delay in every channel and provides comprehensive signal routing.

The channel processor design is based on the work done by engineers at Research Department, who developed COPAS (COmputer for Processing Audio Signals). The powerful architecture of the processor has enabled the production of versatile software which implements all the necessary digital audio functions.

Conventional microprocessors and mini-computers are too slow for audio signal processing applications and a 'bit-slice' technique has been employed in COPAS to overcome this problem. COPAS also uses other techniques to maximise its operating speed. Multiplication is done outside the microprocessor in a single-chip multiplier that operates some 16 times faster than the multiplying function of the microprocessor itself. Another important technique is known as "pipe-lining". This makes it possible to put the next micro instruction into the "pipe-line" while the first is being executed, and this almost halves the cycle time. Together these techniques produce a machine in which 16 separate 'activities' can be programmed into each 56-bit micro instruction, which can be executed in 140 nanoseconds.

Co-operation between the BBC and Neve has extended beyond Research Department's COPAS system, with SCPD and operational user departments contributing to the evolution of the control system. The introduction of the new digital desk will be an important step in the total digital chain from microphone to transmitter.

The production version of the desk will be installed in a digitally equipped Radio Outside Broadcast vehicle to be used on a variety of programme applications. The vehicle will also contain two 1/2 inch fixed head digital tape machines, and will have provision for a multi track machine.



Editorial

The increased television licence fee has been announced, and, at £46 for colour, is still good value at less than £1 a week. Although the BBC is disappointed that it was not the full £50, they nevertheless recognise the need for economic stringency at a time of deep recession. The new fee is to last for three years. Provided inflation does not increase beyond the levels anticipated by the Government, existing capital projects should be able to go ahead as planned.

ABOUT 'ENG INR'

Congratulations to our eagle-eyed readers who spotted, amongst other things, the incorrect photo-captions on page 3 of the last edition. To be topical and up-to-date it is necessary to produce the magazine quickly and this means that the time allocated for final checking is often too short. I must apologise, therefore, for the errors that sometimes creep in.

We are always on the lookout for interesting stories, and anyone who would like to help fill the magazine can get in touch with me on LBH 5432. We cannot always guarantee to publish your stories, but we will do our best. The final copy dates for 1982 editions are: 12th March, 11th June, 10th September, 10th December, although the earlier you submit the story, the better.

May I offer my thanks to my secretary Kim, who has brightened the pages of past editions of 'Eng Inr' with her cartoons. Sadly she has moved on to better things, and this has left a space that will be difficult to fill. If there are any budding cartoonists who would like to see their work published, please let me know.

As the time of festivities draws close may I wish all our readers a Merry Christmas and a Happy New Year. Thank you also to our contributors, without whom there would be no 'Eng Inr'.

Alan Lafferty

New Continuity for Radio Scotland

Two new production continuity suites were brought into service in Glasgow for Radio Scotland on 3rd October 1981.

Aubrey Holland, from SCPD, who was the SCPD project leader, says 'The Continuity Studios in Glasgow provide Radio Scotland with both flexible and comprehensive facilities. Their dual role as continuities and production studios saves on capital and revenue costs in a region that is short of studio space. There has been the fullest co-operation with the technical staff at Glasgow, who have been involved at every stage of the planning and installation.'

The studio has an 'Alice' 10-channel desk, feeding into the cubicle desk on which the presenter can fade up discs, tapes, the desk microphones, play either of two tape cartridges or 'opt' in and out of the other networks. In addition there are three record desks.

Each control cubicle has a 12-channel, 2 output Neve sound desk, with a BBC designed 6-channel Mono Mixer, Telephone and Cue Select Panels, Network Switching, 6-channel Response Selection Amplifiers and five compressor limiters. With continuity-type operation there is an extensive requirement for line and telephone facilities, so that outside sources can be routed into the programmes. For this reason, the cubicle has a complex arrangement of lines for routing through the main Glasgow control room. The Network Switching facility allows Radio Scotland to broadcast programmes from one of the main Radio networks, Radio 1/2, 3 or 4, when not transmitting its own programmes. The cubicle is equipped with 4 Studer A80 tape machines and three of the new RP 2/10 record players.

In each announcer's booth, a smaller 8-channel, 'Alice' desk can be used as part of a continuity or separately when the announcer goes live directly into the network.

For communications within the suite and with the outside sources, SCPD has developed a talkback and pre-hear system using the very latest technology. They have recently installed similar equipment in a single studio continuity area for Radio Ulster in Belfast.

'continued from Page 1'
"RADIO-DA TA"

to have all its services on vhf from the late 1980's. Reception on medium and low frequencies has not been forgotten, however, and provision has been made for VHF radio-data to carry information that will enable a suitably-equipped receiver to tune automatically to long and medium wave stations as well.

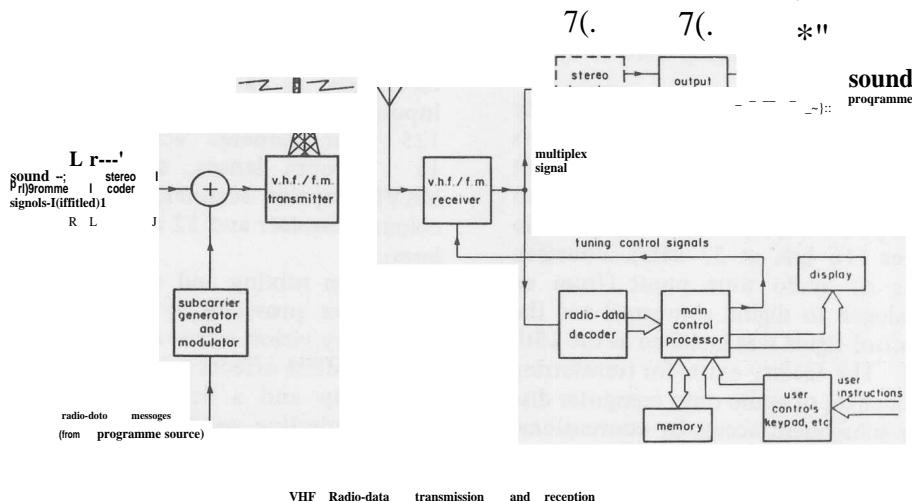
Research Department began experimental radio-data signal transmission in April this year from three of its VHF FM radio stations in the London area. Transmissions of this kind have actually been going on for almost three years now, but these new experimental signals represent the latest stage in the BBC programme of work on this exciting new development.

In the paper delivered recently to the IERE Conference on Radio Receivers and Associated Systems, the technical details of radio-data were described by Or. Bob Ely, the Research Engineer who has been concerned with

this work since its inception. In a recent Research Department Report (RD 1981/4) Bob gives a description of the experimental signals now on the air. This Report gives a detailed outline specification for a possible system and represents an invitation to British Industry to join in the experiment by building experimental receivers and thereby help to ensure that the BBC signals are a format best suited for the listener and the receiver. The need for receivers to be modest in cost has been considered throughout the work.

Broadcasters in other countries are also carrying out similar experimental transmissions. In particular, Televerket in Sweden and TDF in France have systems that are very similar to the BBC's and under the auspices of the EBU, discussions are taking place to agree a common European system.

"If you know what you'd like to hear and can be there to listen to it, radio-data will do the rest", says Bob.



Jimmy Jewel! (right), of SCPD, discusses the Neve 12-channel, 2-output sound desk with Peter Rowe, an engineer in Communications Engineering Services at Glasgow, in the new production continuity control cubicle. The studio can be seen through the window on the right.

WOW its 'SHOW GIRLS'

Some months ago a series of programmes called 'Show Girls' was made. This involved following the progress of two dancers from Britain in various talent competitions, culminating in a finale at the Desert Inn in Las Vegas. This was an 'unrepeatable' performance: the show closed the next day! Unfortunately, a fault had occurred on the Nagra audio tape recorder giving rise to severe wow (approximately 10 per cent speed variations about 3 times a second), rendering the material unusable. The fault did not come to light until after the performance.

Various conventional techniques for speed correction failed, and TFS (Television Film Studios) contacted Research Department. They wondered if anything could be accomplished using digital techniques, possibly by making use of the 50Hz control track normally used to synchronise with film.

Tony Moore and Guy McNally decided to use Research Department's PDP11 computer in an attempt to put things right. This has the ability to accept and replay data at digital audio rates (16 bits at 32 kHz). Fourteen bits of audio were input (from an analogue to digital converter) and the control signal was included as the 15th bit. The facility exists for transferring sequences of audio onto computer disc for subsequent access by conventional (e.g. Fortran) programs.

Initially the speed information had to be extracted from the control signal; this was done by a frequency demodulation process. Knowing the 'instantaneous' speed, the signal was interpolated and re-sampled at points corresponding to equal 'correct-time' intervals. The signal was then fed from the computer to a digital to analog converter using a regular 32 kHz clock and re-recorded on a Nagra recorder.

The processing was quite intricate, involving digital frequency demodulation and correction techniques. A certain amount of guesswork had to be employed initially, mainly in the extent to which the speed information was low-pass filtered: this is because the frequency of the control signal (50Hz) was barely high enough to accommodate the 'bandwidth' of the speed fluctuations. It was also found necessary to make allowances for the distances between the record, replay and control heads on the recorder.

TC2 re-enters service



TC2 Production Control Room

TC2 is a small (320m²) general purpose television studio which has been out of service since 1969. It has just been completely refurbished and equipped with up-to-date facilities.

The major part of the vision system has been supplied by Link Electronics to a BBC specification. Inputs to the mixer include five Link 125 colour cameras with Schneider 15 : 1 zoom lenses, a Rank-Cintel MKVIIC caption scanner, a Cox 3-level colour synthesiser and 12 outside source lines.

Vision mixing and special effects facilities are provided by a 24-channel Grass Valley vision mixer equipped with a single E-MEM effects memory, a quad-split facility and a downstream keyer with a borderline generator. A "quad overlay" effects system using BBC Colour Separation Overlay (CSO) processors and soft-edge switches allows complex shots to be set up beforehand and to be offered to the mixer when required. In addition, a shot-box is provided to control the Quantel digital effects equipment located in TC5.

The control suite is equipped with over 50 picture monitors, 30 of them in

However, the overall exercise was a success, and the material was declared to be eminently broadcastable and the show is due to be transmitted in the near future. The processing was done in 'chunks' of around 3 minutes (as this is the maximum amount a disc can hold); the total material processed lasted about 15 minutes. As it took about 4 hours of computer time per 'session', the programs were run overnight.

The exercise was very useful, both in vividly demonstrating the power of computer audio processing and in validating certain recent processing algorithms.

the production control room. Most of the switching functions in the studio are carried out by a Pro Bel custom-built switching system incorporating a 40 x 32 interfield-cutting preview matrix. Alpha-numeric indicators are provided under all preview monitors.

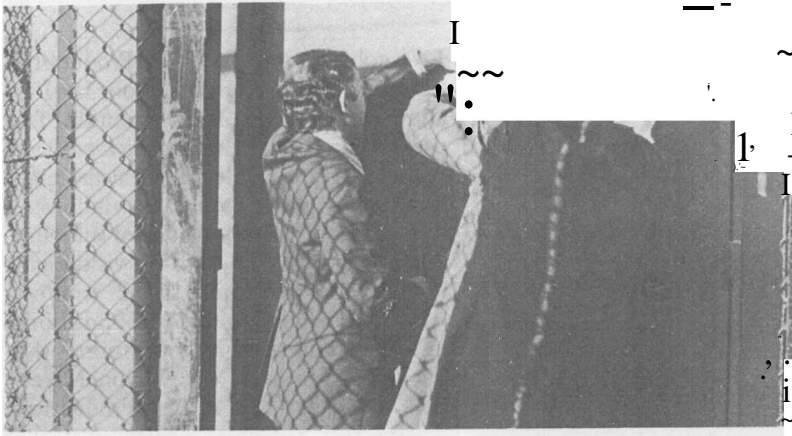
The Sound system was supplied by Neve, to a BBC specification. The sound desk is a 40-channel mono mixer, with up to eight channels which can be used with free grouping, i.e. where the 'eight' can be used either as channels or as separate groups. Novel features include pushbutton monitoring for both loudspeakers and a 144-pushbutton matrix for bay monitoring. The overall system is sufficiently comprehensive to cope with complex current affairs and sports programmes.

The studio communication system is designed around well-tried and established control circuitry and an audio matrix. The system handles production talkback and studio, camera and station intercomm. An engineering manual exchange and a presenter's telephone exchange are also provided.

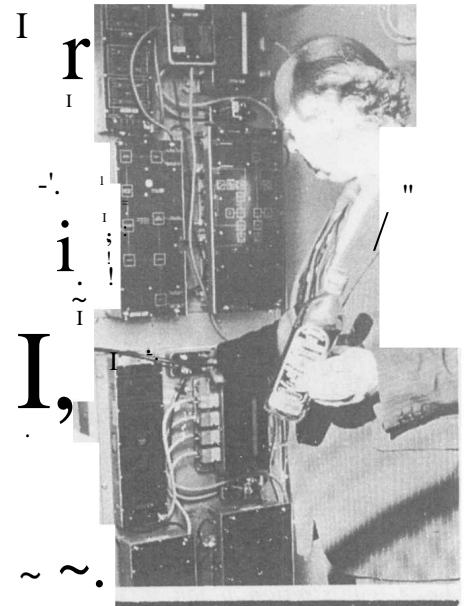
The complete production lighting system was provided by Rank. The lighting control system comprises a Rank-Strand "Galaxy" 240-way lighting control desk controlling 5kW and 10kW thyristor dimmers. A completely new lighting grid had been installed; this supports 42 lighting winches, 26 overhead cyclorama winches and 33 scenery winches. "Saturation rig" lighting is provided by 88 dual-source lanterns; 17 spotlights and 26 overhead cyclorama lanterns are also available.

The SCPD project leader was Gerry Goodhew (also responsible for vision), backed by Dave Procter (sound), Wynne Griffiths (comms), John Hegerty and Pat Kennedy (lighting and mechanical) and Ray Lack (power).

TRANSMITTER NEWS



The new Bushmills relay station, sited in the grounds of a famous whiskey distillery was featured on 'Scene Around Six' from BBC Northern Ireland when the Managing Director, Bill McCourt of the Bushmills Irish Whiskey Distillery, opened the station. Following the opening several members of staff were invited to visit the distillery. The photograph above shows the Transmitter Manager, Jim Drewery (right) and Bert Gallon, acting HPSE N.I. (left), struggling to unlock the cabin before the official opening party arrived. The photograph (above right) shows the MD connecting the receiving aerial to the transposer putting the relay "on-air", having first freed the lock with some of his famous distillation.



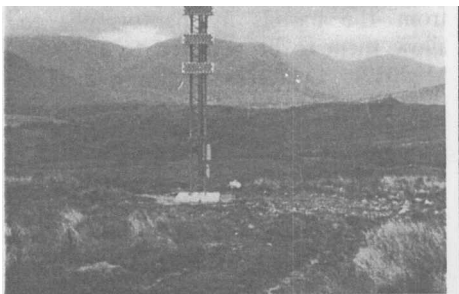
The first of the new generation "silver-streak" tv transposers (see Eng Inf No. 3) recently entered service at the Braemar relay. The new equipment is of modular construction, making for low-cost production and ease of maintenance. The photograph shows Alan Davies, the Transmitter Manager from Meldrum, demonstrating how easy it is to change units. The TCPD installation team was led by Colin Palk.

The adverse weather conditions at the end of November created problems for the transmitter maintenance teams in the remote parts of Scotland. Several main transmitter and relay stations were put off the air by high winds, snow and lightning strikes.

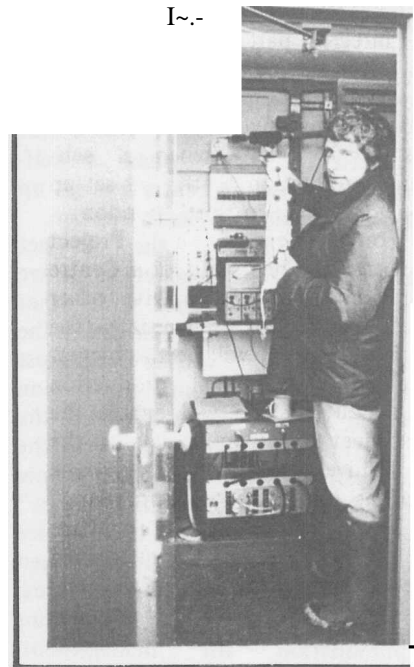
The Tullich tv transmitter was off the air for two days whilst engineers from Meldrum dried out the transmitter cabinet. Snow had entered the cubicle via a fan vent, and caused the transmitter to fail. As one viewer described it, "The picture got snowier and snowier until we lost it all together." Little did he know!

On the Isle of Lewis, the Eitshal main station was struck by lightning, and much of the BBC 1 and BBC 2 transmitter equipment was destroyed. In the workshops even the refrigerator was reduced to a pile of burnt metal. The British Telecom phone lines evaporated, and the shf link equipment was put out of action. Because of the snow and high winds, it was 2 o'clock in the morning before Pete Lawrence, from the transmitter maintenance team at Gairloch, could inspect the damage. The damage to the transmitters is so bad that a portable temporary transmitter has been installed to provide a service. The IBA transmitters, at the other end of the transmitter hall, were unaffected.

Arthur Morris, the team manager at Gairloch, had other problems, though, as the high winds had blown the fible glass cylinder off the top of the

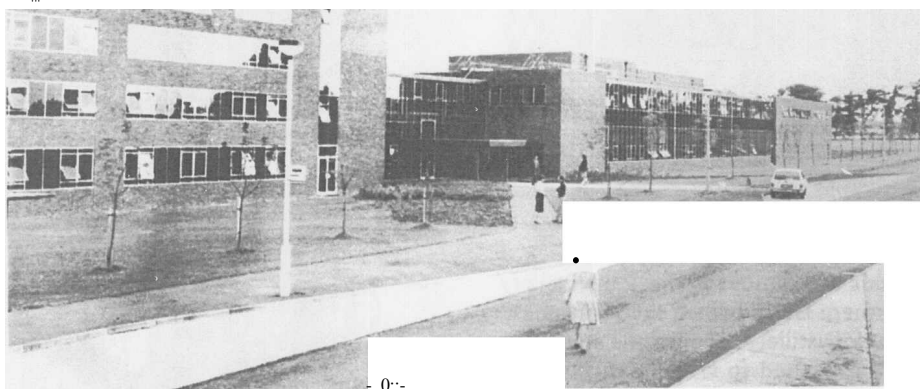


The photograph shows the BBC's first naturally-powered transmitter station at Dychliemore, Argyllshire which has just opened. The station is a link in the chain that feeds the relay station at Dalmally with signals from the main Torosay transmitter on the Isle of Mull. The amplifiers can be powered from either solar panels or 3 wind generator, and these can each feed power into separate storage batteries. An automatic changeover system changes the power supply from one source to another should a battery fail. The batteries have a capacity of about three weeks without re-charging.



mast at Skriag. This meant that several smaller relay stations were not working either, because they rely on Skriag for their programme feed. Fortunately, a splendid effort by the riggers, Willie Skinner from Rosemarkie, and Pat Brown from Kirk O'Shotts, allowed some temporary aerials to be rigged, and a service to be provided.

New BBC IOU Production Centre



The Administration block, main entrance and reception. On the right, is the technical block.

We, in our unique partnership with the Open University, started production work at our specially designed Open University Production Centre on the University's campus at Walton Hall, Milton Keynes in Buckinghamshire on 29th September 1981. The centre is capable of making up to 400 radio and television programmes each year, which allows for future development in the number of programmes required by the University as an integral part of its teaching system. Its opening marked the latest step in the partnership between the BBC and the Open University, which was established in 1969 when a self-contained production centre was set up in Alexandra Palace in North London.

Tony Berry, the Project Manager, says "The Production Centre compares very favourably with other production centres of similar size in the United Kingdom. It will be the biggest purpose-built educational production centre in Europe and will enable the BBC to meet its commitments to the Open University for programme productions during the coming years."

The Centre consists of an Office Block and a Technical Block joined together at the Main Reception area. The Office Block contains accommodation for management, production and administration staff, catering areas, design offices and listening and viewing rooms.

In the Technical Block there are two television studios, two sound studios, a Central Technical Area, film dubbing/review/editing areas, Outside Broadcast vehicle areas and the usual support areas. These include such facilities as wardrobe, make-up, scenery,

visual effects, mechanical, electrical and electronic maintenance workshops and stores. The Centre Technical Area includes a Television Apparatus Room, Quality Check Room, video tape cubicles, telecine area and a Video Rostrum Camera.

Planning and installation of the technical equipment was carried out by Studio Capital Projects Department.

TELEVISION STUDIOS

The Technical Block at the OU Production Centre at Walton Hall, Milton Keynes, contains two television studios. Studio 1 with a floor space of 336 square metres and Studio 2 with 102 square metres.

Studio 1 is a fully equipped small production studio with four Link

110 colour cameras. The Production Control Suite is at ground floor level to allow easy access to the studio for production staff. This arrangement was considered preferable to the usual high level gallery with observation windows.

The production control suite has separate production control, vision and lighting control and sound control rooms. There are four control positions in the production control room, the Technical Manager, the Vision Mixer, the Director and the Production Assistant. The desks and monitor stacks are positioned so as to allow direct line-of-sight between the Director and the staff seated at the desk in the Production Control Room and those in the other two rooms.

The Vision Control Room has a Grass Valley 16-channel, 4-bank ABCD Vision mixer with multiple re-entry, chroma-key and comprehensive wipe pattern generators. The chroma-key incorporates the BBC fringe suppression system. The lighting is controlled by means of a 'Thornlite 500' micro-processor based system with 200 dimmer channels and 200 memory files. In the studio, the lighting grid is at a height of 8 metres above the studio floor. It is equipped with 45 motorised lighting winches supporting forty-one 2.5 metre barrels and four 1.2 metre barrels. Each of the two 2.5 metre barrels is normally fitted with two laniro Kahoutek 2~ kW/14 kW dual source luminaires. These are suspended from the barrels by pantographs to allow them to be adjusted to different heights. Cyclorama lighting is also



Tom Peckham and Mike Coy (centre) of SCPD seated at the control desk in TV Studio 1, while John Bloomfield, OUPC, adjusts the monitors. John was attached to SCPD for the installation.

available by using 4 colour overhead units suspended from the appropriate barrels or "Groundrow" units. Between the rows of lighting winches are eight scenery winch tracks. Four winches are mounted in pairs at the end of each of the tracks.

The Sound Control Room has a 20-channel/4-group control desk built to a standard BBC Specification for production studios, two Studer A80 1/4" tape recorders and two BBC-designed disk reproducers. There is also provision for the addition of a multi-track tape recorder and other equipment for post-production editing.

Studio 2 has been equipped initially for operation on a "drive-in" basis with the CMCR. The installation has thus been confined to production lighting and cabling to a connection point in the nearby OB base where the vehicle will be parked when used in this mode.

Production lighting in Studio 2 consists of luminaires supported from simple tracks and pantographs. The luminaires are controlled by a Thorn QT 120 lighting control panel which has been transferred from the studio at Alexandra Palace. Dedicated control room facilities can easily be added in the future if outside broadcast commitments prevent the Colour Mobile Control Room (CMCR) from being available for studio work.

SOUND SUITE

There are two studios in the Sound Suite, one of 104 square metres and the other a small talks studio with a floor space of 20 square metres.

The larger studio is equipped for drama and music with a 19-channel



Sound supervisor, Martin Ward (left), and Sound Manager John Eden-Eadoll, seated at the Calree MK3 general purpose desk in the Sound Control Room.

general purpose stereo control desk, four Studer A80 tape machines and four disk reproducers of BBC design. The adjacent talks studio, which also serves as a quality check room, contains two tape machines and one disk reproducer. Control is from a Glensound desk equipped for 7 stereo and 4 mono channels.

The suite also contains three editing/transfer rooms, each with three tape machines and a linking console, a 'Try-over Disk Room' for listening to the content rather than the quality of a programme, a tape store, office and maintenance room.

CENTRAL TECHNICAL AREA

The area is divided into a number of rooms for video tape recorders, a

video rostrum camera or episcopes room, telecine, a television quality checking room, maintenance room and television apparatus room.

The Television Apparatus Room contains the equipment bays associated with the television studios and central equipment serving the Production Centre as a whole, such as signal routing, pulse and test signal distribution, off-air check receivers, and office listening/viewing distribution equipment. A modern solid-state station routing system has been installed to route vision, sound, communications and VTR time-code between 25 sources and 30 destinations. Video timing for the various sources to the studios is by use of Grass Valley 'Isophasors' instead of the digital phase shifters installed in most BBC studio centres at present.

Four of the six videotape cubicles will be equipped initially with broadcast quality machines, and one cubicle with a rack of cassette recorders for producing copies of programmes for distribution to OV study centres and libraries. The broadcast VTRs are arranged in two groups of three with provision for individual operation or two-or three-machine editing. Helical scan one-inch C format machines have been provided since it has been decided to adopt this format for all new OV recordings. However, as existing recordings are on 2-inch tape and will need to be replayed for future programme compilation, two quadruplex machines will be transferred from Alexandra Palace.

The Video Rostrum has been in use at Alexandra Palace for five years and consists of a standard Link 110

At the desk (right to left) are Andy Newell (OUPC), Alan Feme (SCPD) and John Moss (OUPC); John Harris (SCPD) adjusts the VPR2B.

'continued on page 8'