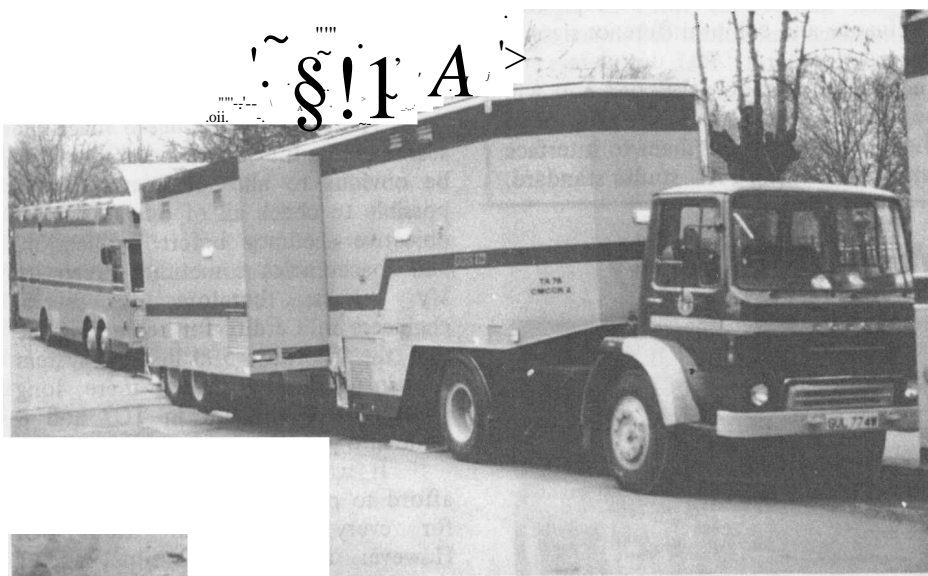


## BOAT RACE MAKES HISTORY for new 08 vehicles



The new CMCCR2 on site at Putney for the Boat Race.

The 127th University Boat Race marked yet another milestone in the history of Television Outside Broadcasts. In service for the first time were the new Colour Mobile Central Control Room (CMCCR) and Mobile Communications Area (MCA).

The CMCCR uses an unconventional approach to the problem of outside broadcast vehicles, whose size is normally limited by the demands of road traffic regulations. For major outside broadcasts such as the Boat Race, Open Golf Championship or Wimbledon Tennis, the normal production control room is too small for the extra number of cameras and monitors required for full coverage of the event.

The CMCCR has therefore been designed with electrically operated expanding sides, which enlarges the production control room from the normal 2.5m to 4.5m. One of the expanded sides contains a bank of thirty black and white, and four colour monitors; the other side accommodates the production staff and allows free

movement around the production control desk.'

At the rear of the vehicle is the sound control area, housing a 44 channel Neve stereo sound mixer, and a communications system based on a 50 x 100 pin-board matrix that enables the communications to be tailored to suit the needs of each outside broadcast.

The front of the vehicle houses an engineering and vision control area where the vision signals are processed and monitored. The vision mixing and routing equipment is mounted here, together with a smoke detection system, alarms and the power distribution equipment. Other equipment includes digital video synchronisers, and sophisticated measuring equipment. Space has been left for two camera control positions or a video tape recorder to be accommodated on a temporary basis.

The Boat Race was rowed over some 4Y..miles of the Thames, and this created problems for Tel OB's because of the difficulty of connecting the 10 landbased camera sites to the central

control room.. In addition cameras were mounted on board a helicopter and on the "Pembroke Puffin" boat, and these signals also needed to be connected to the central control room. To overcome these problems, uhf and shf radio links were provided carrying camera signals back to the CMCCR. Reverse circuits over vhf radio links were established so that the camera control data for the Philips LDK5 type cameras could be remotely controlled from the central control room. In addition an extensive vhf talkback network was established enabling the production staff to talk to the cameramen at the remote sites. The co-ordination and control of all the communication facilities was provided by the new Mobile Communication Area (MCA) vehicle, which was designed with major Outside Broadcasts such as the Boat Race in mind.

The MCA houses all of the radio link equipment and also has the capability of checking the quality of the signals coming in from a maximum of twelve dual-head links, and these can be displayed permanently on 12 monochrome monitors. The vehicle can use six independent vhf radio telephone systems allowing full talkback facilities with the camera and radio link sites. Television signals pass through a 32 x 16 routing and monitor matrix, where test signals can also be inserted to check the various link and cable parameters.

For the Boat Race broadcast twelve cameras were used, three being connected by landline, the remainder by radio link. This is a record number of remotely controlled cameras for a BBC Television Outside Broadcast.

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### Reception Quality Checks

Do you live in the service area of the Wrotham vhf transmitter?

Would you like to take part in listening tests at home on your own domestic radio?

Send for an explanatory letter to Alan Lafferty, Room 701, HWH.

## Digital Stills Store at R.D.

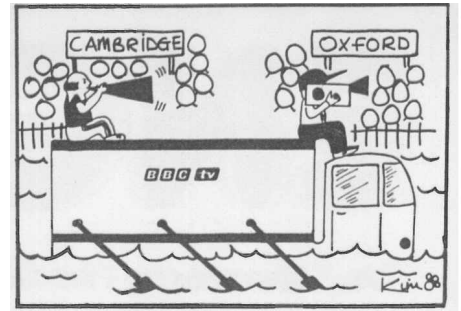
Two types of digital electronic stills-store are currently being developed at Research Department.

A television animation store is being constructed which, in conjunction with a television rostrum camera, can generate animated sequences for television. Up to 800 pictures will be stored for replaying at normal television rates. Specially developed digital television processing circuits installed within the store system will enable still pictures to be combined by normal mixing or keying operations. The operation of the system will be entirely programmable. Construction of the animation store is due to be completed by the end of 1981, although a programmable television rostrum camera will not be available until next year.

A second type of stills-store is

being developed to meet the more general need for a studio stills picture store. This store will have a smaller capacity and slower access than the animation store described above. It will simply present two still pictures to the normal studio mixer via two independent output channels. A first prototype is to be completed by September 1981 so that the Television Service can evaluate the use of such systems.

Both types of stills-store are based on the storage of television signals, on computer-type hard disc drives, in digital component form as separated luminance and colour difference signals. Special digital PAL decoders and encoders are being developed and will be installed in the inputs and outputs of the system to enable them to interface with the existing PAL studio standard.



## Editorial

The economy, we are told, is in recession and the effects of inflation surround us. Yet the ingenuity and resourcefulness of engineers in the BBC enable the high standards, set many years ago, to continue. The cutbacks of the past year may still be felt in many areas, yet we still remain the fillest broadcasting organisation in the world.

The need to produce a magazine such as "Eng Inf" on a small budget will be obvious to all. It is not always possible to check all of our stories for objective accuracy before publication, and inaccuracies sometimes creep in. My thanks, therefore, to several engineers in Cardiff for reminding me that the Thornlite 500 lighting system was installed and in use there, long before the equipment in TC7 and 8 came into use (Eng Inf No. 3).

It would be nice to be able to afford to print one copy of "Eng Inf" for every engineer in the BBC. However, this is not possible, and I would ask all of our readers to pass copies on where possible. Please do not me them away in ring binders to gather dust until the day you retire.

There are occasionally extra copies available, although further information on any of the individual subjects can always be gained from the Department concerned.

Alan Lafferty

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This mixer has a new feature in that the controls on the control room desk are converted from analogue voltages to multiplexed digital signals, processed via PROMS to modify fading laws, and then converted, digital to analogue, in the actual respective fading amplifiers, thereby controlling the levels of the audio or video signals. Also there is no separate "cut" bank; cutting being performed as a "fast" fade. Similar mixers are due to be installed in the TV Continuities at TV Centre later in 1981.

The SCPD team responsible for the installation were Mike Lyons, Tim Hardiman, Peter Arnold and Les Cussans.

## CARDIFF: new continuity



Cardiff television Continuity 'B' suite

The second TV Continuity Suite at Broadcasting House Cardiff has now been handed over by Broadcast Systems Unit 'B' of Studio Capital Projects Department on time. It has now taken over the BBC Wales continuity control from the adjacent TV Continuity Suite 'A' so that some urgent remedial modifications can be made to this TV Continuity which for a while will only be used for the occasional BBC-2 opt-outs by Wales.

The facilities in the new TV Continuity (known as TV Continuity 'B') are the same as in TV continuity 'A', less the Ryley CAPGEN character generator and one BAIO/501 slide-scanner.

The control room has been

enlarged by removing the wall between it and its Engineer position room, which was not required, thereby allowing a better and more spacious layout and larger screen sizes on the picture monitors.

The mixer has been provided by Michael Cox Electronics Limited to BBC specifications, which stated that its control panel layout and functions must be identical as far as practicable to those on the Prowest/EMI mixer in TV Continuity 'A'.

The mixer is an audio/video mixer of the "knob-a-channel" type, with remote control of both audio and video. The electronics are housed in equipment racks in the Communications Centre upstairs.

## RF tests on new OB vehicles



As part of the commissioning tests on new television OB equipment, engineers in SCPD supervise the rigging of the equipment in an area of high rf field strength close to high-power transmitters. Both the Crystal Palace television transmitter, which radiates powers of 1000 kW at uhf and 200 kW at vhf, and the high power mf transmitters at Brookmans Park are ideal for the tests.

The photographs show a new two-camera OB vehicle being put through its paces at the Crystal Palace Sports Stadium which is about a mile from the tv transmitter and is a regular venue for sports OBs. The vehicle is equipped with two Philips lightweight LDK14 cameras which are used with interface units to enable them to operate into LDK5 camera base stations. Philips LDK5's are the production cameras of conventional size used as standard

equipment in the latest type 5 OB vehicles.

Electronic cameras are especially vulnerable to rf interference because of the low-level signals in the head amplifiers. It is difficult to provide adequate shielding because the amplifiers are necessarily close to their respective camera tubes. Rf interference comes, literally, straight through the lens, the optical path being free of any permanent metal shielding.

For the Crystal Palace tests, the cameras were rigged with 700m runs of cable. The cameras were then moved around and pointed in various directions while their outputs were monitored for the tell-tale signs of rf patterning on the pictures.

Following the successful tests this particular OB unit entered service at Pebble Mill.

## EXTRA TIME

Wednesday 1st July will be one second longer this year as the result of an international agreement. One o'clock in the morning will last for one whole second instead of flkking instantly over. There will be a new time 0059'60" (BST) which will last for one second until 0100'00". Just imagine a whole second longer in bed - unless you are unlucky enough to be on night shift!

The official statement of what is going to happen is: 'In accordance with international agreement the UTC time scale will be retarded by the insertion of a positive leap second at the end of June 1981'. UTC - (The initials" for the British equivalent of Co-ordinated Universal Time) - is based on the frequency of radiation corresponding to the transition between specified energy states of the Caesium 133 atom which is, by definition, taken to be 9,192,631,770 Hz.

Under the control of the Bureau International de l'Heure, ~eap seconds are occasionally inserted and, if ever necessary, deleted, in order to keep UTC within!: 0.7 seconds (usually) and !: 0.9 seconds (extreme tolerance) of UTI (equivalent to GMT).

Those of you lucky enough to have watches accurate to better than a second a day must remember to adjust them: Don't take them back to the shop because you have suddenly found that they have started losing a second a day.

## EQUIPMENT DEPT. OPEN DAF



Peter Hearn, Equipment Department, who is the Supervisor of the printed board shop, shows parents and potential trainees how the BBC manufactures printed circuit boards. The open day at Avenue House attracted over 150 visitors during the evening.

## Transmitters Opened

The following uhf tv stations have opened since January.

Mynydd Pencarreg, Dyfed  
Matlock, Derbyshire  
Cwmaman, Mid. Glam.  
Ludlow, Salop  
S1. Bees, Cumbria  
Kirkmichael, Strathclyde  
Looe, Cornwall  
Downderry, Cornwall  
Duncraig, Highland  
Culm Valley, Devon  
Kerry, Powys  
Lea Bridge, London  
Cemaes, Gwynedd  
Amlwch, Gwynedd

## End of an era

BBC Piccadilly, Manchester closes after 52 years of broadcasting, when North West regional television move to their new premises at Oxford Road on May 15th.

The BBC established itself at Piccadilly in April 1929, and many new ideas were incorporated into the technical areas. An automatic switching system using uniselectors was used for the first time for the routing of lines to studios. Designed by A. S. Atkins, an ex Post Office engineer, the system eventually worked well, and remained in service for many years.

Also new to the Manchester control room were the now familiar 'A', 'B', 'c' and 'D' amplifiers mounted on standard racks. These amplifiers are supposed to be the first to be painted in the now familiar "BBC grey". Until 1929 all equipment had been painted a standard black, but the new GPO un-selector panels were a grey colour, and so the control room amplifiers were painted to match. The colour was later adopted for all BBC equipment.

Other novel features included the first use of 'Volume Indicator' meters, the forerunner of the PPM and measurements were made using a TS/4 tone source and AD/2 amplifier-detector measuring to an accuracy of 0.25 dB at a level of -55dB.

## Loudspeaker developments

Because of the continuing lack of consistency amongst commercially manufactured loudspeakers, Research Department is still extremely active in the development and realisation of new designs of loudspeaker units and assemblies.

Taking the LS 5/8, as an example, this was originally designed at Kingswood by Dudley Harwood (now retired) and Derek Mathers. Once all the teething troubles, inevitable in new transducers, were solved, a British loudspeaker manufacturer, Rogers/Swisstone, was assisted to make the assembly under licence both for the BBC and for commercial exploitation. Using this approach, not only does the BBC get the loudspeakers it needs, but much of the development costs can be recouped from the licensing revenue.

Current activities at Research Department centre around a much needed smaller assembly of approximately the same size as the old LS 3/6 (or Spendor BCI). This time, however, a new method of objective assessment is available in the form of a laser interferometer recently designed by Bill Taylor. The interferometer allows a point by point measurement of even the smallest movement of the cone of a loudspeaker. Thus it can be used to locate such things as resonances

in the cone material under normal operating conditions. With the aid of the interferometer, Ted Randall and Derek Mathers hope to identify some of the limitations of earlier 200mm cone slrapes, and derive a transducer free of most of the unwanted colourations which give each loudspeaker its characteristic sound.

## Computer aids Project Planning

At anyone time SCPD are working on many major projects. Any one of these may have a budget cost of several million pounds. At present, for example, the cost of the project for moving the Open University Production Centre, from Alexandra Palace to Milton Keynes in Buckinghamshire, is in the order of three million pounds.

With a project of this size it is important to examine critically each stage to ensure the work is properly organised and finished on time. SCPD has a special group within Planning and Information Unit which uses a computer based project planning package called P.E.R.T. Each project is broken down into small identifiable jobs. The computer is then fed with the duration for each job and other essential information such as resources (engineers, wiremen, etc). It also needs to know how the jobs depend on each other.

Roger Powell, the group leader, is also an executive committee member of the ICL PERT User Group which looks at ways of developing the software in order to extend its usefulness for each of the organisations represented.

Roger says, "We are fortunate to be able to adapt a graph plotter programme that had been developed by Leeds City Council, which gives all concerned a very clear presentation as to the timetable of the project."

Ian Stone, the Head of the Unit, says, "There is no doubt that being able to keep a close watch on any changes or delays in a large project saves SCPD a great deal of time and money. Our Project Managers realise this value and are very keen themselves to get the latest reappraisal."

## OPEN WIDE



*The phased replacement of type D sound mixing desks in the Television Centre studios continues with TC8, the latest in line to receive a new 50 channel, 8 group stereo mixer. The mixer was manufactured to our specification by the Royston-based firm of Rupert Neve and is the third of this basic design to be installed in the BBC, previous ones being at Pebble Mill, studio A and Cardiff, studio C.*

*However, the biggest installation headache with these latest desks, compared to the type D predecessors, is their physical size and, not for the first time, the new desk had to be delivered straight through the sound gallery ~ observation window. Not, of course, before the window had been carefully removed and considerable preparations made.*

*SCPD engineers Alec Whitfield, Peter Matthews and foe Meredith, and Installation Chargehand Bryan Pope were on site early on Easter Tuesday to oversee the operation which was carried out by a team from Bullens.*

# TV SOUND gets it together



Terry Newbery (SCPD) discusses the NECAM control unit with Mike Jones, a sound supervisor.

Sypher-2, the new audio post-production suite, has recently entered service at Television Centre. The suite has been developed as a result of six years' experience with the Sypher-I suite. Sypher - SYNchronised Post dub with Helical-scan and Eight-track Recorder - was designed by SCPD in co-operation with Larry Goodson, A.H. Tel. Sound, to meet changes in television production techniques.

With improved video tape editing, directors may plan between 10 and 100 recording breaks, and make 200 or more edits to remove errors and to tighten the pace of a production. This makes it very difficult to produce a well-balanced continuous sound track at the time of the studio recording. With Sypher, the dialogue sound and special effects can be brought together, and music can be added to the edited video tape after the production. The recent series of 'The Hitch-Hikers Guide to the Galaxy' is an excellent example.

In the Sypher system, the edited picture is copied onto a non-broadcast standard INTR (helical video tape recorder), and the sound on to one of the tracks of an MSR (multi-track sound recorder). EBU time code is added to both to enable sound and vision to be synchronised. Additional music and sound effects can then be recorded on the other tracks of the MSR. The sound effects are mixed with the newly edited sound which has been carefully synchronised with the edited picture, to form the final version of the sound track. This is then transferred back to the master video tape in the place of the original sound.

Terry Newbery, the Project Leader, says "Sypher-2 is an enlarged and enhanced version of the first Sypher suite. Because of the developments that have taken place over the past six years, Designs Department had to design a synchroniser system that would match the modern HVTR's and that would be capable of handling the time offsets of

slave machines. We also wanted a synchroniser with each slave recorder having its own synchroniser unit so that further slave recorders can be added at will. The modular design of this system allows the synchroniser to be used with the simplest or most complex arrangement."

The Designs Department synchronisers have been designed to operate on the wide range of speeds of modern HVTR's, so that the slaves stay together at all times. This saves time, allowing the operator to switch the synchronised recorders from spooling to play or record instantly.

Each slave synchroniser is provided with 'event' stores. An 'event' consists of an offset value and a cue point. This enables the slave tape recorder to be parked at a cue point until the master recorder reaches the corresponding time code point, when the slave recorder will then automatically run into synchronisation. This facility is particularly helpful in the use of "snoop" tapes - 1/2 inch recordings of the entire studio production - which may be used to restore sounds lost in editing or to substitute sound from an alternative take.

A "NECAM" computer-assisted mixing console, made by Neve, is used to control the large number of sound channels involved and to memorise cue points for non-synchronised equipment, and to switch in effects. The cue points can be entered by either using a keyboard to put in time code, or by using, what are called 'on the fly' buttons to mark time code points on the tape. The NECAM system uses a floppy disk to store data representing the position of all the faders in the sound console against a time code reference. The data is then used to drive the motorised faders back to the same positions for each replay of a particular scene. At any time the sound balance can be changed and the new

settings stored in the memory.

The NECAM system makes it possible to go repeatedly backwards and forwards over each section of a mix, retaining that which is correct and updating only that which is not. Each "attempt" may be stored, and it is possible to select parts of different "attempts" using the stored data. The controls for NECAM include a clear and self-explanatory status display. This has a wide angle view and is easily read under normal lighting conditions.

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## News from PEBBLE MILL

Planning work for the technical refurbishment and Central Technical Area development for Pebble Mill has begun, and a local working party has been formed under the chairmanship of Manager, Communication and Engineering Services, Tony Pilgrim. The working party includes Manager Operations, Ken Page; Planning Manager, Eric Holmes; Video Manager, John Lannin; Audio Manager, Brian Forgham; Technical Services Manager, Frank Stevens; and Assistant to MCES, John Grantham, who will act as permanent secretary to the working party, and will co-ordinate local involvement with the project.

The refurbishment of Studios A and B, and Television Continuity at Pebble Mill will also include the formation of a new Central Technical Area, in which it is planned to combine all radio and television switching and routing operations, together with the television studio technical equipment.

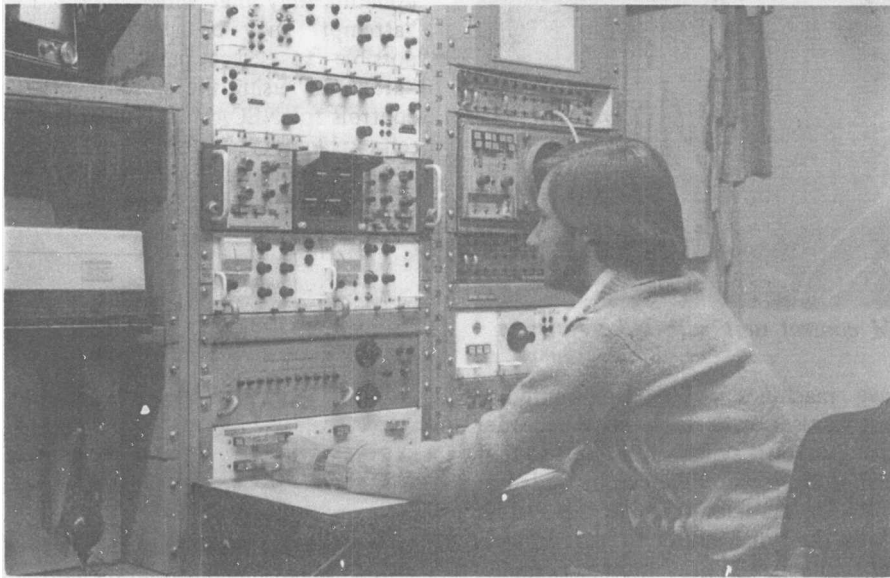
H.E.Tel. Projects will shortly be issuing a statement of requirements for the refurbishment programme and the television projects engineer who has been involved with Pebble Mill from its beginning, will be Ian Stewart.

Work is expected to begin in 1982, and the programme is for Studio A to be refurbished in 1982, and Studio Bin 1983.

There will, of course, be a considerable involvement of SCPD in the project, and they will be largely responsible for carrying out the work. As in 1970, when Pebble Mill was being constructed, some local engineers will be working closely with the specialist department.

Refurbishment of the radio studios is also likely to take place during this period.

# Communications Department: Special feature



*Keith Moore, shift engineer, measuring tv test signal parameters, in the Switching Centre*

Communications Department is based in Central London and consists of a Systems section dealing with capital projects in the communications field and long-term planning of the networks, and an Operations section dealing with the day to day provision and operation of communications facilities. In this short article we are concentrating on two areas in Operations - London Switching Centre and the Audio and Telecommunications Area, both sited in Broadcasting House.

## LONDON SWITCHING CENTRE

The London Switching Centre is the distribution point for the two BBC tv networks and contributions to London from within the UK. and abroad. The engineers in this area are responsible for ensuring that the quality of all signals routed through the centre is within strict tolerances. The area is manned for the hours of scheduled tv programmes, but when dealing with transmission to and from countries in other time zones, it is often necessary for staff to work through the night.

### *Network tv Distribution*

The BBC 1 and BBC 2 network signals follow similar routes from Television Centre through Broadcasting House to the transmitters throughout the UK.. Two feeds of each network arrive from Television Centre on wideband coaxial cables. One carries encoded sound-in-syncs and the other has a separate analogue sound circuit. The coded feed is used to provide signals for three distribution chains to the regions and the uncoded feeds for the Crystal Palace transmitter. Reserve feeds for the chains are obtained from either the encoded or analogue circuits. In the event of the loss of the signal on one of the circuits from Television Centre the changover to the reserve feed is automatic.

At specified times, Network 1 fragments into 12 regions each producing its own local news programme. It is possible by using "an arrangement of 'opt-out' switches to feed material other than network to the BBC 1 or BBC 2 transmitter chains. When this happens, the normal distribution chain can be used between London and the studio centres to carry opt-out material for use in these locally originated programmes. The Network 2 circuit can be utilised in a similar manner during periods of trade test transmission or close-down.



*David Bonor, shift engineer, operating the Switching Centre central desk*

## TV Contribution Circuits

Contributions from a region to London or another region are carried on a network of permanent circuits, augmented by extra 'occasional' circuits as required.. The temporary circuits are usually rented from British Telecom but may be borrowed from other users such as the IBA. Outside Broadcasts in the regions are routed, " using mobile shf links, into the local studio centre for connection to the network. Central Allocations Unit (CAU) provides facilities to cover the daily requirements.

Satellite transmissions, which only a few years ago were rare, now occur frequently. Because of the high charges involved, there is usually no time allowed for line-up and often a circuit from another continent has to be made acceptable in a very short time. Eurovision circuits are also handled in this area.

Once a contribution circuit has been checked to see that it meets an acceptable standard, by a specified time, it is offered to the user. In the case of Television Centre and its Spur (TV News), the circuit is selected by TVC using a remote control of a number of the destinations in the 25 x 36 vision and sound matrix at Broadcasting House Switching Centre.

The remote control system, which operates using a pulsed-tone coding, also gives the Central Apparatus Room full information on the state of Network distribution in the Switching Centre e.g. which chain is on main or reserve feed, or whether a chain is opted out.

There are a total of 22 circuits between Broadcasting House and Television Centre. By using a BBC designed carrier system and base-band, they are carried on 11 coaxial tubes. All circuits have access to the full 25 sources, some of which are tied to particular uses and the remainder used according to commitments.

**AUDIO AND TELECOMMUNICATIONS AREA**

The Audio and Telecommunications Area (ATA) in BH is the central BBC test room for audio and telecommunications services provided on British Telecom's plant in the London area.

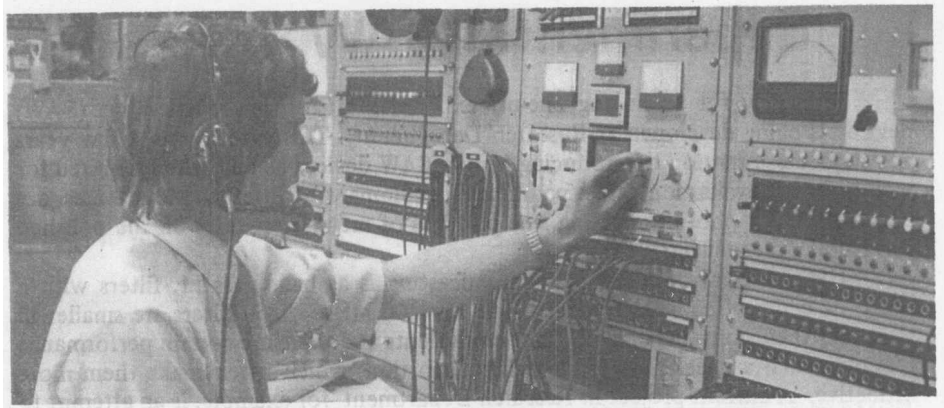
In the ATA, audio circuits are tested and equalised, faults diagnosed, and replacement circuits organised to restore the service. Circuits are not normally routed through the area, but whenever it is necessary for testing, equalisation and fault investigation purposes they are extended via London Control Room (LCR).

The internal telecommunications networks are centred in this area; here staff can monitor and control the operation of the system and generally work to maintain and improve the standard of service provided. In the ATA the following facilities are handled:

*Outside Broadcast Circuits*

Music and control lines from OB sites are usually tested two or three days before transmission, to determine the equalisation necessary for the required music bandwidth, and to ensure that noise and harmonic levels are satisfactory. Details of the equalisation settings are passed to LCR who then set up the programme chain to give the same performance as that obtained on test immediately before transmission.

One of the ATA specialities is the matching of pairs of mono circuits to permit satisfactory transmission of stereo signals. Disparate circuits with path length differences frequently of the order of 160 km require locally devised techniques and equipment to correct inter-channel phase differences. These techniques can, by fine adjustment of the special equalisers, reduce the initial phase error of several thousand degrees to better than ten



*Joe Tozer, engineer, testing lines for a stereo OB, in the ATA*

degrees. They also provide cheap stereo paths from sites where the only alternative transmission systems would be too expensive.

*Permanent Circuits*

Another responsibility of the ATA is the equalisation and maintenance of all permanent circuits in the London regions, whether part of the long distance network area or the London lines network. Some 3,000 British Telecom circuits are rented between BBC offices, studio premises, offices of foreign broadcasting organisations, and embassies, in the inner London area. Staff may work at base or visit any of the other terminals to test the lines. This often includes acceptance of new circuits which, for music lines, necessitates the design and construction of tailor-made equalisers. The work involves close co-operation with the users of the facilities, and particularly at time of faults, close liaison with British Telecom engineers in order to maintain the service and to minimise interruptions.

*International Circuits*

In addition to domestic audio circuits, the ATA is responsible for testing and equalising international music circuits. This includes stereo routes used by the Radio Service, such as those from venues used on the BBC Symphony Orchestra tours.

*Telecommunications Networks*

The ATA is the technical heart of the BBC's telecommunication networks for inter-regional PBX and control lines. It handles both local and long-distance telegraph circuits carrying mainly ADX and news agency messages. Interception and test facilities have been provided to permit surveillance and maintenance of the system.

Many Of the telephone and teleprinter services provided throughout the UK are carried on BBC-owned multiplex terminals which allow 12 speech channels to be carried on 48kHz 'groups' rented from British Telecom.

The ATA is responsible for the satisfactory operation and maintenance of the terminal telephony equipment throughout the country. Provision of circuits using multi-channel telephony techniques gives a considerable saving when compared with renting the individual circuits from British Telecom.

Further savings are achieved by sharing the channels. For example, PBX lines which are in demand for office traffic during normal office hours, can be used in the evenings and weekends as cue or control lines for programme purposes. Facilities for switching these circuits, and for inserting the appropriate form of signalling interface, are provided in the ATA.

Long-distance telegraph channels are provided by narrow bandwidth voice-frequency signals, multiplexed onto small portions of the normal telephone or control circuits. These are routed through the testing facilities of the ADX, with the physical circuits from the many local London out-stations. Telegraph signals from commercial news agencies and those within the BBC, are routed through the ATA. They are then distributed to a multitude of programme production areas throughout the country including Local Radio stations, and the Newsrooms at Bush House, Television Centre and Regional centres. They are also made available to topical programmes such as TODAY, WORLD AT ONE and GRANDSTAND.



*Julian Strickland, engineer, checking details of a reported fault, at the telecommunications fault position in the ATA*