No 23 - Winter 1985/86 **The Quarterly for B B C Engineering Staff** Please Circulate

Glasgow Studio 1 Refurbished

Glasgow Studio 1 returned to full service in December after refurbishment, coinciding with the 50th anniversary of the Scottish Symphony Orchestra. The studio boasts a new control room, solo instrument annex and improved acoustic treatment. Part of the refurbishment included the restoration of the audience lobby, which was restored to its pre-war elegance.

Studio 1 entered service in November 1938, being an addition to the Queen Margaret Building - formerly a medical college which produced the first female doctor. Apart from updating the control desk and associated audio processing equipment, nothing has been done to the fabric of the studio since then. Used mainly for orchestral and audience shows, the main change as a result of this refurbishment was the removal of the choir rostrum and restoration of the wooden floor. Gone is the old wooden wall panelling which was designed "to give the best conditions for the type of programme" (Engineering Information No 7, September 1938). In its place, modern panelling has been installed to the same criteria, and the previously satisfactory acoustics, have been preserved with little noticeable difference.

To accommodate the new mixing desk, it was necessary to build a new control cubicle. With no space available in BH, a three-storey extension to the studio was built to house new air-conditioning plant, an instrument store, a recording channel and the control cubicle.

In keeping with other music studios, the control cubicle has been equipped with a 48 channel Solid State Logic SL4000E multitrack desk, though not yet provided with its automation computer. Three Studer A80 twin-track tape machines and a gram deck have been installed, along with a Lyrec multitrack tape machine with remote control, previously housed in an OB vehicle. The control cubicle is also equipped with AMS RMX16 and EMT244 digital reverberation units and an AMS DMX15-80/S along with Lexicon PCM41 digital delay units. Quality audio monitoring is via LS5/8's and provision has been made for studio visual monitoring using a Sony CCTV system.

The restored audience lobby at Queen Margaret's Building, Glasgow

MSS Into Full Service

The BBC's new message switching system (MSS) was put into service on November 3rd, 1985. This replaces the old ADX system which had been in service from 1970. Since March 1984, however, a temporary installation had been in use after the failure of the ADX hardware, and pending completion of the software for the final MSS system.

The MSS provides a store and forwarding service for textual messages between any terminals connected to it. Simple address-codes added to the top of messages instruct the MSS as to where they should be sent. The MSS is used for many different purposes. News items are distributed this way to newsrooms and local radio stations, booking schedules are sent to control-rooms and transmitter fault reports from MICs are sent to studio centres. In addition, the Telex connections enable messages to be exchanged with UK and overseas organisations for such things as travel, shipping of goods, and orders for equipment.

The computers which support the MSS are located in the lower-ground floor of Broadcasting House. They consist of six DEC PDP 11/44s, each equipped with 1 megabyte of memory, dual 67 megabyte exchangeable disc-drives, and multiple input and output interfaces. The processors are interconnected via a high speed bus, so that as far as the user is concerned the system behaves as if it were a single computer.

The computer room is situated on the opposite side of the building from the Central Telecommunications Area (ATA), whence data-circuits to the MSS users within the BBC are distributed. Connections between these two areas is made using individual limited-distance modems for each circuit. At present there are about 400 of these, although the present capacity of the MSS is 312 two-way lines. Sufficient space has been allowed in the

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General view of MSS computer room

Transmitters Opened

The following transmitters have opened or changed since October:-

Uhf Television

Austwick	N Yorks
Cefn-Mawr	Clwyd
Trefechan	Mid Glamorgan
Broughton	Borders
Aveton Gifford	Devon
Dunsford	Devon
Hope-under-Dinmore	Hereford & Worcs
Winshill	Staffs
Falstone	Northumberland
Ferryside	Dyfed
Middleton	Gtr Manchester
Brailes	Warwicks
Muldonagh	Co Londonderry
Claudy	Co Londonderry
Hammersmith	London, W6
Llangurig	Powys
Elton	Cheshire
Sutton Coldfield	new uhf aerial
Black Hill	new uhf aerial
Mynydd Emroch	extended coverage
Caterham	extended coverage
Blaenau Gwent	extended coverage

Vhf radio

Llanddona	Stereo
Llangollen	Stereo

Local Radio : Frequency Changes

Radio Kent	Swingate
Radio Sussex	Heathfield
Radio Sussex	Reigate
R York	Acklam Wold

MF : New Transmitters

Radio Wales	Forden

New North East Regional Headquarters

The first phase of the new North East regional headquarters in Newcastle came to fruition in November when the buildings on the Fenham Barracks site were accepted. As yet, they are technically empty shells, although heating, lighting, air-conditioning and the other usual services are already connected.

Designed entirely in-house by ACED and SCPD, the new headquarters will provide over 5,000 square metres of accommodation on two floors, including a 219 square metre Television Studio.

Of striking appearance, the building employs a steel frame with external walls clad with vitreous enamelled steel insulated panels. Double glazed reflective glass cladding is employed for the reception and restaurant areas at the front.

Great care has been taken to achieve the high degree of acoustic separation essential for the effective operation of the studios. The mechanical services installation incorporates advanced computer monitoring.

As well as providing modern technical facilities for broadcasting, a good deal of attention has been paid to the internal working environment. The entrance and reception areas on the ground floor, and restaurant on the first floor, have been enhanced by the introduction of three large rooflights which allow shafts of daylight to reach deep into the heart of the building. Materials have been selected which conform to the technological image of the exterior but still allow scope for workspaces to be personalised.

In addition, on completion of the project there will be extensive landscaping to provide a pleasant setting and outlooks not only towards the town moor opposite, but also across the site itself.

The installation of new studios for Radio Newcastle is the first sign of technical life on the site, with Mark III stereo desks forming the heart of the complex. This work will continue until the studios are fully operational in May 1986.

Two new television studios, A and B, will replace those currently crammed into the old converted lying-in hospital in Newcastle city centre. Studio A, will have a floor area of 219 square metres, and will be used as the main studio for regional opt-outs, features, and servicing the network: Studio B, being much smaller at 38 square metres, will be used for presentation, Breakfast Time, and Lunchtime News inserts; it can also double as a post production area and for dubbing, with simple sypher facilities.

The television system contract has been

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The Fenham Barracks site, the new home for BBC operations in the North-East.

New Triax Cable

With the introduction of the new generation of studio and lightweight 'triax-fed' cameras, it became apparent that there would be a need for a new camera cable for studio use.

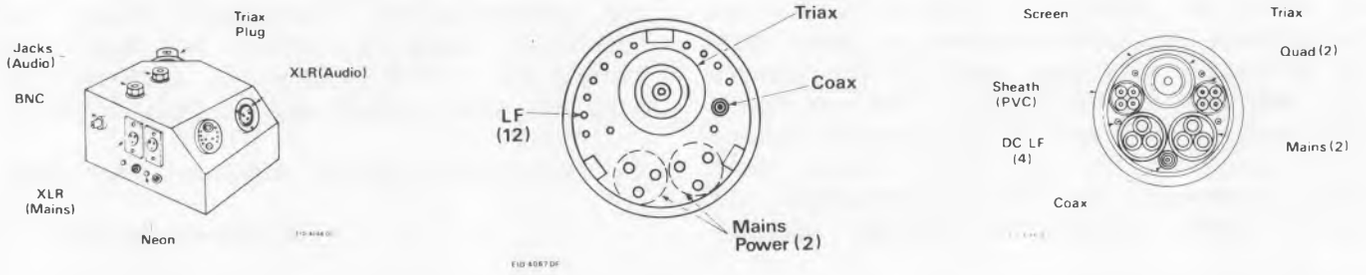
The initial thoughts were that the cable would be based on standard triax, but would incorporate additional conductors to provide facilities not usually available on a lightweight camera and which would be needed in a production studio. The cable would be sheathed overall with a heavy duty PVC sheath (similar to PIF36/1MD cable) of controlled diameter, because this will not get trapped under studio pedestals.

Discussion showed that this cable could be used to advantage, because the optimum diameter allows two sources of standard mains supplies to be made available at the camera head, enabling the powering of auto-cue, headlamps, etc., to be achieved on the studio floor. A diagram depicting the cross section of the cable, designated PIF20/1M, is shown. All elements are individually screened.

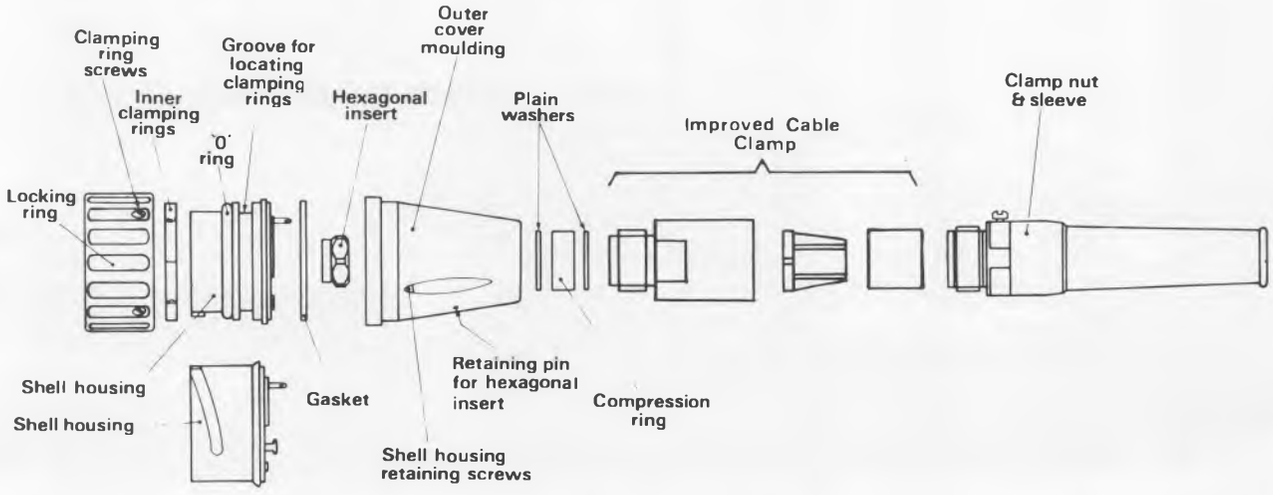
Because there was no commercial connector that would accommodate the proposed cable, it was agreed that for studio applications the TV36 style connector would be the most suitable. A design was agreed, after discussion with connector manufacturers, based on the TV36 shell, but with a new contact insert. The contact layout and general assembly are shown.

To enable this cable-connector assembly to be used with a studio camera it is necessary to provide an interface (splitter) box, coded EP5/522, mounted on to a studio pedestal, (with, for instance, a Link 130 camera). The same splitter box will be used with lightweight cameras, either strapped to a lightweight mount with a webbing belt, or a stand-alone unit (rather like a spider box).

The cable, connectors and splitter box are available from Equipment Department. It is likely that the first studio equipped with the new cable system, will be Glasgow Studio A, followed by Leeds in mid-86.



The interface box, (left), and contact layouts for the new triax cable. An improved cable clamp is shown below.



60 Years of Transport

On the 4th November 1925, the Control Committee of the British Broadcasting Company approved the purchase of Morris Cowley cars for all main stations.

It is interesting to note that the Chief Engineer was instructed to prepare regulations to include log books, supervision and maintenance of the vehicles.

The Corporation recognised that it had a fleet of vehicles around 1932 and the earliest records show that a Morris Van, Reg. No. GY 9335 was purchased on 18th September 1932 at a cost of £270.00. It was subsequently sold for £80.00 in 1944.

To mark 60 years of Corporation Transport, Equipment Department have made a minature of a 1925 "Model A Ford" in the livery of yesteryear. The minature was produced with the assistance of BBC Enterprises and Matchbox Toys, who will market a similar model through their toy outlets.

405 Line Converter Removed

Nigel Philips and Graham Hill examine the only 405 to 625-line electronic standards converter ever built. It will shortly be removed from the Central Apparatus Room in TVC, where it had been used for the conversion of archive material.

The history of this machine is not clear, though it is thought to have entered service in 1966, along with several 625 to 405-line converters. Originally known as SCV4 (1-3 were optical) it latterly became known as LS1. It was probably made by Designs Department, and was used in it's early days for converting 405-line vt material into 625-lines for transmission on BBC2. There was also a stage when Network Control Room 1 had been converted for 625-line working, and a 625 to 405 converter was on the output. This sometimes meant a double conversion for the 405 network - not to be recommended.

At some point in its career, SCV4 was removed from TVC and sent to Cardiff (on holiday?). It was cheaper to do this than have the Welsh-language schools programmes converted in London.

The 405 to 625 conversion process is not lost forever, though. Graham Hill has modified several processing boards which, when used in the DD ACE four-field converter, allow "normal service to be resumed". The quality of pictures from the ACE converter are a great improvement on the old equipment.

(If anyone has documented details about the converter SCV4/LS1, the editor will be pleased to set the record straight).

Frequency Planning for Ancillary Services

Prior to the withdrawal of 405-line television from Bands I and III last year, about 45% of the spectrum between 30 MHz and 960 MHz was allocated to both broadcasting and to the ancillary services connected with broadcasting. In the face of considerable pressure from other potential users, the Government accepted the recommendations of the Independent Review of the Radio Spectrum (The Merriman Committee) that Bands I and III should be used for land-mobile services, thus reducing the available space for ancillary services, such as communication links, talk-back services and radio cars.

It was also recommended that the broadcasters should be given every encouragement to accommodate their ancillary services within the existing broadcasting bands and, furthermore, that any further requests for spectrum for ancillary services should be given very close scrutiny in view of the many other competing claims for frequencies.

The DTI have followed these recommendations by demanding that the broadcasters justify their requests for spectrum by proving that they could not be accommodated within existing allocations in Bands II, IV and V. To ensure the optimum use of the spectrum for ancillary services, the DTI has asked the BBC and the IBA to set up a Joint Frequency Management Group (JFMG). Special allocations of spectrum will be made to the JFMG, which will be responsible for its utilisation by the BBC, ITV and ILR. There is no doubt that the broadcasters will be severely constrained by frequency allocation problems; the DTI have made it clear that broadcasters cannot expect immunity from the need to economise on use of the spectrum. The planning work currently being undertaken by Research Department is an example of the attempts being made by the BBC to ensure the effective utilisation of the available spectrum.

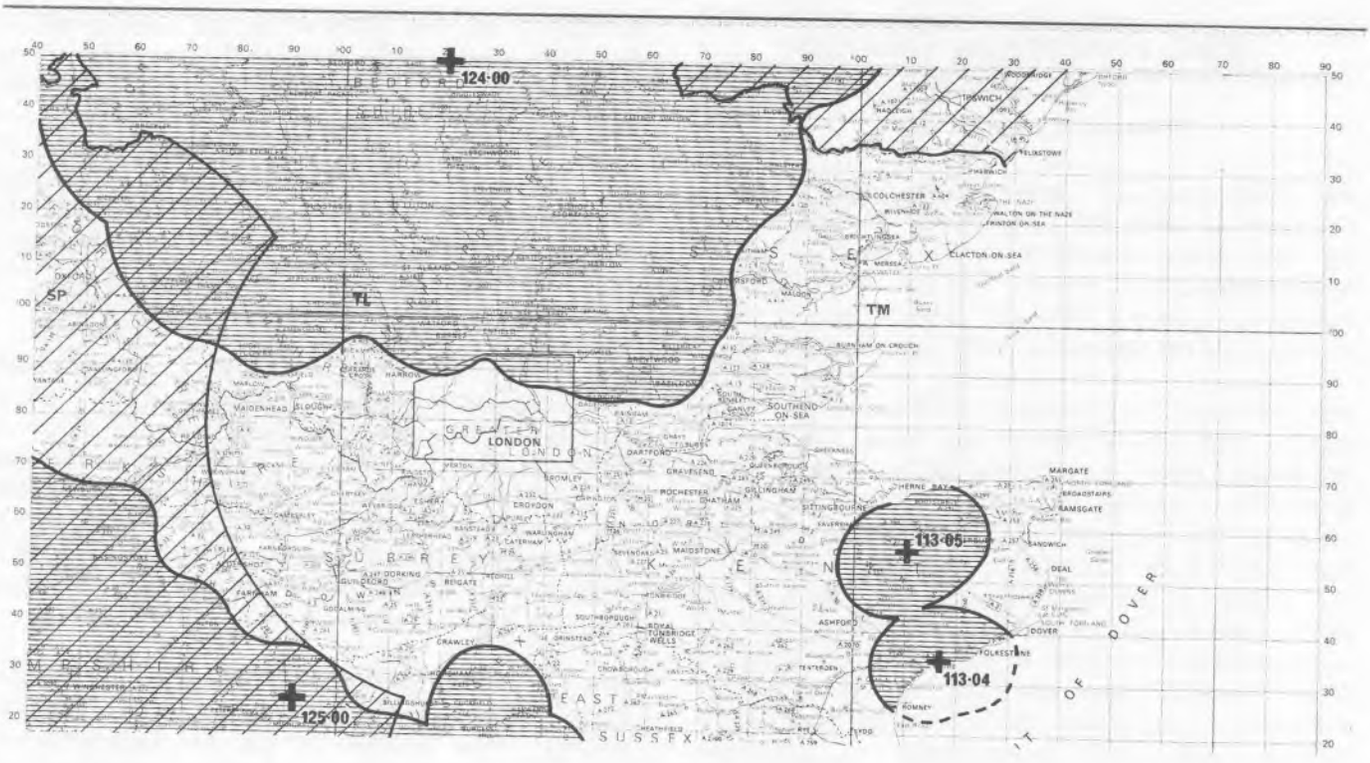
Accepting that the technical quality of the broadcast signals often depends on the quality of ancillary services facilities, the need for careful planning and allocation of the limited spectrum available is evident. Many ancillary service operations have to share frequencies used for broadcasting, and it is essential to ensure that there is no mutual interference.

Over the last 20 years, engineers at Kingswood Warren have established a comprehensive computer-based radio-wave propagation prediction facility, which is primarily used in planning the BBC's television and radio networks. The facility has a large data-base which contains terrain data for the whole of the UK, with over 1 million stored terrain-height values. Profiles of the terrain are derived from the data-base, and these are used in computer calculations to determine transmitter coverage and interference levels from other adjacent and co-channel transmissions.

Service Planning Section also use these facilities to plan the ancillary service frequency allocations. The methods for broadcast networks are optimised for domestic reception at 10m above ground level. It has been necessary to introduce methods which are more applicable to ancillary service requirements, for which lower aerial heights are more relevant, and this has been particularly successful. A recently published comparison between the BBC prediction method and others available in the UK, was made by Rutherford Appleton Laboratories as part of the National Radio Propagation Research Programme. It showed that the BBC method gave the most accurate results when used specifically for mobile-radio predictions. Nevertheless, the method is not always as accurate as desired, and new radio-frequency field-strength data are being collected by Service Planning Section using typical vehicle-mounted aerials. This will assist an on-going programme of research to further improve the ancillary service facility.

The recently published Frequency Planning Album (UHF Band IV) assists OB units with the planning of operations using frequencies which are subject to geographical restrictions. The Album contains base maps covering the UK, with replaceable transparent overlays showing areas where restrictions apply. This publication is a convenient means of updating existing restrictions, and providing new information for future allocations.

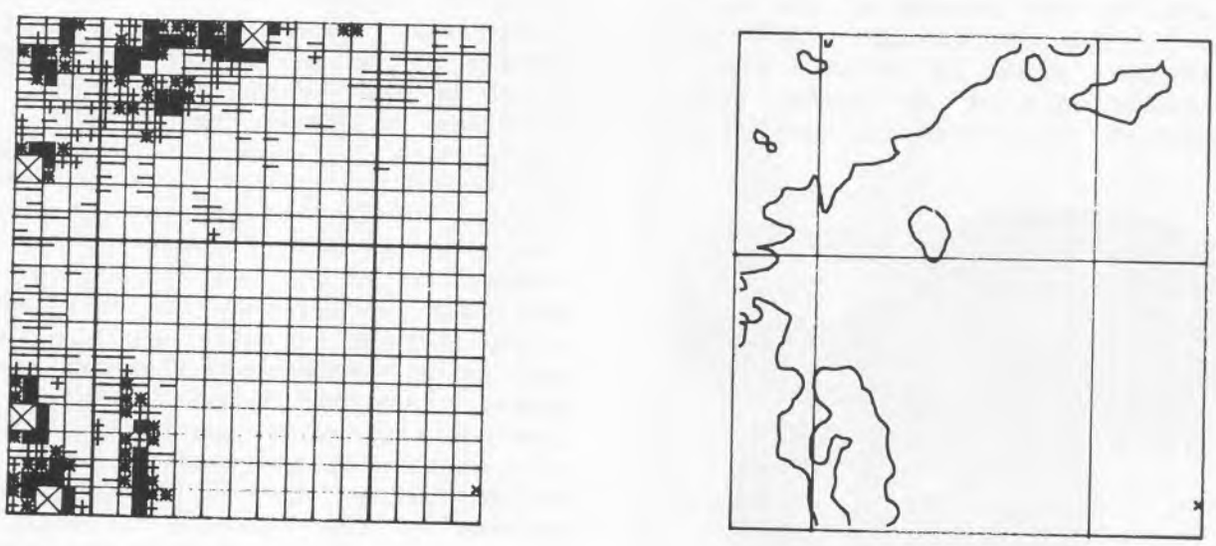
Computer-based, field-strength predictions are also used extensively for



A typical page from the Frequency Planning Album for Band IV.

planning base-stations for mobile communications. This provides an economic means of assessing and comparing coverages from a number of potential sites, and achieving optimum coverage. The computer output can be in the form of a map overlay, with a range of symbols representing bands of median field-strength within 0.5km squares, or more simply, with contours representing particular median field-strength levels.

Urgent consideration is being given to a coverage plan which will provide a mobile communication facility in the London Metropolitan area. Due to the extreme shortage of VHF spectrum in this area, the feasibility of using UHF is being assessed. UHF has not been used previously by the BBC for this type of operation. To gain experience, and to provide further evidence for checking and improving prediction methods, a site test is in progress using TV Centre as the base-station. The investment in base and mobile transmitters for such a facility is significant, and it is essential that that the required coverage is achieved at minimum cost, with economical use of the radio spectrum.



Planning map overlays using symbols (l) or median field-strengths (r) within 5Km squares. [Service area of Crystal Palace Channel 21, site height 123m, aerial height 99m, maximum e.r.p. 25w, field strength dB (uv/m), Rx ae height 10m].

BBC Prototype Tweeter

by Ted Randall
Research Department

BBC high-quality monitoring loudspeakers frequently use BBC designed low-frequency and mid-frequency drive units. The high-frequency drive units (tweeters), however, have always previously been commercially designed and manufactured.

The current monitoring loudspeakers type LS5/8 and LS5/9 both use the Son-Audax HD13D34H tweeter. This is a 34mm soft-domed unit which takes over from the bass unit in the region of 2 kHz. The tweeter has generally proved to be satisfactory, but over a number of years there have been some variations in performance, particularly at the high frequency end of the range, because of manufacturing changes. Reliance on a single source of supply and past experience of product quality variations over which the BBC has had little or no control, led to the decision that Research Department should acquire the expertise needed to design and manufacture a tweeter, so as to be able to exert pressure on the manufacturers. The project was carried out at Kingswood Warren by Ted Randall, with guidance and advice from Derek Mathers. The aim was to produce a prototype which would equal or, hopefully, exceed the performance of the Son-Audax tweeter in current use.

The diaphragm of a typical moving-coil tweeter is made up from three integral parts, a dome, from which the major part of the sound is radiated, a surrounding roll and, on the outside of the roll, a flange. The flange is stuck to a carrier-plate which is in turn fixed to the outside pole of the magnet system. One edge of the cylindrical coil-former is glued to the diaphragm at the junction of the dome and the roll. The roll performs the functions of both the spider (suspension) and the surround in a normal moving-coil drive unit, ie, it provides the restoring force and the mechanical termination required by the moving system, allows co-axial movement, and maintains the lateral position of the coil within the annular magnetic gap.

The magnetic circuit consists of a ceramic ring magnet with mild steel pole-pieces arranged to produce a narrow annular magnetic gap, 0.95mm wide and 3mm long. The unmagnetised magnet assembly is fabricated with the aid of special jigs and bonded together with an acrylic adhesive. After magnetisation, the flux density in the gap is 1.5 Tesla.

The choice of diaphragm size is a compromise between output power and directivity; the output power is proportional to the fourth power of the diameter and the directivity also increases with increase of size. The 34mm diaphragm of the Son-Audax HD13D34H is a satisfactory compromise suited to BBC requirements. A significantly smaller diaphragm than this would place an intolerable restriction on the output power. However, since the choice of commercially available diaphragms is restricted to 25mm and 38mm, the latter has been chosen for the BBC assembly.

The material from which the diaphragm is formed, must be sufficiently flexible to allow co-axial movement at the roll and sufficiently stiff to retain the essential shape of the dome. Generally a synthetic polymer is used which may be either film (sheet) or woven filament (fabric), the latter requiring to be sealed by application of a 'dope'. The Son-Audax diaphragm is of this doped fabric type. Ideally, the diaphragm material should possess a high degree of internal damping since this property is likely to give a smoother steady-state response curve and lead to a sound which has fewer colorations, ie, tonal effects which although clearly audible do not show up on steady-state response measurements. Alternatively, diaphragms made from materials with low intrinsic damping will require an additional damping layer to be applied to the surface, which, because of the increase in mass, will lead to a small but inevitable decrease in sensitivity. Various preliminary tests on both types of dome material led

to the choice of a 38mm diaphragm of 75 um thick polyester with an applied damping layer, for further development.

The voice-coil and voice-coil former of a tweeter must be capable of withstanding the high temperatures generated by the electrical dissipation in the resistance of the voice-coil. Experience gained in bass unit design suggested the use of Kapton (polyimide sheet) for the voice-coil former and polyimide-coated wire for the voice-coil, bonded together with high temperature epoxy resin.

The bass unit experience was also useful in devising techniques for tweeter fabrication but, because the components are smaller, the work requires greater manual dexterity, particularly for voice-coil winding. The construction jigs are more complicated and the dimensional tolerances required to achieve success are considerably tighter.

On-axis steady-state frequency response tests on the new tweeter show a very favourable comparison to the Son-Audax assembly. After simple R-C equalisation, the new tweeter is comparable with the Son-Audax unit up to 12 kHz and better than it, ie, flatter, at higher frequencies.

Distortion measurement comparisons between the two units also show a similarity of performance. The harmonic distortion is below -40 dB relative to the fundamental (except for an inaudible peak at a frequency corresponding to a fundamental of 14 kHz) whilst 3rd harmonic distortion is better than -50 dB. The only potential problem with the new unit is that, being of larger diameter, it is slightly more directional than the Son-Audax at high frequencies. However, objective tests only tell us a limited amount about loudspeakers. Far more important is what they sound like.

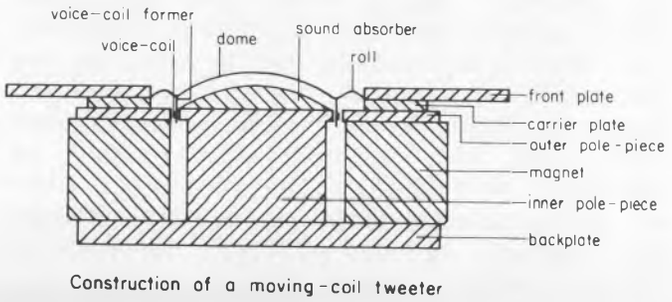
Extensive listening tests carried out during development showed that the subjective quality of the two types are closely matched. For these tests an LS5/8 with a specially modified baffle was used. The bass unit was mounted in the normal position and the two tweeters being compared were mounted side by side at their normal height on the baffle. The units could be selected alternately so that critical comparison of the two units could be made using specially chosen passages of programme familiar to the assessors. The listening tests confirmed the high quality of the tweeter and its potential for BBC applications. That still did not complete the design appraisal, however.

Endurance tests are also essential to enable the electrical and mechanical ruggedness of the unit to be assessed. For this, continuous Radio 2 programme, filtered appropriately by an LS5/8 crossover network, was fed to the unit from a 100 watt amplifier adjusted to reach maximum output on programme peaks (corresponding to 108 dB peak sound pressure level from the tweeter at 1 metre). After 7 days the unit failed because of an open-circuited voice-coil, presumably due to localised overheating, mechanical fatigue or adhesive failure.

A similar test on a Son-Audax unit produced a failure after 4½ days as a result of the voice-coil windings becoming detached from the voice-coil former, presumably because of adhesive failure. Again no signs of general overheating were discernible.

Finally, field trial tests in monitoring environments, which frequently differ greatly from that of the Kingswood Warren listening room, were carried out to establish to what extent the quantitative differences from the Son-Audax assembly were important in its intended monitoring application. To assess the consistency of the product, a batch of six units were made, and all were found to be satisfactory, both subjectively and objectively. Two of these units have undergone field trials in the quality monitoring room of Radio O & M and the conclusion reached was that the units are of sufficiently high quality for use in a BBC monitoring loudspeaker.

Thus, if difficulties arise in the supply of commercial tweeters, the BBC is now better placed to advise manufacturers on improvements to their own designs, or even to offer a licensed design of tweeter.



Construction of a moving-coil tweeter

Routers Switched Into Service

The re-development of the London Control Room (LCR) continues, with the recent introduction of new source routers. Housed in Apparatus Room 3 in the lower ground floor of BH, the system is probably the biggest installation of its kind in the world. It replaces the uniselector system that was installed in the late 1950's, which had stood the test of time, but is becoming increasingly difficult to maintain.

Manufactured by NTP in Denmark, the system is basically a stereo matrix with 288 inputs, 352 outputs, and about 170,000 active cross points. The system comprises two main electronic routers, A and B, plus a further two virtual routers, one for studio red-light switching, and one for the engineering manual exchange (EMX) with relay routing for control lines.

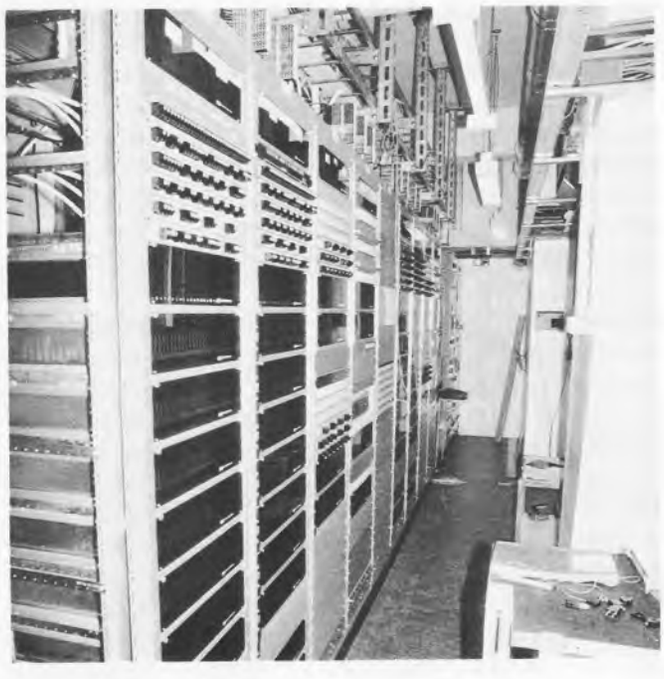
Being the hub of the lines between sources, studios, continuities, and the PCM/NICAM system has its problems though. What would happen if all the sources and destinations went through a single matrix and it developed a fault? What would happen if there was a mains failure? What would happen if there was a serious fire in the basement? All of these questions had to be tackled by Jeff Bottom and his team from SCPD, and Radio Projects.

Duplication within the router system into two half-routers, with common inputs, overcomes the immediate problem of equipment failure. Arrangements for mains failure are somewhat more complex. Each half-router is fed both by the mains and from the 50 volt battery room supplies. All cards in each half-router have dc supplies that are both mains and dc derived. Mains comes into the apparatus room from two different sources, one from a non-maintained source and one from the generator maintained system. These are fed to an automatic changeover unit, and the non-maintained input is normally switched to the routers; this is operationally more convenient because this supply is not affected by routine diesel tests. The apparatus room is guarded by a halogen gas automatic fire extinguisher.

Each router has two matrix controllers which operate on each part of the matrices separately. Control information is stored in RAM, and lithium batteries are fitted as a back-up to the mains. The matrix controllers can also be manually change-over via key switches.

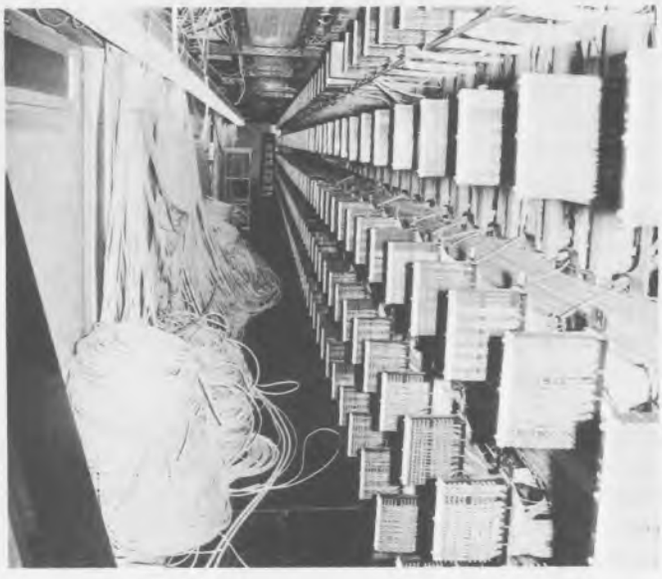
Individual selection is controlled via distinct Z80-based microcomputers which are linked together by an "ethernet" system. Twelve microcomputers are grouped together via a local coaxial network. Data from sources such as studios or continuities is fed to the Z80's via Fibre-Optic links. These are important in the installation since they overcome the problems of earth loops and interference. The installation team gained extensive experience at fibre-optic handling and terminations in the course of the project. The first area to be connected in this way was the Radio 1 continuity in Egton House (see 'Eng Inf' No 21), via three, 8-core optic cables.

The control system is supervised by two vdus. One is located in the main control room, the second in the network supervision area; the latter can only make enquiries, and is not able to issue commands. Information is displayed in the form of a database which allows the operator to see which sources are connected to which destinations.



The new router bays

Also in the apparatus room are two hundred stereo/mono combiners; these provide a mono signal from a stereo source for direct distribution to studio areas. Similarly, there are mono to stereo 3 dB hybrids that produce a pair of signals at the correct level for the matrix stereo inputs.



Cabling in the mdf room

Up to twelve Radio Networks can be handled by the close-down sequence generators located in room 3. The generators supply the pulsed tone-sequences heard on the networks after programme hours. The stereo test tone generator, used to transmit line-up tones, is also to be found here.

The new routers are fed via the existing main distribution frame (mdf). To accommodate the additional cabling, the number of 200-way tag blocks has been increased by 50%, bringing the grand total to 987.

All of these new facilities have meant changes in the London Control Room. The old OU continuity room has gone, and in its place are new racks for Optimod processors for the mf network, new line receiving equipment and NICAM3 coders. The air-conditioning has been altered and now runs in visible trunking throughout the area. All of these changes will be more fully reported when they are complete.

Credit must go to the ingenuity of the engineering, technical and operational staff engaged in the project. SCPD, ACED and Radio Projects have maintained the service, despite the changes. In many instances, equipment has been by-passed, moved, and returned to service without any interruptions. This has not been an out-of-hours project, but one which has caused the least disruption in the minimum amount of time.

Last Chance for Engineering Ties

There are still a few ties available featuring the BBC and lion logos, and the word "Engineering". They cost £2.75 each, in blue or maroon, and can be obtained by contacting Alan Lafferty on LBH 7962.

NEWCASTLE
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awarded to Marconi and will commence in January 1986 under the guidance of SCPD planning engineers. Both studios will be equipped, with COX T16/1 vision mixers and there will be a total complement of five cameras, three Link 130 and two NEC 100 lightweight cameras. The audio contract has been awarded to Calrec, and the communications to Philip Drake. All the colour monitors will be provided by Chroma Research.

Unusually for an island-site, the lighting will be carried on remote-controlled motorised pantographs. The 120 dimmers by DEW Electrical Engineering Ltd will be controlled by a Rank Strand Gemini control system in the main production control room.

A central technical apparatus room, with over fifty-seven bays of equipment, will form the technical heart of the building. The vt area will have both 1-inch and 3/4 inch video-tape machines, and the graphic design area a Rank Cintel slide-file and Aston 3 caption generator.

The building has a common reception area for both regional television and local radio, but otherwise they will operate separately. Except, that is, for the L-shaped news-room where local radio have one leg and television the other. At the corner is a common news intake area shared by both operations.

Technical installation should be completed by the end of 1986, and the site fully operational in February 1987. The old hospital site will then revert to the City of Newcastle.

MSS
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computer room to add a further processor so that another 96 lines can be provided when necessary. The computer also has connections to public-switched data-networks, namely telex (18 lines), packet-switch-stream (one dataline, seven logical channels) and the public telephone network via five auto-dial, auto-answer modems. One computer of the six is kept as a spare in case of a failure of one of the other five. Switching of lines from a failed computer to the spare is done by a rack of latching relays under the control of a single push button.

The complete system was supplied by Scicon Ltd, although most of the installation of the hardware was done by BBC staff. The software supplied by Scicon has been developed from their earlier message-switching systems with additional facilities to suit the BBC's requirements. Considerable delays have been incurred in getting errors out of this software and BBC Communications Engineers have spent a lot of time testing the system to make sure it performs up to specification.

The computer room itself has been equipped to a high specification with air-conditioning, filtered-air, dust-sealed wall finishes and sound-deadening treatment. Partitions provide separate areas for storage of spare components and an engineers room for maintenance of computer hardware. Normally, however, the whole area is unattended and is therefore provided with a sophisticated fire-alarm system using heat and smoke detectors and a "sniffer" device for sampling the air in individual computer cabinets. There are also intruder-alarms and a closed-circuit television system to enable operational MSS staff to view the area. The MSS needs to be supervised to cope with messages which cannot be handled automatically (mainly telex) and to avoid congestion and delays to messages due to various causes such as failed data-circuits or insufficient line capacity. Central Services staff man the Telegraph Centre for this purpose. This has been refurbished and re-equipped so that it is no longer the noisy bustling area it was in the days of the ADX. The room, situated on the second floor of Broadcasting House, is now operated almost entirely by vdu's instead of noisy old teleprinters. The few printers still there are modern quiet machines. The decor of the room has been carefully selected to produce a restful environment and the lighting is indirect, to avoid glare on vdu screens. A colour television monitor is also installed in the room which displays to the supervisors the current status of message queues and diversions within the MSS.

Supervising area of Telegraph Centre

The circuits for distribution of MSS traffic around the BBC are derived in a variety of ways. Those to the regions and local radio stations use a network of statistical multiplexers over digital or analogue bearer circuits.

Local London links are accomplished by a mixture of telegraph circuits, modems on analogue circuits or data over voice equipment (DOVE), using telephone extension wiring. The types of terminals connected by this means vary from humble receive only matrix printers to other message switching systems and newsroom computers. BBC micros are widely used as MSS terminals.

Overall control of the MSS project was in the hands of SCPD, Steven Redburn of Computer Systems Section co-ordinated all of the various tasks involved. Keith Moore and John Bates, who are the MSS resident engineers in Communications Department, played invaluable roles in testing software and installing hardware. Sean Murphy and Mick Connell from Central Services have provided the operational support during the implementation of this new system.