

# enginf

No 24 - Spring 1986 **The Quarterly for BBC Engineering Staff**

## New facilities at BBC training centre

Trainee engineers and technical staff will benefit from new facilities at Wood Norton. Two new dormitory blocks, which have recently been opened by past Directors of Engineering, Sir Francis McLean and Sir James Redmond, bring to an end a seven year plan to modernise and update the residential facilities at the training centre. The new "McLean" and "Redmond" dormitories feature large conference and meeting rooms as well as 160 single-study bedrooms. They replace old wooden huts built to house wartime broadcasting staff, and post-war temporary dormitory buildings. The centre can now accommodate up to 300 students in single room studies.

Welcoming the past Directors of Engineering and other guests to the opening ceremony, Bryce McCrirrick, (DE), spoke of the valuable part that Engineering Training Department, (ETD) played in the training of broadcast engineers; not only



The McLean and Redmond dormitories at Wood Norton.



Sir Francis McLean, watched by Bryce McCrirrick (DE), unveils a plaque on the new dormitory.

for the BBC, but foreign broadcasters as well, since the courses run at Evesham were recognised worldwide. He paid tribute to the ETD staff for maintaining the high standard of training whilst the modernisation programme was in progress, and to the architects and civil engineers, for the fine buildings they had designed.

In response, Sir Francis McLean told the story that once, on an overseas visit, a foreign head of engineering, hearing that Sir Francis was from the BBC, asked if he knew Harry Henderson. Such was, and still is, the reputation of the ETD abroad!

Sir James Redmond, who was accompanied by Lady Redmond, recalled how he and a few other senior BBC engineering managers had spent a "pleasant" weekend hearing about digital techniques many years ago. He feared that he would probably fail his "C" course if he had to sit it today - a sentiment echoed by many of the engineers present!

After lunch the guests and visitors were treated to a tour of the ETD facilities.



# LETTER TO THE EDITOR

Dear Sir

Regarding the article in Eng Inf 23, I was the SCPD Project Leader responsible for the installation of the line-store convertors at Television Centre. Unfortunately, due to the passage of time and several office moves, I no longer have records of the installation. However, a couple of telephone calls to my colleagues have allowed me to piece together an approximation of what happened.

In 1964/5 Network Control 1 and Sub-Control were refurbished with equipment and circuits suitable for working 405 and 625. (This refurbishment immediately followed the construction and service of NC2 and BBC2). In 1966 it was decided that refurbishment of studios, etc, to be dual standard should cease and that all picture origination should be at 625-line standard. To achieve this a 625 to 405 convertor was put in the output of NC1 but could be overplugged to the output of Sub-Control. If a 405-line source was faded up, the convertor was bypassed to avoid the dreaded double conversion. At this time, the 405 to 625 convertor was only used to allow 405 sources to be transmitted on BBC2.

Subsequently, about 1969, when BBC1 UHF transmissions commenced, the transmitter sites were provided with 625 to 405 convertors and the BBC1 output from Television Centre was at 625-line standard. By this time, most sources were capable of originating 625 and it was mainly only archive material that suffered the double conversion. The line store convertors used for this purpose were made by Designs Department, and were, in fact, the precursor of the DD field store convertor.

Research Department also made a bigger and better line store convertor but, if my memory is correct, it was only used to clean up the signal coming from the RD analogue field store convertor.

Both types of field store convertors were installed in Television Centre for use with transmissions from the Olympic Games in 1968. I remember this well because despite much forward planning, both equipments (several bays each) arrived at Television Centre on the same day.

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Another anecdote regarding 625 origination. After installation of the 625 - 405-line stores convertor with 625/405 detectors on each of the sources to the Network mixer and a 'cue router' to provide the control signal for the convertor bypass switch, we forgot to allow for the fade-to-black. The equipment had been in service for a few days before the problem was diagnosed and, of course, immediately solved.

Eric Taylor  
Senior Planning Engineer, SCPD

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## Transmitters Opened

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The following transmitters have opened or changed since January:

### UHF Television

Bangor	Co Down
Brading	I.O.W.
Crosby Ravensworth	Cumbria
Elham	Kent
Lyminge	Kent
Mountfield	E Sussex
Rhondda B	Mid Glamorgan
Rosedale Abbey	N Yorks
Steyning	W Sussex
Tintern	Glos
Trecastle	Powys

### VHF Radio : New

Keelylang Hill	Orkney
Aberdare	Mid Glamorgan

### VHF Radio : Re-engineered

Barnstaple	Devon
Tacolneston	Norfolk

### Local Radio : Frequencies changed

R Derby	Sutton Coldfield
R Humberside	High Hunsley
R Northants	Geddington
	Moulton Park
R Sheffield	Holme Moss

Copies of the booklet "Radio and Television Stations 1986" may be obtained by ringing EID on LBH 5040, or by writing to Room 713, HWH.

# Computer Keeps Track of 2000 Broadcast Services

From the balmy Scilly Isles to the wind-swept Orkney Islands, Transmitter Department is responsible for keeping the BBC's transmitting stations running. The stations range from half-watt uhf transmitters serving small villages, to the half-megawatt, short-wave transmitters used for the External Services. There are over a thousand transmitting sites, with about two thousand transmitters in use.

Keeping records about such an operation can be very difficult, and a new Burroughs computer system has recently been bought to help with this. The computer is being brought into use with the help of Engineering Computer Services staff, who evaluated many different makers' products before the Burroughs was chosen. The new system consists of an XE520 "mini" computer with 37 Mbyte Winchester disc storage, and three B26 work-stations networked together.

Commercially available software was purchased to cut the time taken to get the system into use. The main software is a database management system which keeps track of the information held in the computer. Using ready-made software has great advantages; for example, the system is largely self-documented, making later changes easier. Programming is easier because it is possible to focus on the end-use rather than the fine details of coding.

Other software available includes the "Multiplan" spreadsheet with graphics capability, and a versatile word processor. An extended Pascal compiler is also available for specialised programs. The spreadsheet has already proved useful for financial and manpower planning.

Besides the word processing and spreadsheet use, three main applications are being developed. These are a full database of BBC transmitting stations, a service message database, and an equipment fault analysis system.

The main database will hold site and equipment information for each transmitting station. Site information includes fixed data, like National Grid Reference

and telephone numbers; equipment data includes type of transmitters, programme sources, mast height, etc. Typical queries which could be answered by the system include finding sites with masts above a particular height, and giving a list of all stations where a particular equipment type is used.

The service message system will take over from the present Hewlett Packard computer which receives messages about service loss and degradation at BBC stations. These come in on the Message Switching System (MSS), from Monitoring and Information Centres (MICs), and from External Services transmitting stations at home and abroad. Problems with stations can be identified by analysing historical data held in a database containing service messages going back over several years. For example, the need to install standby generating plant at a station can be shown by looking at the record of mains failure over a period.

The third main application, and the most ambitious, is to build up a similar database for transmitter equipment faults. Information on faults is obtained from maintenance staff and put onto discs using BBC micros at the team bases. These discs are then sent to HQ for entry into the Burroughs computer. This system will provide automatic alarms if equipment is unreliable so that changes can be made to improve reliability. The overall aim is to provide better service to the public at lower cost to the BBC.

BBC micros at team bases are also used to return information on how often transmitting stations are visited for maintenance. This data is held on the central database and is used to generate the Comparative Work Points for each maintenance team. This is an important tool for ensuring efficient use of staff in the department.

Peter Lee  
Transmitter Department

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# Masterful.....



## .....Acorns

Acorn Computers Ltd have recently released the new Master Series BBC micro-computer, which will replace the Model B, already out of production, and the Model B+, which is being phased out. There are five models in the new series, ranging in price from £399 to £1,600, with 10% discount when ordered through the BBC Club.

### Master 128

The standard micro is The Master 128 (£499), based on 65C12 processor with a total of 128K of RAM; 64K in sideways and 64K standard, including 20K shadow; 50 bytes of RAM are stored in a battery backed clock. The machine comes fitted with the 1770 disc filing system (DFS), the machine operating system (MOS), with extended graphics, Basic 4.0, View 3.0, Viewsheet, Edit (a screen editor) and an ADFS all contained in a single 128K ROM.

### Econet Terminal

The Master Econet Terminal (ET) (£399) is similar to the 128, but without some of the interfaces, such as the DFS. The machine is fitted with an Advanced Network Filing System instead, and this can be used to link the computer to the older Model B or Model B+ machines without difficulty. It is possible to upgrade the ET with a DFS, but Acorn will not be supporting this.

### Co-Processor

For an extra £125 the Master 128 can be fitted internally with a second processor (now called a co-processor) based on a fast 4MHz 65C102 processor and called the Master Turbo. Z80 second processors can still be used externally, connected via the familiar tube connector.

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### Master 512

Next in the range is The Master 512, with half a megabyte of memory, and 16-bit 80186 processor. The machine comes complete with a range of software, such as DOS+, or the GEM collection from Digital Research. Acorn do not claim IBM PC compatibility, though it should be capable of running programs such as Wordstar that do not rely on IBM hardware.

### Master Scientific

Top of the range is The Master Scientific upgrade, again with half a megabyte of memory, and a 32-bit 32016 processor. This allows languages such as Fortran 77, ISO Pascal and C to be used. Programs developed on the Scientific will run unchanged on a mainframe in most cases.

### Other Features

The machine physically resembles the familiar cream and black Model B and B+, but has an extended keyboard making it wider. Acorn have included a full numeric key-pad complete with arithmetic function and return keys; to accommodate this, the arrowed edit keys have been re-configured. The 128 comes with two ROM cartridge sockets (similar to the Electron), with each cartridge supporting two 16K ROMs. Internally, there is space for three more ROMs, two at 32k and one at 16K. The l.e.ds have been moved to the top of the keyboard and the cassette motor indication removed. The loudspeaker now appears in the centre of a raised cover, and the function strip has been re-designed to be angled. It is just the right length for those strips of key identification, (no more wrong keys pressed because the function strip moved!).

The whole of the cover has been raised, to accommodate the co-processor, though the overall height is similar to earlier models. This has been achieved by altering the size of the rubber feet, which, at the same time, prevents objects such as pencils from disappearing into the 'black-hole' underneath!

The power supply unit and disc-drive connectors are placed in the same position as the earlier models. To the underside of the case, and to the rear, are extensive air-vents, and the machine does not get quite so hot! The rear connectors have been re-arranged, though the uhf output still appears on a nasty phono socket. The interface connectors under-



neath are unchanged though closer to the surface/mount. A nice feature for micro-users who suffer from other people inadvertently pressing the 'break' key is a screwdrive slot that, when turned, disables this function.

#### **Software**

There are many thousands of software suppliers for the model B and B+, and the majority of programs, we are told, will run without any difficulty on the new series; it remains to be seen how many of the new operating system commands will conflict! Similarly with peripheral hardware support, these may be trans-

ferred without too many problems.

#### **Conclusions**

All in all, a nice looking machine, with most of the bugs of the early computers ironed out (and a few added?). Clearly, few people will be rushing out to exchange their upgraded, sideways RAM Model B for the Master Series. However, the games players may find that the improved graphics allow more aliens to be 'zapped', and the Wordwise users may eventually come to understand the intricacies of View. One only hopes that the instruction manual is written in logical English and not computer-ese.

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## Outside Broadcast Peripheral Equipment

Equipment Department has recently undertaken the design, development, and manufacture of peripheral equipment for OB Vans, including locker doors with hinge and lock assemblies, sliding battery trays, and power distribution cabinets.

#### **LOCKER DOORS**

The doors are equipped with a pair of hinges to provide parallel action vertical lift opening, in which the door folds flat to the vehicle body (aircraft style). This allows maximum access to the locker, with minimum obstruction down the side of the vehicle, an important consideration at cramped locations. The hinges are made from tubular steel and incorporate Newton Gas Damper Cylinders that hold the door in the raised position. The hinges incorporate ball-joints which, because they are flexible, enable the doors to align in their apertures, despite small frame distortions which occur due to flexing of vehicle chassis. The doors are also fitted with handle operated door latch mechanisms, which are internally protected against impact from items stored in the lockers. For protection against the weather metal-work is plated and sprayed black.

Three groups of vehicles are being catered for, each of which is fitted with different size locker doors. There is a requirement for thirteen sets of six locker doors for camera vans, the first of which is for Tel OBs; three sets of seven locker doors for articulated camera vans for use at Manchester and Birmingham, and one set of five locker doors for a technical support vehicle for Cardiff. Supplies have been init-

iated and in each instance spare components will also be supplied.

#### **BATTERY TRAYS**

Double-decked sliding trays, accommodating two pairs of vehicle batteries, can be easily drawn out for inspection and maintenance. The trays incorporate heavy duty telescopic slides and can be latched in the normal position. The trays are plated and finished in acid resisting paint.

#### **POWER DISTRIBUTION CABINETS**

Power distribution cabinets - developed, drawn and supplied by Avenue House - are used to distribute auxiliary supplies at 240V ac and low voltage, (either 12V or 24V dc) in camera vehicles. The 240V ac is distributed for water heaters, test bench supplies, ring mains etc, while the 12V or 24V dc is distributed for interior lights, step lighting, locker lighting, refrigerator, water pump, etc. The circuit and specification was supplied by Tel OBs and Transport Section.

The cabinets are wired in accordance with Safety Standards and Regulations and incorporate earth leakage circuit breakers. All services are protected by current overload trip circuit breakers or fuses. The cabinets also incorporate change-over relays which allow the vehicle batteries to sustain essential supplies in the absence of mains. A built in battery charger allows supplementary recharging of the technical service batteries.

Further details can be obtained from Avenue House.



# Glasgow Studio A Back in Service

Television Studio A in Glasgow was out of service for most of last year while a major refurbishment, the first for 14 years, was undertaken. Link Electronics were the main contractors for the work, which involved the production, vision and lighting, sound control rooms, the studio itself, and the vision apparatus area. A new Grass Valley 1600 7FPYF vision mixer, with a six-channel pre-mixer and a special effects panel, similar to the one in TC3 (see Eng Inf No 21), have been installed. Picture monitoring is carried out on three Chroma colour monitors for preview and studio output, and on six monochrome Melford monitors for each camera channel. An additional twelve monochrome monitors allocated to outside sources, such as NEC E-Flex, digital affects, Slide File and pre-mixer, as well as video tapes and telecine machines. Inlay facilities are provided from a trolley to the rear of the desk.

The sound control room was re-furbished by Calrec, who have installed their own 58-channel desk. (The existing desk was only 9 years old, and the remainder of it's useful life will be spent at ETD Wood Norton.) The sound facilities include three gram decks, three 1/4 inch tape machines and an Otari 24-track recorder, plus a range of distribution amplifiers and monitoring equipment. The successful TC3 type EMX has been installed together with a comprehensive



The re-furbished Studio A in Glasgow.



Glasgow Studio A: Sound Control Room.

Philip Drake Electronics Studio Communication System.

Lighting control is from a Rank Strand Galaxy console with a Gemini lighting effects module. In the studio, the pantographs and flip-flop cable trays were re-furbished, with additional winches and lights being provided for the corners. All luminaires were replaced and supplemented by top cyclorama lighting units. Additional scenery winches were also installed. The studio is equipped to handle four full facility Link 130 cameras with Schneider zoom lenses, plus two NEC-100 lightweights fitted with either Schneider or Fujinon wide-angle lenses. The studio is temporarily operating with four NEC 100 cameras until all the Link 130 cameras are available.

Extensive building work was undertaken, involving the reconstruction of the entire Control Suite and related areas, in order to improve the usage of the available space and to conform with fire regulations. The old linoleum studio floor surface was removed and replaced by a resin floor.

Pictures by Guthry Photography.

A revised version of the Ninth Edition of the Engineering Safety Regulations, (ESRs), is expected to be issued during April. All engineers are reminded to make sure they receive a copy of the reprint (on green paper) from their Line Managers. Remember, safety first, your life may depend on it!



# Quantel DVE moved

Television Centre Production Studios each have access to a Digital Video Effects Quantel (DVE) 5001; to achieve maximum use only two machines are installed, one serving TC1, 2 and 3 and the other TC4, 5, 6, 7 and Effects Workshop, although both can be used by vt. Due to the noise of their cooling fans, the equipments need dedicated sound-proofed rooms, and one of these was situated in an annexe off TC5. Since this studio was due for refurbishment in 1986, it was necessary to move the machine to a new site.

Because this is a heavily used facility, Programme Planning naturally requested no out-of-service time for the move, whilst SCPD realised that some time would be lost, (even if they could work miracles). The compromise was new bays and cabling to house the DVE, with the bonus of a proper router, and extension of the facility to TC8. Thus, the out of service time could be reduced to a few days. The sting in the tail was that this limited time would be over Christmas!

Prefabrication of the bays took place in September and October. Technician, Colin Boardman, supervised wireman, Hon Fai Lueng and Les Nuttal, building a system with AM4/536 video amplifiers, a Router using ITT zero insertion force connec-

tors, and specially designed air deflector plates to aid cooling. During this time ACED designed a purpose built machine room in an unusual part of TC6 VAR and after asbestos decontamination of the area Norwest Holst completed building work in just two weeks. New "Jumbo" coax cable was air-freighted in from Norway and cable running was undertaken by PDS; apart from difficulties in finding routes to some VT cubicles, all went well. Despite delays caused by contractors installing the ventilation ducting in the wrong place, the whole system was installed and tested a month early, but due to the heavy use of the Quantel for Christmas programmes it was decided to keep the move date as planned. Local staff under John West of Vision Facilities took advantage of this time to undertake acceptance tests, and made several suggestions for improvements, which were incorporated.

December 21 was the critical day, and the Quantel was moved out of TC5, just before it's demolition, and installed in the new bays. Over the Christmas holiday the equipment was debugged and returned to service one day ahead of the schedule agreed with Programme Planning. Special credit must go to the Vision Facilities shift staff for their assistance over this period.

The SCPD engineer responsible for the project was Andrew Hughes of Television Studio Section.

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## Damage to Transmitter Station

The bitter February weather caused severe icing on the old and new masts at the Holme Moss VHF transmitting station. Set high up in the Pennines, Holme Moss is said to have the the worst weather record of any transmitter station in the UK. The ice, up to 15 inches thick in places, caused a severe strain to be put on the temporary stays, supporting the top of the old mast and there was a fear that it might collapse and bring down the new mast as well.

In the event, the station was evacuated and the team were transferred to Emley Moor, but the transmissions continued automatically from Holme Moss. At the same time, limited monitoring operations were taken over by Crystal Palace MIC.

On February 18th, one of the temporary stays supporting the rusty, partially dismantled, old mast shed part of its load. Since then, falling ice has caused severe structural damage to the transmitter building and some damage to the main feeders at the base of the new mast. In one instance, a block of ice measuring 6' x 6' x 2' fell off the cylinder of the old mast and crashed through the reinforced concrete roof.





# New Local Radio Cars

Since its inception, BBC Local Radio has made extensive use of outside broadcast radio cars for on-the-spot reports and to provide music-quality circuits back to the studios when no suitable land lines are available.

A new series of radio cars, the Mk IV, based on the Austin Rover 2-litre Montego estate, has been developed and the first one completed has been delivered to Radio Oxford. This is the first of a batch of fourteen such cars in production, of which those for Radio Cambridge and Radio Northampton should be completed shortly.

Each car is fitted with a high-grade UHF link transmitter, a speech-quality VHF radio telephone, and a conventional car radio for off-air monitoring. A feature of the UHF link transmitter is selectable high and low power amplifiers to achieve the best signal-to-noise ratio for the received signal in the studios. The Storno VHF radio telephones are normally used for talk-back and cueing, but they can also be used as a 6 kHz programme channel for speech, when necessary.

## The 'Reporters Panel'

The audio facilities have been revised from previous cars and the best features are presented in a standardised new layout. All of the basic controls needed by a reporter are contained on a single panel mounted above the car's console. A button on this 'reporters panel' switches on the technical supplies when the reporter is ready to transmit. Before an item can be sent, the reporter has to raise the pneumatic mast carrying the aerials. The mast, which is fitted in



Engineers and Reporters Control Panel.

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the centre of the car, reaches a working height of 7.5 m (25 ft) and is protected by safety interlocks. It is controlled by a switch at the rear of the car when the hatch-back is raised. This ensures that the operator can observe any overhead obstructions before attempting to raise the mast.

Switching on the UHF link transmitter also energises a three-channel audio mixer, which is routed through a limiter to the transmitter. One channel is fed from the reporters microphone, which is plugged into the lower dashboard. The second channel is set for line-level operation and can be used to transmit pre-recorded material via a Uher tape recorder. An electronic, remote-hold facility enables recorded pieces to be trailed simply by pressing the Uher's pause button. The microphone and transmit modulation levels are controlled by faders and monitored via an illuminated, bar-type ppm.

The standard car radio is fitted below the reporters panel and underneath this is the Storno VHF transmitter control unit. A purpose-built moulding, houses the radio microphone receiver, the microphone inputs, headphone jacks and the warning lamps.

## New Microphone Mount and Cable

With the rapid growth of Local Radio, several different styles of microphone mount have been produced over the years. Using vastly different methods of construction and layout of facilities, such as VHF transmitter press-to-talk key, alternative headphone feeds for off-air signal, or reverse talk-back.

A new mount for the microphone has, therefore, been introduced with the Mk IV car. This standardises the most used




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## Take To The Road

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Masts of the Isle of Wight, while the electronics for the mixer, engineers panel and reporters panel were designed and produced by DNS Services of High Wycombe. A separate 'traction' type battery is fitted in the engine compartment of the car to power the transmitter and ancillary technical equipment. It is designed for continuous high-load operation, unlike the standard car battery which is designed to cope with the short, sharp load of starting, and is charged by a separate alternator. The special body alterations, fitting of the technical battery, and car rewiring was completed by Home Services of Tiptree.

Many BBC departments were involved in the new Radio Car under the direction of Dave Adkins of Local Radio Engineering and Steve Betteridge of Radio Engineering. The project engineering team responsible for the development, included Jerry O'Leary, Bruce Campbell and Terry Beswarick from the Communication Section of TCPD at Brookmans Park. Equipment Department produced the new microphone cables and the special mouldings for the radio microphone receiver and various connectors and indicators. Transport Section were responsible for acquiring the vehicles, their sign writing, fitting the second alternator and towing equipment.



features and contains an AKG D130 microphone, two headphone jack sockets and a press-to-talk button. The latter enables the reporter to switch from UHF programme feed to the VHF radio telephone for talk-back purposes with the studios.

The new mount is fitted with a short cable for use when interviewing inside the car and can be connected to a 18.3 m, (60 ft) extension cable for more distant work. The extension cable is plugged in via an external socket set in a shrouded recess above the rear-wheel arch. The cable, specified by Equipment Department, contains five screened quad circuits, yet it is still flexible for ease of handling when interviewing.

### Comprehensive Monitoring Facilities

More comprehensive monitoring facilities are provided on a drop-down panel fitted into the glove compartment in front of the passengers seat. These facilities enable an audio engineer to control the technical aspects of a broadcast from the car when it is being used as a link vehicle back to the studio. Feeds into the vehicle could be from another mixer, from a radio microphone or from the reporter at the end of the extension cable.

The engineers panel provides a facility for talkback to the reporter from the car, a studio-quality ppm, a battery (vehicle/technical) voltmeter and a system override keyswitch. The panel is also fitted with two line/Mic channels and a Mic/Radio Mic channel. These three channels are mixed with the output of the reporters panel.

### Design and Construction

Much of the work for the new car has been carried out by specialist companies. The mast was designed and fitted by Clark



Radio Oxford's new car.



# D.A.T.V.

## New concept for Television

Research Department has recently proposed a new concept known as Digitally Assisted Television (DATV). In DATV, the television signal consists of two parts - an analogue video signal and a high data rate digital signal which can carry control and additional information about the picture.

The major use that has been proposed for DATV is its application in the bandwidth reduction of a High Definition Television (HDTV) signal.

The bandwidth of an uncompressed HDTV signal, using over 1,000 lines, is likely to be greater than 36 MHz. This is too wide to be transmitted through a single channel on any existing broadcast band. One goal for a bandwidth reduction system is to enable an HDTV signal to be carried by a single 12 GHz DBS channel. Each channel has an RF bandwidth of 27 MHz and will accommodate a maximum baseband bandwidth of about 12 MHz. Therefore, if transmission on a DBS channel is to be achieved, any bandwidth reduction system employing DATV should be capable of producing a reduction factor of at least 3 to 1.

Bandwidth reduction of a signal can only be achieved by discarding some of the information present in the original signal. In the case of television, it is possible to exploit the fact that the signal contains a significant amount of redundant information. Because of the periodic nature of the signal and, to some extent, the predictability of the displayed picture, it is possible to reconstruct or restore picture information that has been discarded. Attempts have been made to do this in the past by predicting, within the receiver, what the discarded information should look like. However, although such methods can be successful on stationary pictures, it has so far not been possible to demonstrate such a system that will work for all picture sequences.

Using DATV it is possible to operate bandwidth reduction procedures at the studio and to instruct the receiver

continuously, via the digital channel, on how picture reconstruction can be achieved. By operating the bandwidth compressor, at the studio, and the complementary process, at the receiver, it is possible to dynamically optimise the whole process to suit the particular picture being transmitted. Controlling the whole system from the studio end of the transmission chain, brings a number of benefits. Firstly, all the processing decisions are taken using the high quality, full bandwidth pictures available at the source, rather than at the receiver where they are band limited and may be corrupted by noise and interference. Secondly, using DATV it is possible to concentrate the highly complex, and hence expensive, prediction equipment at the studio end of the chain and to keep the receiver relatively simple. This also has the benefit that high quality 'state of the art' processing can be employed at the studio rather than in the receiver, which by necessity must be several years in development.

At Kingswood Warren a number of research projects are being conducted to look at various bandwidth reduction techniques that could be employed with DATV. These are three examples of systems under consideration:-

### **Motion Adaptive Sub-Sampling**

In this method, the picture is sampled, pre-filtered and then re-sampled in two ways, both of which result in low bandwidth signals. This process is known as sub-sampling. One sub-sampled signal results in good stationary picture resolution, but blurred pictures on movement. The other sub-sampling method gives only moderate resolution on both stationary and moving pictures.

At the encoder, the picture is divided into a large number of small rectangles. Within each rectangle, the pictures derived from the two sub-sample signals are compared with the original picture to see which process is giving more accurate results. That rectangle of the picture is then transmitted, by the more accurate process, over the analogue channel of the DATV signal. The digital channel of the DATV signal informs the receiver which of the two processes is being used, and the receiver then reconstructs the picture accordingly.

Further research is being done into the possibility of measuring the value of any



picture motion, in terms of a motion vector, that might be present within each small rectangle. The motion vectors can then be transmitted to the receiver over the digital channel of DATV. Here, the motion vectors can be used to control complex digital processing which will allow moving areas to be reconstructed at the same resolution, as stationary areas.

#### Block Adaptive Sub-Sampling

In this method the picture is split up into a large number of small blocks. Each block is examined from frame to frame in order to measure the amount of change or 'activity' that is occurring. The most active blocks are then transmitted at high accuracy in each frame. The less active blocks are updated at low accuracy but occasionally are sent at full accuracy to avoid errors being accumulated. The digital channel tells the receiver which blocks are being sent in which mode and the receiver then reconstructs each block accordingly.

#### Slope Coding

The video signal is first sampled at a high enough rate to give a full resolution picture. The slope coder then selects a proportion of the sample values for transmission, and generates a data signal which gives the position of the selected samples. The analogue channel of the DATV system transmits the sample values while the digital channel transmits the sample position information.

At the decoder, the signal is reconstructed by deriving the missing sample values using straight line interpolation between the samples that were transmitted. The coder decides which sample values to transmit such that the error between the original input and reconstructed signal is always kept less than a present threshold.



Graham Thomas (RD), demonstrates DATV.

Early results from the work at Kingswood Warren suggest that it should be possible, using DATV, to achieve HDTV quality in the home with a bandwidth reduction factor of between 2 and 4.

DATV techniques also offer possibilities for improving 625-line television systems. The C-MAC/Packet System has both analogue and digital capacity and it is, therefore, possible to use it to carry a DATV signal. The analogue channel would carry a 625-line, interlaced, 50 field picture. The digital channel would carry control information to assist up conversion processing at the receiver which could be used to improve the standard of the display (eg 625-line sequential).

Charles Sandbank, (DDE), said "DATV is a powerful technique to squeeze HDTV signals through the bottleneck of transmission channels using the sort of technology which will be in our homes in the 1990's. I am confident that it will play an important role in establishing a European broadcasting strategy for HDTV".

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## Streak Test Waveform Generator

Designs Department have produced a new Streak Test Waveform generator, (GE6P/562), to replace the out-of-date Line-up Test Generator. It produces four different waveforms - streak, 50 Hz, white, and black. These are used to check the low frequency response of video circuits and their ability to recover from the sharp transitions between white and black.

Seven horizontal bars of differing width make up the Streak Waveform. They range from a bar 0.5  $\mu$ s wide at the top down to one of 32  $\mu$ s at the bottom. Each bar is double the width of its predecessor. They are followed by a 19 $\mu$ s wide patch of variable lift over the full field. This enables the length of a streak on any bar to be measured and a more accurate assessment of a video circuit's capability for handling transitions between black and white to be made.

A further feature of the equipment is that its waveforms are derived from a PROM which can be re-programmed to generate a wide range of other waveforms.



# Satellite Control in TVC

The International Control Room (ICR), part of Television Network Department, at TVC is the control centre for programme and news exchanges between the BBC and their opposite numbers around the world. Permanent terrestrial circuits connect TVC to the Eurovision Network via BH Switching Centre. Access to the East European Intervisioin Network can be obtained via the EBU switching centre in Brussels, but most exchanges with the countries outside Europe are made by direct satellite links.

The terrestrial Eurovision circuits have been used in two distinct roles:-

- i) News exchanges. These take place two or three times a day. Each broadcaster offers the topical output of the day and these contributions are controlled from the EBU switching centre in Brussels to all participating countries. (In this role, the exchanges are known as 'multi-laterals').
- ii) Specific exchanges, where one broadcaster passes material direct to another. (Not surprisingly, these are known as 'unilaterals').

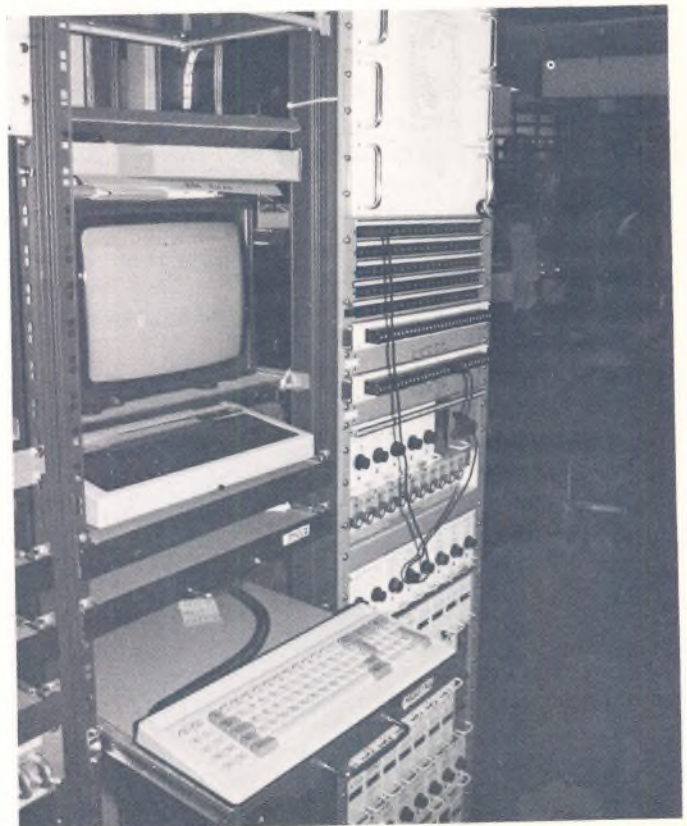
The existing terrestrial network has worked well for a number of years, thanks to the close co-operation between the EBU members. However, traffic continues to increase, and it was felt that the multi-lateral type of exchange could be better handled by a communications satellite. The EBU therefore decided to rent two transponders from Eutelsat when its first generation of satellite came on stream, and this has now become a reality.

In order to access the satellite carrying the transponder pair (Eutelsat 1, Flight 2), BT have provided permanent bi-directional main and protection terrestrial video circuits between the BBC London switching centre and the relevant British Telecom International, (BTI) earth-station (Madley 4). Like the terrestrial Eurovision network, sound-in-syncs is used to carry the associated sound. In order to make the most

efficient use of the rented transponders, the EBU proposed that broadcasters should have direct control of the switching of signals to and from the satellite. In the UK case, this required the provision of a video matrix and remote control facilities at Madley, and control equipment at the broadcasters' premises. The EBU specified the general format of the control systems required, so that it would eventually be possible to extend the system back to Brussels, thus enabling that one centre to control the whole network.

Marconi, the contractor for the UK earth-station, was given the contract to provide the Madley terminal but, when the company was asked to supply the remote terminals, it was unable to meet the budget and time scales required. Designs Department, therefore, agreed to assist, since it had had experience in the development of a number of complete remote control systems, similar in some respects to that which was now needed. The final system thus has BBC-designed control terminals, at TVC and ITN, which work into the Marconi-designed stations control system at Madley.

Software for the project was contracted out, but the chosen software house was unable to maintain a constant design



The satellite control equipment in ICR.



team, and eventually had to close the office involved. The software provided met the specifications, but did not operate well when applied to the full hardware. Extensive modifications by Designs Department to the software were necessary in order to make the system work satisfactorily. The first-model system was ready by early 1985, based on an Intel microprocessor, keyboard and colour monitor. Two systems were then installed; one at ITN - who are also subscribers to the Eurovision network - and the other, the master, in ICR. Four-wire data circuits were rented from BT to carry the remote control signals to and from Madley.

The system now installed, allows the engineers in ICR to select either the A or B transponder on Eutelsat 1, Flight 2, to either of two terrestrial circuits from the earth-station. If two simultaneous transmit or receive relays are required, an additional vision circuit has to be ordered.

A colour monitor displays a graphical representation of the remote matrix, and an inhibitor prevents a transponder being illuminated when it is already carrying traffic. The ITN remote controller has a

similar capability, but works through the ICR controller rather than direct to Madley. The system is designed to operate with up-to six satellite transponders, six terrestrial circuits, a test generator, and a test monitor at Madley. Expansion of the system, within these limits, may be made through the terminal keyboard without any further design work.

To date the system has worked well in the hectic atmosphere of ICR, where the project is part of the re-furbishment of the area. This has involved effort from several BBC departments: Designs, Communications, SCPD and Tel Projects, to name but a few.

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A revised version of the Ninth Edition of the Engineering Safety Regulations, (ESRs), is expected to be issued during April. All engineers are reminded to make sure they receive a copy of the reprint (on green paper) from their Line Managers. Remember, safety first, your life may depend on it!

## Streamlined Text Handling

Computer Systems Section, SCPD, have awarded a £3m contract to Honeywell Information Systems to supply a computer system to streamline text-handling at the monitoring station at Caversham. Language monitors will enter transcripts of broadcasts from other countries directly into the computer; and the new system will also automatically convert radio-telegraphy and wire-service signals for presentation on visual display units (vdus).

The BBC Monitoring Service is the British national agency for reporting the contents of foreign broadcasts. The team of monitors at Caversham operate in many languages to maintain a listening watch on broadcasters from around the world. News and information are obtained from radio, television, and radio telegraphy broadcasts. Caversham's news service and publications are widely used internally by BBC news and current affairs departments, and externally by the British Government. These services are made

available to subscribers throughout the world, including information services, news agencies, newspapers, journalists, universities, banks, embassy libraries, research organisations and other commercial organisations.

The new system will be based on the Honeywell DPS 8 series distributed main-frame computer. Using proven technology, it will feature in-built duplication to prevent data-loss. There will be nearly 200 vdu terminals, processing about 750,000 words a day. The output will be fed either directly by wire to the BBC new-rooms and other agencies, or will electronically coupled to photo-typeset printers for publication in the popular "Summary of World Broadcasts".

Monitoring Service Acting General Manager, Roland Challis said, "The new computer will provide a faster, more accurate service for our customers. With the increasing number of broadcasts from around the world that we monitor, it is important that we can easily disseminate the information". The new system should be operational by November 1987.



# I.E.E. Television Conference

On the 29th May 1934, the first meeting was held of the Television Committee under the Chairmanship of Lord Selsdon, a former Postmaster General. The terms of reference of the Committee were: To consider the development of television and to advise the BBC on the relative merits of the several systems and on the conditions - technical, financial and general - under which any public service of television should be provided.'

Subsequently, the Television Committee submitted its report of the Postmaster General, Sir Kingsley Wood, on 14th January 1935. The report included a number of recommendations, the most important of which was: 'High definition television has reached such a standard of development as to justify the first steps being taken towards the early establishment of a public television service of this type.'

This service commenced on 2nd November 1936 and was based initially on the utilisation of equipment provided by the Marconi-EMI Television Company Ltd and by Baird Television Ltd. The London Station, at Alexandra Palace, was the world's first high definition television station which broadcast regular programmes to the general public. Following a trial period during which the systems of the two suppliers were employed on an alternate basis, the Television Advisory Committee recommended that the 405-line apparatus designed and manufactured by Marconi-EMI Television Co Ltd should be adopted for the London and future stations. The last transmission by the Baird Television Ltd system took place on 13th February 1937.

The development of the 405-line television system was an outstanding British achievement, bearing in mind that electronics, as distinct from radio communications, was in its infancy when EMI commenced its work on television in 1931, and that the company was able to offer its system to Lord Selsdon's committee only four years later.

J L Baird played an important part in the progression of television in the United Kingdom. He was the first person in the world to demonstrate a rudimentary form

of television; this he did on 25th October 1925. Baird worked tirelessly to advance his basic ideas on television but was considerably frustrated in his efforts. Essentially, his low definition system was not appropriate for a public television service. However, when a competitor, EMI, appeared in 1931, Baird Television Ltd soon afterwards initiated a programme of development work which led to their 240-line system of 1935/36. Unfortunately for the company, their studio scanners lacked the mobility and ease of use of their rival's Emitron cameras and the Television Advisory Committee decided that Marconi-EMI was the superior system.

## Call for papers by the IEE

IEE Professional Group Committee S7 (History of Technology), in association with PGC E14 (Television and Sound), is organising an International Conference on The History of Television to commemorate the 50th anniversary of the founding of the world's first high definition television service in 1936. The conference will be similar in form to the recent successful History of Radar Conference and will be held on the 13th to 15th of November 1986. It will cover progress from the first proposals for television, via the experiments of the 1920s and the subsequent low-definition transmissions, to the realisation of high definition television in the 1930s and all its subsequent advances.

Contributions are sought primarily from people in all parts of the world who have had first-hand experience of developments in television engineering, including its commercial and political aspects, although papers based on historical research from primary sources will also be welcome.

Typically, papers will be of about 3,000 words. However, it is hoped also to include a few shorter contributions dealing with specific episodes; these may be read as papers or displayed as poster material.

## Topics to be covered include:

National histories, Pick-up devices, Display devices, Receivers, Antennas, Television Sound, Lenses, Standards conversion, Telecine, the Television waveform, Recording, Transmitters, Signal distribution, Lighting, Electronic effects, Digital techniques, the impact of micro-electronics.



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## 24-Track at ETD

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A new training facility at Wood Norton is an audio studio and a 24-track control room. The main feature of the control room is a Soundcraft TS24 desk, which will be used to introduce students to in-line modules. The photograph shows Malcolm Nelson and Jill Diver, lecturers in the Audio Operations Unit of the Engineering Training Department, at the desk. To the right of the picture is an OTARI 24-track tape machine with its remote control unit. Not shown, but further to the right of the tape machine, is a bay with the Dolby units, a Maxim synchroniser, Revox cassette machine and other essential items.



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## Ceremonial Bays

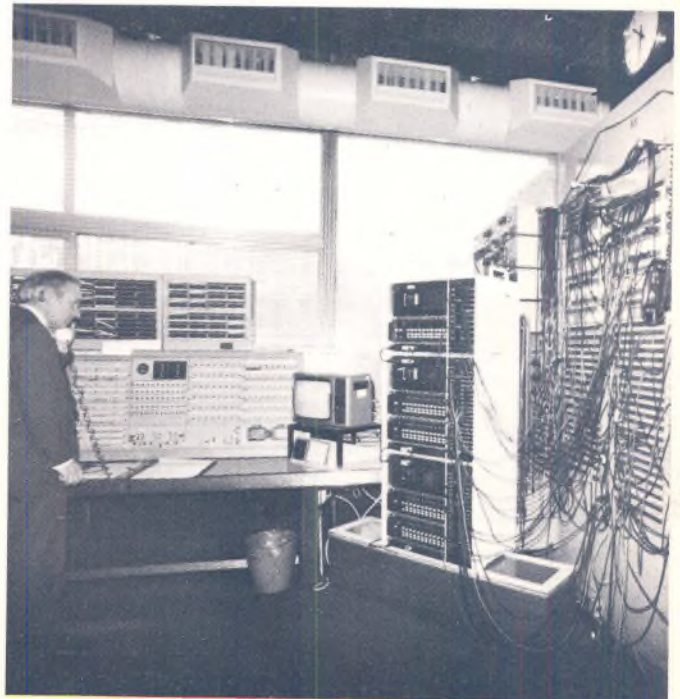
The established radio and television sound routing facilities in the London BH control room can handle up to five hundred input sources which can be routed to any of a thousand or more programme destinations. However, this capacity can be exceeded when an extra large event, such as a Royal Wedding, a major sporting contest, or a political conference, takes place. Until now, additional line amplifier units from Radio OBs have been pressed into service to cope with the extra demand.

Recently, the fixed capacity was supplemented by a set of purpose-designed, line-send amplifiers, known informally as the "Ceremonial Bays". The new bays are contained in three transportable racks, which together provide a total of fifty line-send amplifiers; forty for use on internal lines, with an output impedance of 75 ohms, and the remainder for connection to BT lines, with an output impedance of 600 ohms. Each amplifier has a variable gain control fitted to the front panel. The amplifiers have been provided and the system built by Glensound Electronics Ltd to SCPD and Radio Network specifications.

The operators can route an outside line and plug it directly to the intended user. The two internal line bays have an auxiliary input and talkback facility and there is ppm and loudspeaker monitoring on all three bays. The talkback enables the control engineer to identify the

desired line more easily and helps him or her to check the circuits before a programme commences.

The bay cases are designed so that they may be safely stacked for storage and operational use. The vertical arrangement on the jackfields at one side of the bay fronts prevents interconnecting cords from interfering with the operational controls. As well as this, the monitoring buses of the bays may be interconnected so that the facilities need only be referred to one bay, thereby simplifying monitoring operations.



**The Ceremonial Bays in BH Control Room.**



## "The Archers" Studio refurbished

Drama Studio 3 at Pebble Mill and its associated control suite, have recently been refurbished and partly remodelled. Studio 3 now has a small dead room at one end with an entrance directly into the studio. At the other end, is an effects staircase leading up to a false door which, like the studio floor, is divided into carpeted (dead) and solid (live) areas.

The walls of the studio and the sound absorbing boxes, have been re-covered using the 'Fabritrak' system. Acoustic Architect, Keith Rose, has carried out tests and the studio has been found satisfactory, although there were early doubts about the effect of opening the dead room directly into the studio.

The principal programme produced here is the 'Archers', for which a wide range of special effects are necessary. When they transferred from the old Broad Street, Birmingham, studios in 1969 the Archers brought a number of artefacts with them. These devices include a number of false doors in free-standing frames, complete with latches, knockers, bolts and locks, "such useful bits-and-pieces". They have also been repainted to be in keeping with the studio's new decor.

### Control Suite

The requirement for the fast editing of each episode, and the addition of "loose scenes" at the end of episodes, led to a new control desk being developed. To accompany this, a new cartridge trolley has been installed to allow the insertion of special effects. This replaced the old Programme Effects Generator, (PEG).



The new control cubicle is believed to be one of the largest in the BBC, with an area of 12.5m wide by 4.5m deep. In practise, two rooms were opened up to make a common area. The control desk and producers table are divided from the tape and gram operations by a high screen.

The tape decks are Studer 810 machines and behind are EMT 950 gram decks. An archway leads through to a second room, housing the apparatus bays, cartridge trolley and soon, an Otari multi-track recorder. An older BBC type RP29 gram-deck has been fitted with modern electronics and a new, fast-start deck.

A unit developed especially for the regional drama studios was the tape routing matrix, made by NTP Electronics. This device controls the record feeds to the 1/4" tape machines, and the replay feeds from the many tape and gram units. It also provides monitoring of the record and pre-fade output circuits of the tape machines.

### The Control Desk

The main feature of the control cubicle is the new Calrec multi-track control desk. This uses conventional analogue technology, but is fully stereo capable and can be used for music. (However, the Archers at present is produced entirely in mono because of overseas sales of the programme).

In addition to the extensive signal processing on the desk, out-board equipment is provided on a trolley, which houses Quantex QRS and Lexicon PCM 60 reverb units and a Studer cassette machine. There are thirty-six input channels on the desk with individual faders assignable to any of ten VCA stereo group faders. Each channel has a compressor/limiter and an expander noise-gate section.

SCPD discussed the requirements of the audio staff at Birmingham. The result, which employs manufacturers standard equipment, is a great success. The installation of the Pebble Mill desk was contracted out to Calrec. Overseeing the design and installation of the desk and refurbishments was Project Leader Simon Brown of SCPD, assisted by John Noble, Services Supervisor, Mark Decker, Sound Supervisor from Pebble Mill's audio team and Neil Dunstan, RSS Planning Engineer.