

ENG INF

The Quarterly For BBC Engineering Staff

BBC OPENS 1,000th TV TRANSMITTER

On Friday 7th November, the one-thousandth uhf colour television transmitter came into operation at Hedleyhope, in County Durham.

The opening was performed by Mike Neville, famous as the presenter of the magazine programme, 'Look North', from our Newcastle studios. He was accompanied by George MacKenzie, Chief Engineer, Transmission.

The Hedleyhope relay station was built to provide uhf colour television services for about 1,000 residents of Waterhouses, Esh Winning and East Hedleyhope in the Deerness valley, County Durham.

The engineers in Transmitter Capital Projects Department have been building transmitting stations for the colour services of BBC 1 and BBC 2 television for thirteen years. The first station which opened the 625-line service of BBC 2 back in 1964 was Crystal Palace. Other transmitting stations were added in the following years, and the first colour transmissions started on 625-lines in 1967. In 1969



Mike Neville connects the aerial to the transmitters at Hedleyhope, while George MacKenzie makes sure that it is not cross-threaded

the BBC 1 service was duplicated on 625-lines and in colour.

During the '70's the pace of uhf television transmitter building increased. TCPD engineers adapted their techniques to build smaller and smaller stations to cover the small remaining areas not served by the original high-power stations. Many hundreds of stations were needed, and the engineers gradually moved from the individual construction of the big stations to the production-line techniques needed for the seventy relay stations which come on the air every year.

Gordon Bowhay, the engineer who installed the transmitters at the Hedleyhope station, says he is on the road for nearly 40 weeks in the year just installing transmitters. The other members of the teams are equally dedicated. Our rigging teams have built the steel towers and fitted the aerials at



The Hedleyhope mast and transmitter cubicle being filmed as a possible TV news story

AWARD For CEEFAX PAPER

John Chambers, Head of Special Projects Section at Research Department, has won the American Institute of Electrical and Electronics Engineers (IEEE) "outstanding paper of 1980" award, for a paper entitled "ENHANCED UK TELETXT MOVES TOWARDS STILL PICTURES".

John presented the paper at the IEEE Spring Conference held in Chicago earlier this year. The paper has been published as Research Report number 1980/4, and in "IEEE Transactions". The award from the IEEE comes in the form of a commemorative plaque and three hundred dollars cash.

* * * *

stations throughout the length and breadth of the country. There are specialist aerial engineers, all keeping the relay programme going. To save time and expense at the sites of the new stations, much of the construction work is done at the TCPD base, at Brookmans Park in Hertfordshire. The transmitters are tested, the aerials assembled and the cubicles, which eventually house the equipment, are wired and fitted before being taken to site.

The total capital cost of a relay station to the broadcasters is about £50,500. This represents about £50 per person in the service area. The cost is shared between the BBC and the IBA - when the fourth channel transmitter has been installed by the IBA, the shares will be roughly 50-50.

Breakdown of costs (£000's):	
Steel Tower	6.0
Site (purchase & preparation)	4.8
Cubicle	1.9
Electricity supply	4.4
Aerial system	5.2
Transport	0.5
Wiring, ancillary etc.	1.1
BBC transmitters	7.4
IBA transmitter (estimated)	4.0
BBC staff effort	15.2
Total	50.5

The cost of the Hedleyhope station is typical for a straightforward relay where there were no particularly difficult problems. At stations serving fewer people or where long access tracks or expensive towers are needed the cost per person can rise to £100 or £150 or even more.

ACE comes up trumps

The BBC and McMichael Ltd., have reached an agreement licensing McMichael Ltd. to manufacture the new digital four-field standards converter.

ACE was developed by engineers in Designs Department following fundamental work on the interpolation process carried out by engineers at Research Department. The Converter offers superb movement portrayal and provides a standard of performance not matched by any other commercially available equipment.

Standards Converters are used by the Television Service to convert television pictures from the 525-line, 60-field NTSC standard used in the USA and Japan, to the 625-line, 50-field PAL standard used in the United Kingdom and much of Europe. The Converter is equally good for conversion in either direction and is used extensively in the 625/525 mode to export BBC programmes to America.

McMichael Ltd. is a Company within the GEC group, which has concentrated on professional electronic engineering for the military market, and has developed considerable expertise in both analogue and digital electronics. In recent years, McMichael Ltd. has provided television signal coding equipment to British Telecom, Data Collection Platforms for various users of the Meteosat meteorological satellite, and is providing advanced VHF transmitters to the British Home Office for use by Police and Fire services.

Granville Cooper, Technical Director of McMichael Ltd. says: "McMichael Ltd. believe the agreement to manufacture ACE is an important step for the company, since it allows us to bring our background of high reliability engineering to the professional broadcast market".



'The Standards Converter licensed to McMichael Ltd. (L-R): Alan Wheeldon, McMichael; Tim Shelton, DD; Sid Casson, HES; Steve McGuinness, McMichael; Nigel Rolfe and Roger Robinson, DD; Mike Clevely, McMichael; Derek Simmons, DD; Peter Rainger, DDE; and Granville Cooper, McMichael

CARFAX goes to COURT

The BBC sought an injunction against Talbot Cars Ltd., to prevent their intended use of the trademark "Carfax", and this was granted on the 19th December 1980. Talbot Cars Ltd., wished to use the name "Carfax" for their spare-parts operation, although "Carfax" has, since 1977, been used by the BBC as the registered name for their proposed broadcast traffic information service.

The Carfax traffic information service was developed by Research Department. The system allows motorists to listen to their favourite radio programmes or in-car entertainment, automatically interrupting when there is local traffic information which will affect them.

For a country-wide service, a grid of low-power transmitters would provide local traffic information throughout the country on a single frequency in the medium wave band.

The service could provide information on alternative routes after accidents or traffic jams, and particular groups of road users, such as lorry drivers or foreign visitors, could be specifically addressed by special coding.

Engineering trials, which have proved to be successful, have been run from five transmitting stations in Greater London for the past year or so. The trials are being conducted by the BBC in association with the Transport and Road Research Laboratory.



Editorial

In this edition of "Eng Inf" we feature the work of Transmitter Department. Much of their work goes on behind the scenes, and to many the transmitters are often described as being only the "load on the end of the line".

We have visited three different areas of Transmitter Department to see how they operate. A Monitoring and Information Centre, a remote maintenance team, and an External Services high-power transmitting station. In each area the staff cheerfully carried out their duties often in the extremes of operational environments. Credit must be given to the high degree of engineering skill shown by engineers in Transmitter Department, that enables BBC programmes to be seen and heard throughout the UK and rest of the world.

Thanks are due to the many engineers too numerous to mention personally, who allowed us to question and photograph them for this series of articles, and to all of the others who keep the services going.

Have you got an interesting engineering story to tell? contact Alan Lafferty on BH 5432/3 or room 701 WHH.

Transmitters opened

The following UHF TV relay stations have opened since November 1980:

Kenmore (Tayside)	7.11.80
Baltasound (Shet Is.)	3.12.80
Mallaig (Highland)	6.12.80
Ravenscraig (Strath.)	12.12.80
Lydbrook (Glos.)	7.11.80
Hedleyhope (Cty. Durham)	7.11.80
Forest Row (E. Sussex)	21.11.80
Alten (Hants.)	5.12.80
Brightstone (I.O.W.)	12.12.80
Bristol (Avon)	19.12.80

ELECTRONIC NEWS GATHERING: back in service



The ENG unit rehearses a story at TVC

The BBC News ENG unit returned to full operational service on November 1st. Since then it has made a considerable impact on the way the news is gathered, edited and transmitted. ENG - electronic news gathering - uses lightweight television cameras instead of the more conventional film cameras, allowing the transmission of news stories without the delay of chemical processing.

The cameras used by the two-man BBC ENG unit are IKEGAMI HL 79 'one piece' cameras, fitted with zoom lenses, that can be operated from the

mains or from a portable battery power supply. The signal from the camera can be passed back to the Television Centre base via the radio-link vehicle or direct land-line or can be recorded on-site on a Sony BVU 100 U-matic video cassette recorder.

In one lunch-time news broadcast only a few days after the ENG operation restarted there were three stories covered by one ENG unit alone. The sale of goods by the Miss World contestants was pre-recorded on the cassette video-recorder and sent back to Television Centre by dispatch-rider for

editing there; the crew then moved on to cover the meeting of the Firemen's Union discussing their 6% pay award, and this was again recorded on the video cassette recorder, but replayed via the radio-link vehicle on site, at the appropriate point in the news. A last-minute live broadcast via the radio-link vehicle, updated the firemen's story, and proved the flexibility of ENG.

The radio-link equipment is mounted on a specially adapted Range Rover. The roof has been strengthened so that it can be used as a camera platform, but its main purpose is to support a 1.2m dish aerial which is used on the 2.5 GHz vehicle-to-base radio-link system. The dish aerial is permanently installed on the vehicle roof on a small purpose-built tower, which, when not in use, lies flat on the vehicle roof. An electrically-operated ram raises or lowers the tower in only a few seconds. The radio-link can operate directly to the Television Centre, but due to the high frequencies used, a line-of-sight radio path is required, and this is not possible from many sites in Central London; therefore, four Nurad horn aerials have been installed on the 122m high Millbank Tower, one horn covering each aspect of the building, and making it effectively an omni-directional reception point. The receiving equipment is remotely controlled over a landline, by an operator at Television Centre allowing any of the four aerials to be selected. A panning aid is provided on the link vehicle which uses a radio-telephone channel and allows the ENG operator to align the dish aerial for maximum signal strength at Millbank Tower.

In addition to the radio-link equipment, the Range-Rover houses a 12 GHz receiver that can pick up the camera signal transmitted by the cameraman. This removes the need for long trailing cables, and allows the cameraman freer access to buildings. The vehicle has six UHF whip-aerials that are used to provide an off-air feed from the local UHF TV transmitter, and this is fed to a conventional television receiver; this is used by the reporter for cueing purposes.

At Television Centre there are two ENG editing suites, one for 525-line operation, and one for 625-line operation, although it is expected that more will be provided as demand increases. The editing suites have Sony BVU 200 video tape recorders with Sony 500P editing systems. In the event of a late story they can be rush-edited in the transmission suite and then passed straight to the news room, but stories would normally be routed to one of the editing rooms if there is time.

RADIO 1 at WOOD NORTON



Peter Powell, Radio 1 D.J., with a group of students and instructor Jim Cook in the Continuity Suite at the Engineering Training Centre, Wood Norton. Peter, with producer Dave Tait, was visiting to talk to students on the T.O. (Radio) Course about the work and problems of a D.J. Because it would have been difficult to get back to London in time for his afternoon show, Peter agreed to stay on and run the show from the local Continuity Suite.

This suite is normally equipped with a fault simulator to train operators how to respond when faults occur and so minimise the effect on the network output. On this occasion the simulator was disconnected and the programme went without a hitch. During the programme Peter interviewed Kevern Oliver, the Course Manager, and a few of the students to give the listeners some idea of the facilities available and the activities that take place at the Training Centre.

DESIGNS '80 EXHIBITION IN LANGHAM



Tim Shelton and David Read, DD, demonstrate the RP 2/10 Disc reproducer to MDR, watched by HDD, Gordon Parker (L), and Don Cummings, Radio O & M (behind)

Coincident with the Es.i.C. Meeting in October, Designs Department staged a two-day exhibition "Designs 80" which showed some of the latest products being handled by the Department.

On the first day the exhibition was open to senior staff and members of the Es.i.C. meeting. The second day the exhibition was organised for members of the technical press and representatives from industry wishing to visit it.

During the second day there were ninety visitors from outside organisations and some five-hundred and sixty BBC staff. The exhibits showed the total range of work covered by the Department from audio through to video and RF to digital.

Many of the exhibits showed the extensive use being made of micro-computers in current designs. A very important aspect of the exhibition was the display of manufacturing techniques which have been developed by the Department to ensure that the ideas can be processed into equipment having a high reliability. A specific example of equipment with a high reliability was the newly developed low-cost transposer known as "silver streak". This equipment will be made in very large numbers, both by Equipment Department as well as being licensed to outside firms for manufacture for sale to other broadcast organisations. Details appear elsewhere in "Eng Inf".

Television production tools were on display, including an improved method of colour separation overlay. The new network clock symbol used on BBC 2 was on show, a good example of digital applications to television production. The various electronically generated logos were shown, as well as the development of an electronic test card F which is now becoming an important project due to the difficulty in obtaining consistent slides from outside sources.

In the field of audio, the use of digits in transmission was highlighted by a demonstration of NICAM 3 whilst the



The new Radio continuity studio desk is demonstrated to MDR by Ian Millar of Designs Department, watched by David Smart (L) and HDD (R)

D.E. addresses Es-i-C

As has been briefly reported in the last edition of Eng Inf, the Engineers-in-Charge met at a conference in October and the Director of Engineering spoke about the cuts in Engineering Division. Parts of his speech are reproduced below:

"You will all be very aware of the economies that have been made during the past year and there is no need to go over them again in detail. With the rest of the BBC, we are all taking our share in one way or another but it is true to say that they have not bitten so deep as to undermine seriously the effectiveness and standards of work in the engineering field.

On the other hand we have not yet experienced the full effects of cutbacks. Budgets have been pruned to the required levels, but we are only part way along the road of turning budget intentions into actual economies. We

'continued on page 5

SILVER STREAK LAUNCHED



The 'Silver Streak' prototype four-channel transposer

The new UHF Television Transposer, known as Silver Streak, was shown for the first time at Designs '80. Designed to meet the BBC's requirements for inexpensive relay stations to serve small communities, it will supersede the Blue Streak which has now been in production for five years. The new transposer takes advantage of developments over that period to incorporate many features that minimise the overall cost of providing a television service; low manufacturing cost, simple installation, high reliability, quick replacement of faulty modules, easy maintenance, and lightweight construction.

The heart of the transposer is a broad-band active module which consists of two mixers, two oscillators, and IF unit, and a power amplifier. The module has no integral controls, but its parameters are set when it is plugged into a passive personality module. Thus, the transposer modules at all similarly equipped relay stations are identical, minimising the number of spares required. The personality module is entirely passive and consists of two UHF band-pass filters tuned to the input and output channels, and a simple system of wire links which enable the synthesised local oscillator frequencies to be set on site.

Up to four transposers may be driven from a single low-noise distribution amplifier and two transposers are driven from a single power supply. Thus, a total of three active modules, the heaviest of which is less than 9 kg, are required as spares.

E's.I.C. meeting:

'continued from page 4'

are going to have to live within our reduced budgets and every individual manager must watch his expenditure very carefully. If individual budgets are exceeded, there is no bottomless pit or rescue fund for baling out and the consequences of over-spending can only be further cuts in staffing.

But with careful management we can continue with very active development on most engineering fronts. The past year, and our plans for the future, certainly bear this out.

Last year the BBC spent £46M on Capital Developments - in real terms the most we have ever spent and we are planning to spend £56M this year. In both cases this does not include expenditure for External Services which is another £3.7M last year and £5M this year.

Earlier this year when we were considering the cuts that had to be made, I was concerned, as were other members of BoM, that this was merely Stage I and that further reductions, perhaps even more severe, would be required next year. This would have been difficult to achieve without very serious cut-backs across the board as any fat has now gone. I am now confident, however, that further cuts will not be necessary and I expect D.G. will confirm this later in the meeting."

DE then reviewed the achievements of the previous year, and

A particular feature of the transposer is the two synthesised local oscillators which can be set by wire links to generate the frequencies required for any UHF channel and offset. The generation of one-third line frequency offsets could lead to an expensive and complex synthesiser design. However, this equipment uses a novel approach which, as well as being cheap, gives a transposer output frequency which is independent of input frequency drift. This is an advantage for long chains of transposers where, using conventional techniques, the overall frequency error can be quite large. The output frequency of this transposer is solely determined by its internal, oven-controlled crystal oscillator.

The first production batch of the new transposer is due from Equipment Department in August, and it will start to replace the Blue Streak in new installations in 1982.

concluded by saying a few words about satellites, he said,

"During the last few months we have been very active in developing proposals for the use of satellites both for direct broadcasting and for point-to-point contribution links. Earlier this year we used an up-link hired from Ferranti and the Satellite OTS, for the contribution link for an OB from Glencoe. This was on trial only and the terrestrial link was used for programme purposes, but the trial was highly successful. A further use of OTS is planned from Ben Nevis for next Spring. Later next year we will have our own up-link which is being designed by Research Department. It will be in the form of a trailer to be towed behind a standard radio-link vehicle. Agreement has yet to be obtained from the B.T. (British Telecom) for the broadcaster to operate its own satellite links - the difficulties here must not be underestimated.

On the use of satellites for Direct Broadcasting to the home, France and Germany and other countries have plans to provide a service by about 1986. We have been pressing the Home Office for a DBS service in the UK by the mid 80's and a Home Office committee has been set up to consider this subject. We have made a major contribution to this committee including a proposal that two satellite channels should be made available for BBC services - one a Subscription service and the second a repeat best of BBC1/2 service. This second service we would later programme in its own right to allow the terrestrial services to be available more for regional contributions."

50 Years ago

From the BBC Handbook 1931

The event of the year par excellence has been the completion of Broadcasting House. Unfortunately the decoration and fitting of its twenty-two studios has not advanced beyond the preliminary stages at the time of going to press, and many finishing touches remained to be added to various parts of the building. It has not, therefore, been possible to give a really full account of Broadcasting House in this Year-Book and many of the illustrations show the building in an incomplete form. The BBC, however, hopes to issue a souvenir of Broadcasting House early in 1932, and the BBC Year-Book of 1933 will repair the omissions of the present year.

TRANSMITTER DEPARTMENT: SPECIAL FEATURE

WOOFFERTON transmits to the world



A multi-band HF aerial array



Engineers John Chantler, Jeff Chant and Phil Sandell adjust the 250 kW transmitters at Woofferton

"Nation shall speak peace unto nation" says the motto, and nowhere is this more evident than at the BBC External Services transmitter stations. In addition to overseas relay bases, there are four stations in England. These are located at Daventry, Rampisham, Skelton and Woofferton, and it is the latter that we examine in more detail.

The station, near Ludlow in Shropshire, houses six Marconi 250 kW high-frequency transmitters, or senders as they are known in External Services. These can be selected to power any one of 34 curtain arrays or aerials, to provide coverage to the required service areas. Thus the short wave signals can be beamed to many parts of the globe throughout the day and night.

The station not only transmits BBC external service programmes, but acts as a relay station for "Voice of America" programmes. These are relayed by line from the BBC receiving station at Crowsley Park near Reading. The signals originate either directly off-air, or from a satellite link, and sometimes are replayed from a pre-recorded tape.

The four incoming programme lines from Caversham and Bush are monitored and switched in the control room, where the duty engineers also select the correct aerial array for each transmission. The transmitters can also be remotely switched from the control room. Much of the monitoring equipment relies upon old electromagnetic relays for its operation, and these will shortly be replaced by a more sophisticated micro-processor control system.

The new control system, designed by Designs Department and TCPD and now being installed by a team from TCPD, will not only monitor the

programme lines and transmitters, but can also switch the correct programme to the required transmitter at the right time, and select the correct array for that particular transmission. Programme and transmitter switching in the External Services follows a prescribed schedule which involves many switching operations throughout the day and night, and the new system will have the capability of being overridden, to accommodate short notice changes in the schedule.

The six 250 kW HF transmitters in the main hall are manually tuned and frequency-changed, and require the constant attention of the duty-engineers to monitor their performance. At programme junctions they can accommodate small frequency changes, and aerial changes, with an engineer on hand to bring the transmitter back to peak performance. However, if a major frequency change is required, it can take some minutes to manhandle the different tuning coils into place, and change the settings of the vacuum tuning capacitors.

At the far end of the transmitter hall a team from Marconi



Bernie Keenan at the old control desk



STE Percy Winsor checks the final anode coils inside a transmitter



The new microprocessor control equipment under installation

Communication Systems Ltd., are installing four of the latest B6124 300 kW SW transmitters. These transmitters have several new features which have been incorporated into their design. The control system can store up to 32 pre-set frequency channels, and this means that frequency changes can be carried out in a mere 12 seconds. A sophisticated "hypervapotron" cooling system allows the 300 kW radiated power to be developed on the anode of a single final tetrode valve. The tuning capacitors, coils and valves are all water and air-cooled making them cold to handle, and doing away with the need for special gloves for handling hot components.

The new transmitters have been designed with ease of access in mind, and rapid valve changing will be possible with the self-sealing hose connection incorporated in the cooling circuits. Being fully automatic, the transmitters can be monitored from the control room, with local l.e.d.'s providing a diagnostic aid should a fault develop. The first of the four new transmitters is currently being power-tested; the remaining three are due for completion in March 1981.

The mains-power requirements for a station such as Woofferton provide the local electricity board with a few problems, since the station consumes 3.5 MVA of power at normal transmitter operating levels. Any increase in maximum electricity demand can produce an enormous increase in the final electricity bill and consequently every effort is made to keep electricity charges down.

The engineering staff on the station are required to develop a multiplicity of skills ranging from plumbing and metal work to first line maintenance on vacuum circuit breaker switchgear and microprocessor systems. Considerable support is given to the operational shift engineers by skilled and fully equipped maintenance sections and rigging teams. ❀



The new Marconi transmitter

Remote Team keeps things going in the Western Highlands



The Melvaig transmitting station

Even in the remoter parts of the U.K., transmitter-maintenance teams work under considerable pressure to keep our services on the air. The team at Gairloch, in the western highlands of Scotland, has some extra headaches to cope with.

"The biggest problem maintaining transmitters in western Scotland is one of sheer distance" said team manager, Arthur Morris. "For example, it is 218 miles to the Kilbride transmitter on South Uist and, because the journey involves ferry crossings and single-track roads, it can sometimes take up to 24 hours to get to the station and that's for a potential 700 viewers!"

The maintenance team has a tough job maintaining the twelve stations that are scattered around the Outer Hebrides, Skye and western coast of Scotland. Apart from the main vhf radio and Band I television station at Melvaig, their patch includes the Eitshal high-powered uhf tv station and Ness relay station on Lewis, three uhf tv transmitters on North and South Uist, three relays on Skye, and three uhf tv relay stations on the mainland. In addition they are responsible for the shf link distribution equipment at Glen Docherty, Melvaig and Eitshal.

The five-man team at Gairloch take it in turns to be away from base, and before they leave their Range Rover

is checked to make sure that it contains emergency rations, water, and blankets. "You never know where or when you could get stranded" said senior transmitter engineer Syd Garrioch. "Just before Christmas we were stranded for eight hours, without food, on the jetty at Stornoway waiting for the ferry back to Ullapool. None of the hotels could accommodate us because they were full, and the guest-houses wouldn't take us in because landladies dislike being woken by guests leaving at 4.30 a.m. to catch ferries. As a result we now carry emergency supplies."

Bad weather can also cause problems for the maintenance team. Lightning strikes recently caused five transmitter shutdowns in five weeks. Unfortunately even a minor strike can cause problems, because it can bring the phone lines down for weeks on end; this means that no information can be sent back to the Monitoring Information Centre (MIC) at Kirk O'Shotts. Often the team has a 12-hour journey just to reset a transmitter stabilized power supply which has shut down because of local mains voltage variations.

The team spend a lot of time on the islands, and a spare parts store has been established at the Cletraval station. As Arthur Morris says, "It is no use going all the way to Kilbride to find that you have forgotten a simple thing like a fuse." The ferry charges for the Range Rovers are expensive, costing over £2,000 a year. Sometimes a plane has to be chartered to take faulty parts back to base if the ferry-crossing is too rough.

Being a member of the team has its advantages though, because the western highlands have some of the most spectacular scenery in the U.K. and the team members gain considerable satisfaction from providing a service for the isolated communities in the area. The engineers are all members of the small community of Gairloch, and the sight of one of their two white Range Rovers always provokes a friendly wave from passers-by. However, facilities in the hamlet are few, with only two shops and a garage, and bread and milk deliveries twice a week. Hotel bars are always full, though, mainly with fishermen who, even in the depths of winter, cast nets upon the icy waters. A trip to the dentist can mean a days journey to Inverness, 70 miles away, and the news on Ceefax often beats the newspapers by more than a day. The

'continued on page 8'



STE Syd Garrioch at Glen Docherty

'continued from page 7'

mail-bus bringing in the newspapers does not arrive until three o'clock in the afternoon on a good day, and even later when the weather is bad. There must be compensations though, for Arthur Morris has been here for 15 years and has almost lost his native Welsh accent! He even manages to practice the bagpipes when other members of the team are away from base.

Other maintenance teams such as those at Fort William, or on the east coast of Scotland, share the problems of the Gairloch team, and they are always ready to send an engineer off for short attachments when required. They all operate a commonspares supply system where spares for a transmitter in one area can often be borrowed from a neighbouring team. This has added benefits for the Gairloch team, since the visitors always check to see if they should bring some fresh bread or milk with them to assist with the lack of these basic commodities in Gairloch.



TM Arthur Morris and STE Syd Garrioch discuss a technical point



The Glen Docherty SHF link relay station



The Badachro UHF TV relay station



The Blue Streak transmitters at Badachro

KIRK O'SHOTT'S



The MIC at Kirk O'Shotts

It was in 1968 that the installation of a telephone monitor panel (TMM) and uhf monitoring receiver began a process which has changed the main role of the Kirk O'Shotts transmitting station. In those days, the station served central Scotland with 405-line television and vhf radio but the new BBC 2 uhf transmitters had been installed at the IBA's Black Hill station nearby, and they had to be monitored remotely.

The Monitoring and Information Centre (MIC) at Shotts now monitors more than 200 stations, ranging from uhf main and relay TV transmitters, through vhf radio, to mf and lf radio transmitters. The staff there can keep an eye on the situation throughout Scotland, Northern Ireland and northern England - from one armchair! From the prototype MIC at Shotts have emerged others at Wenvoe, and eventually Sutton Coldfield and Crystal Palace. Shotts is also the base for a mobile transmitter-maintenance team whose duties include maintaining the original vhf radio and television transmitters, and all the uhf transmitters over an extensive area of southern Scotland.

Several methods are used to feed information from all the remote stations into the MIC store. The five main stations at Angus, Black Hill, Craiggelly, Darvel and Selkirk are monitored directly off-air by using a 23-kHz PSK modulated sub-carrier associated with the sound channels, to monitor the state of the transmitters continuously. Other stations are equipped with a device called FRED (Fault Reporting and Encoding Device) which scans all the principal transmitter features and sends information to the MIC as a series of binary numbers according to a fixed Directory. The transmission system is by Frequency Shift Keying (FSK) either at audio frequency on a Post Office line (STD or dedicated), or by ultrasonic frequency on TV or vhf sound for direct reception.

'continued on page 9'

OUR SCOTTISH MIC

'continued from page 8'

Piggy-backing is used to increase the area monitored: for example, the 27.1 kHz data from Orkney is received at the Rumster Forest transmitter, south of Wick, and is added to that station's 23 kHz for reception at Rosemarkie.

Most of the large relay stations are monitored via the public telephone system. When a fault or change of state occurs, the monitoring equipment at the station automatically dials the MIC and brings up an alarm indication. The MIC operator at Kirk O'Shotts can also "call up" information from the Monitoring and Collecting Points (MCP's) that have been set up at Pontop Pike, Divis and Rosemarkie.

The new data-handling complex has only just been installed at Rosemarkie, fifteen miles north of Inverness, and it is designed to monitor information from all the major transmitters in the north of Scotland. The area which the MCP embraces is north of a line from Aberdeen to Oban and includes the Hebrides, Orkney and Shetland. The system is completely automatic and collects the data to send to Kirk O'Shotts.

A Quality-Check area has been established at Kirk O'Shotts so that vision and sound can be viewed and heard under ideal conditions and recorded if necessary. Apart from all the signals from the Kirk O'Shotts transmitters, the facility extends to transmitters monitored directly off-air at Kirk O'Shotts.

All stations serving more than 10,000 people or using thermionic devices such as klystrons or travelling-wave tubes, are equipped with FRED's. Other stations also use the system, for example, where aircraft obstruction

lights have to be monitored or the station is at the end of a chain of transmitter relays. In all there are thirty-two FRED's in the Rosemarkie area.

After arrival at Kirk O'Shotts, the data is assembled into Status and Change-of-Status stores and displayed to the operator in Plain English on a visual display unit. It is also printed on a teleprinter. Every 24 hours each maintenance team is given a chronological collation of fault information in their area.

All the data-handling equipment was designed in Monitoring and Control Section of Design Department by a team under the control of Senior Engineer David Carter.

The Kirk O'Shotts base is staffed on each shift by just four people - one engineer and two Technical Assistants, supervised by a Senior Transmitter Engineer. Recently recruited as a Trainee Technical Assistant is Joanne Parker who, at 18, has given up a career in supermarket management, and who will be among the first female trainee engineers in Transmitter Group. Also located at the station is the transmitter maintenance team who are responsible for stations as far apart as Stranraer in the south of Scotland to Callander, just north of Stirling. The team is split into two, with two engineers carrying out routine maintenance checks, and two engineers on "fire-brigade" duty, ready to go to stations that develop a fault condition requiring immediate attention. The maintenance team engineers and MIC engineers rotate positions so that they all have a period in each area. A wide range of engineering skill is required from the



STE Jim Paton adjusts a klystron amplifier at Black Hill

engineers, from fault-finding on the latest digital electronics, to stripping down a mechanical aerial feeder joint. Most engineers enjoy the mixture of MIC work and remote transmitter maintenance, where their skills and ingenuity enable viewers to receive the highest quality pictures possible.

C.A.I. SEMINAR at TV CENTRE

Members of the Confederation of Aerial Industries (CAI) and two members of Engineering Information Department held a one day seminar at Television Centre on November 21st to discuss problems in providing good television and radio reception to the general public.

The twelve CAI members, Peter Lonsdale (Head of Liaison Section EID) and John Pinniger (EID), spent the morning discussing the Broadcasters problems, transmitter survey techniques and explained various service planning requirements for colour television and stereo radio.

A great deal of interest was shown in the new "self-help" schemes, recently authorised by the Home Office, and time was spent in discussing the requirements for private transmitters and cable systems for isolated communities. One of EID's Range Rover survey vehicles was on demonstration at TC and the functions and workings of the various pieces of measuring equipment and test gear were explained.



T M Barry Rosindale, and Rigger Pat Brown examine a faulty aerial combiner joint at Black Hill

NEW LIGHTING SYSTEM IN TC 7 & 8

The BBC has recently brought the first two all-microprocessor lighting systems, Thornlite 500's, into use in Studios 7 and 8 at the Television Centre in London. The Thornlite 500, so-called because it can control up to 500 studio lights, uses nine Motorola 6800 microprocessors as the basis for its generation.

The system has been developed by the Theatre Lighting Division of Thorn Lighting Limited in close co-operation with SCPD and the user departments, Television Lighting, O & M.

They replace Thorn 'Q-file' equipment, which has been in use for over ten years. In fact the system in Studio 8 was the first electronic-memory lighting system in the world and was also developed in co-operation with the BBC.

Mike Wolfe the project engineer from SCPD says 'An advantage of the new system being software-based is that operations can be changed to suit the individual user's requirements. Also the facilities it offers have been greatly improved. The main features are six group master controls and VDU displays.

The six group master controls can be used for balancing complex lighting sets such as occur with the multi-coloured lighting of a cyclorama - the backcloth that runs around the edges of a studio. A group master control allows any number of lighting channels to be grouped together and then controlled simultaneously. Previously multi-channel working has been limited to the use of two or three channel controllers.

The VDU's (visual display units) show at a glance not only the lights that

have been set up in the studio but their intensity. There are two VDU's built into the desk so that, as well as seeing the present lighting arrangements, the lighting engineer can get a preview of future lighting states and can 'interrogate' each individual part of the system.

Because the 54 printed circuit boards in the desk are made up of combinations of only 16 different types of board, the numbers that have to be held as spares is greatly reduced.

Lighting plots are stored in 200 memories in a core store. A 'next' button automatically selects the next unused memory. Once a number of plots are stored, they can be brought out in various orders by 'sequence' buttons. For example normal sequential recall brings them out in strict numerical order.

The desk also has 'linked sequence' and 'auto add' facilities. These allow memory insertion, a memory to be recalled in any pre-determined order and a particular lighting channel to be updated any time a memory containing it is recalled for use.

A separate special effects panel, manufactured by Zero 88, can be used with the new lighting system. This has twelve channels appearing on 12 crossbars. Using it the TMI can call up various special effects such as 'sound to light' or disco effect, ripple effect and 'chasers', where the lights can be run down in a variety of sequences. These effects are used mainly in Light Entertainment productions and are especially effective in pop music programmes.



The lighting desk in studio 8 undergoing tests by Mike Wolfe of SCPD



The little figure above has been adopted as the symbol representing the BBC Engineering Division.

He is, of course, the lion from the crest of the BBC's armorial bearings which can be seen on the front of the BBC London area telephone directory and elsewhere. The lion also appears as the badge of the BBC Club, but Design Unit of the BBC's Publicity and Information Department have redrawn him in stark black outline to suit the style of the latest Engineering publications and publicity material. He is even going to appear in the heading of future editions of 'Eng Inf'.

Coats-of-arms were first used in the eleventh and twelfth centuries. In those days, when a knight wrapped himself up in armour from head to foot, he became unrecognisable, so the heralds devised distinguishing marks to be painted on the shields and embroidered into the surcoats. That way, they could tell who was bashing whom over the head at tournaments. You could think of it as an early form of colour-coding. Over the years, the system became more elaborate with the addition of crest, supporters, etc. Originally, armorial bearings were the property of individual people, peers of the realm or landed gentry, but latterly grants of arms have been made to corporate bodies and it is the arms of city councils, big companies, colleges and universities that we see most often.

The BBC received its grant of arms in 1927 when it became a public corporation. The full achievement of arms - and that means the whole thing, shield, helmet, crest, supporters, etc. - contains several references to broadcasting. The supporters are 'swift-flighted eagles' wearing collars and bugle-horns as emblems of proclamation and the gold band round the globe in the centre of the shield symbolises transmissions going round the earth. The crest is our lion, properly described as a 'lion passant, holding in the dexter paw a thunderbolt'. Traditionally, the thunderbolt was thought to be the weapon thrown down from heaven which created the noise of thunder and the appearance of lightning. Heralds adopted it to represent electrical energy, which is reasonable when you think that a lightning flash may contain a maximum current of half a megamp.

CEEFAX: LIVE SUBTITLES



The palantypist at work in CEEFAX

For the first time the Ceefax system has been used for the simultaneous subtitling of live programmes. The occasion was the Inauguration of Ronald Reagan as the 40th President of the United States of America. Ceefax viewers were able to read what he said as he said it. The limited experiment was successful, and further work will now be carried out to improve the presentation of the subtitles and to seek ways of improving the dictionary stored in the computer. For example, further experiments will be carried out to determine the acceptable number of lines of subtitle that can be easily read. Extra computing power will be required for these experiments.

The live subtitling system used in the experiment has been developed by Lyndon Thomas, Principal Lecturer in Computing Science at the Leicester Polytechnic, in collaboration with Bill Hawkins and Ron Spencer of Designs Department. It uses a modified Palantype keyboard connected to a powerful microcomputer. The Palantype machine, similar to the machine used for official court reporting in the U.S., produces a form of shorthand.

The micro-computer produces the subtitle in everyday words by comparing the 'shorthand' output of the Palantype machine with a 70,000 word dictionary held in an associated data store.

The operator listens to the speech and by using the Palantype keyboard feeds the signal into the micro-computer. This deciphers the shorthand and produces a signal suitable for transmission on the Ceefax system. The

signal is decoded in the normal way at the viewer's receiver and is displayed as a subtitle.

BBC 2's live coverage of the event from Washington marked another first for the Ceefax service for the deaf and the hard-of-hearing. Over the past two years Ceefax has provided subtitles to certain programmes, among them 'Life on Earth', 'The Queen's Christmas Broadcast', 'The Onedin Line' and 'Yes Minister'. But all these programmes were pre-recorded and the subtitles were added afterwards. The Inauguration of President Reagan was the first to offer subtitles to a programme as it happened. A letter from a deaf viewer the following day commented: "undoubtedly the greatest significance of the 'palantype experiment' was the ability to share with others a moment in history".

As a result of the broadcast, and with Ceefax receivers costing only a few pounds more a month to rent than a conventional colour receiver, a full subtitling service for the deaf is within sight. The main limitation is the cost of the specialised staff required.



Subtitles as the viewer saw them

25th RADIO STUDIO

Around midnight on Wednesday 19th November the 25th General Purpose radio control room came into service when Brian Matthews took a look at theatre and the arts in South Wales in his programme 'Round Midnight' on Radio 1/2. This was the first programme from the radio studio, Cardiff-2, in stereo. The 'old' equipment, a C-type desk, was over 15 years old and could only be used on mono.

The new General Purpose desk has been manufactured by Audix Limited of Saffron Walden to a design developed by S.C.P.D. Although it is basically a Mark II design, the new desk has three additional mono channels to give it even greater flexibility. It has 19 mono channels, 2 stereo channels and 2 groups.



Nick Jennings of S.C.P.D., the Project Leader, says 'Not only is this the 25th General Purpose system to be installed, but it is the first radio control room of this type to work with a narrator's studio as well as the main studio. Cardiff-2 is a large studio which can be used for a wide range of productions - drama, light entertainment and music.'

BBC Wales were involved with the installation of the equipment. Creighton Hales, a local engineer, did most of the preliminary testing work and was involved with the S.C.P.D. team in the actual installation.

A tape control panel and an apparatus bay complete the General Purpose package. The tape control panel allows an audio assistant to set up tape and disc machines without having to use any of the facilities on the control desk. This means that inserts and sound effects can be set up as the programme continues. The panel was made by Leever's Rich to a BBC design.

On average we are bringing a General Purpose studio into service every five weeks. BBC engineers adapt the basic design to fit the special needs of a studio. The desks have been manufactured to the same specification by Audix, Calrec Audio Limited, and Neve Electronics International Ltd., - all British manufacturers.

ROYAL OPENING FOR MANCHESTER MUSIC STUDIO

Her Royal Highness the Duchess of Kent was present at the opening concert in the new music studio at the Network Production Centre in Manchester on December the 11th. The new studio forms part of a £5.4 million development designed to bring the BBC's Manchester operations onto one site. The studio will become the permanent home for the BBC Northern Symphony Orchestra.

An unconventional approach to the design and construction of the new studio has resulted in a considerable saving in both time and costs. An eighth-scale acoustic model of the studio was constructed at Research Department and frequency-scaled tests were carried out using non-reverberant music played into the model. Music recordings made in the model were then replayed to both musicians and project-planners so that the quality of the studio's acoustics could be assessed before a brick had been laid.



HRH The Duchess of Kent talks to Charlie Sandbank (HRD)



The BBC Northern Symphony Orchestra rehearse in the new music studio

The acoustic response of the finished studio matches very closely the response obtained in the eighth-scale model, and architects, engineers and musicians are delighted with the results.

The construction of the building itself was begun in 1978 with drilling of auger-bored piles into the ground where rows of Victorian terraced houses and shops had once stood. The use of conventional pile-driving techniques was prohibited, because the noise could have been transmitted to existing studios on the same site.

The studio control room houses a thirty-two channel in-line mixing desk, purchased from Solid State Logic Limited as "off the shelf" equipment. The desk is capable of operating in

stereo, quad or multi-channel mix-down modes, with in-built signal processing.

Individual channel control is by voltage controlled amplifiers (VCA), each channel module incorporating an extremely comprehensive equaliser and sophisticated expansion and noise-gating facilities. Eventually the desk may be computer-assisted enabling even greater control of signal processing during multi-track operations.

A pair of Rogers BBC LS5/8 monitor loudspeakers allows the Audio Supervisor to monitor the programme from the studio, and Studer A80 tape machines are available for recording.

In addition a wide range of microphones can be used in the studio, including Neumann SM 69's, AKG C414's and Calrec 1250 s.



The Solid State Logic control desk

printed by the Print Unit E.T.D. Wood Norton