Post Office telecommunications journal

Winter 1976/77 Vol. 28 No. 4 Price 18p

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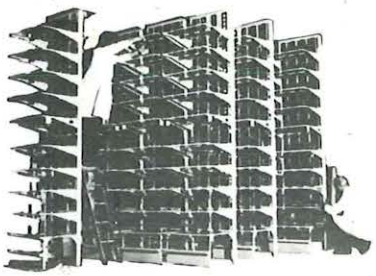

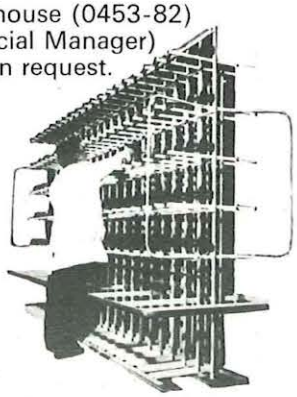

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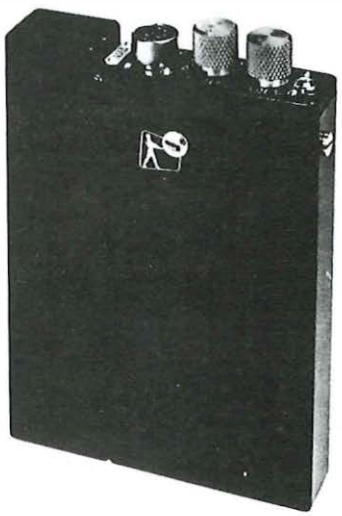

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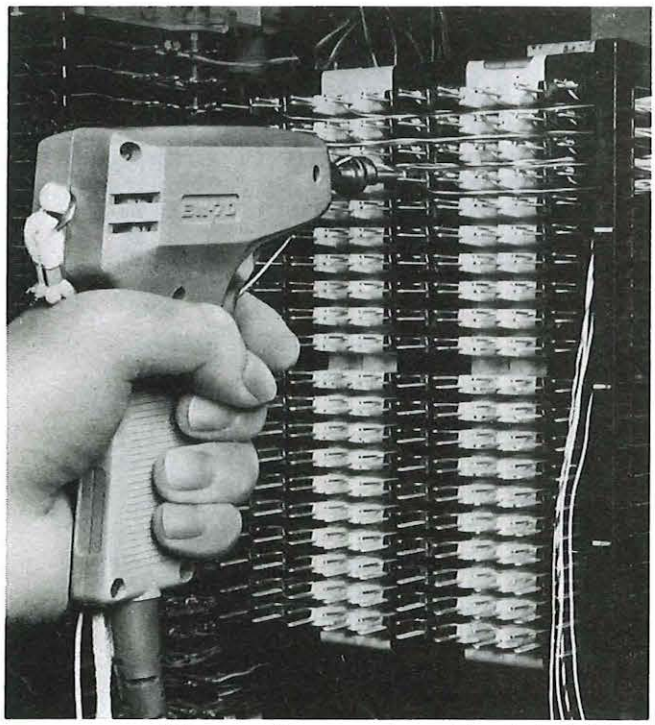

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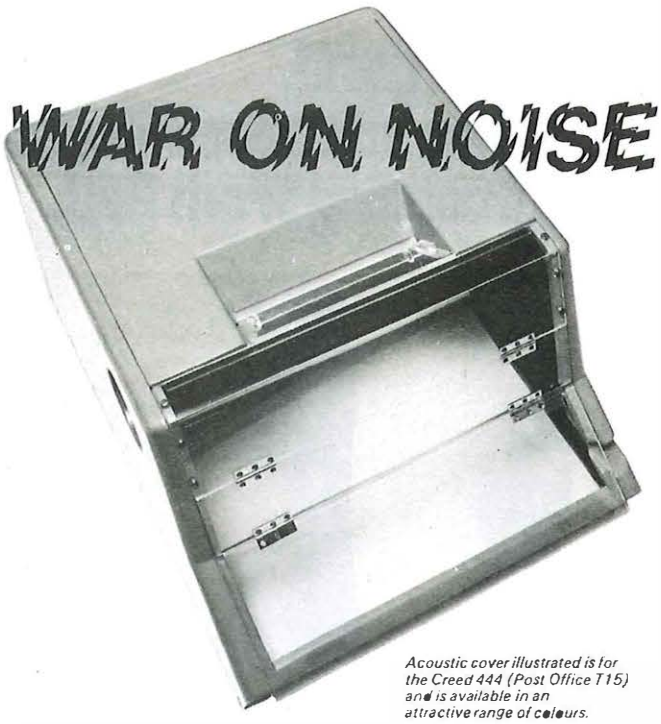

Acoustic cover illustrated is for the Creed 444 (Post Office T15) and is available in an attractive range of colours.

Noise has always been an irritant but now, in the 1970's with the ever increasing number of machine installations in offices, it has become even more of a problem. Indeed research has drawn attention to the fact that it is a definite health hazard.

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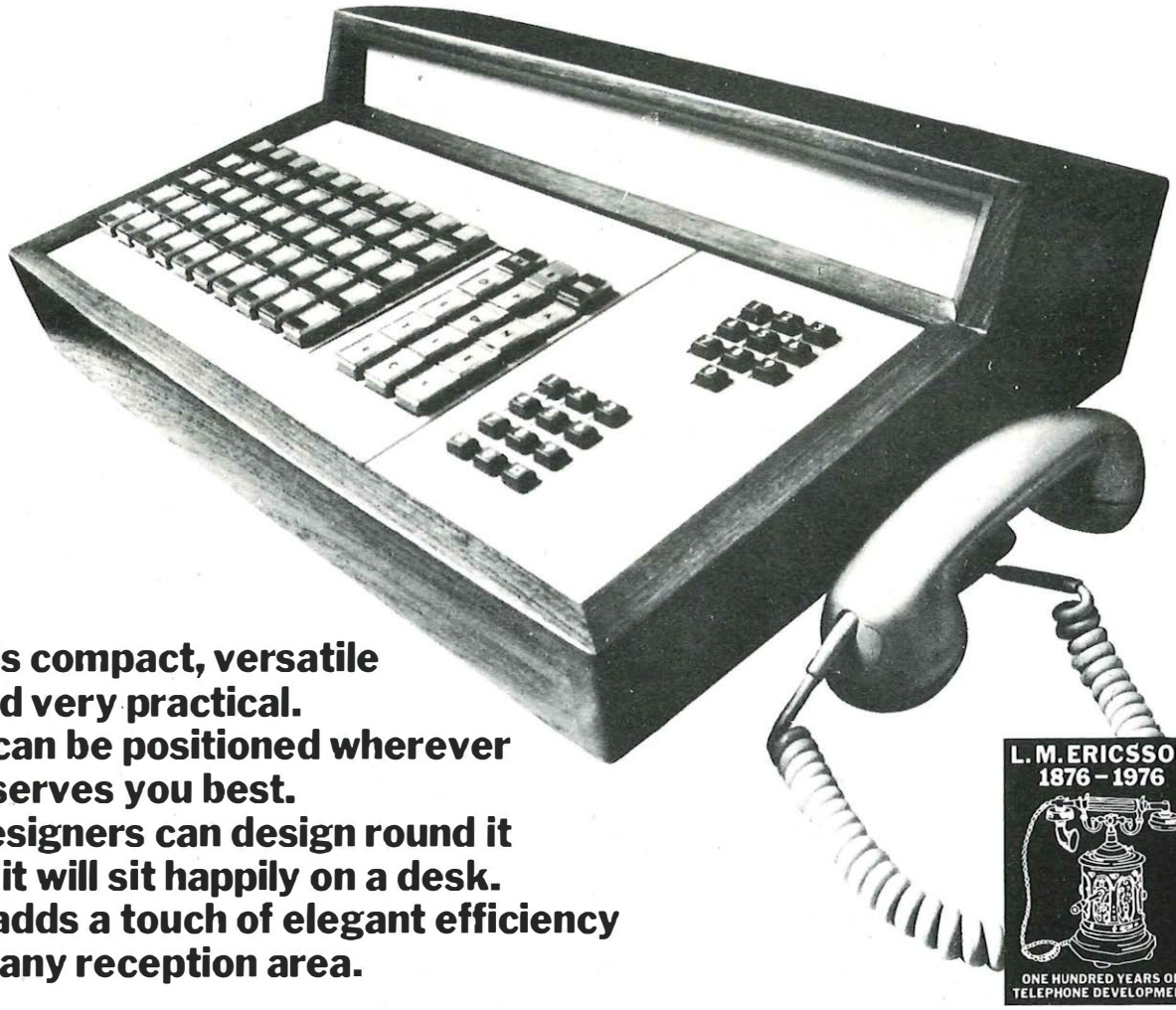

It is compact, versatile and very practical.
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It is completely automatic and gives the operator finger-tip control of the superb ARD 562 PABX.
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Designed to deliver maximum efficiency with minimum effort this PABX will often allow operators to have time for other duties. Your operators work faster and stay happier.

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The Thorn Ericsson ARD 562 (or its smaller version ARD 561) is available on leasing, rental or outright purchase. Let Thorn Ericsson take a good look at your special telecommunications requirements – it won't cost you a penny. Write, ring or clip this coupon for all the information you need for the next move. Act now.

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Ringing up the changes

A telephone call made between London and New York on 7 January 1927 heralded the opening of the first transatlantic 'phone service for the public. Until then telecommunications between Britain and the USA were limited to telegrams. On that historic first day a total of 31 calls were made – today about 34,000 calls are made between the two countries every day.

Other comparisons between the service 50 years ago and modern transatlantic telephony bring into sharp focus the enormous expansion and progress made possible by advancing technology. Probably the most significant result has been the dramatic reduction achieved in cost to the customer.

The first calls a half-century ago cost £15 for three minutes – equivalent to £135 in present money values. Today customers pay just 75p a minute for a self-dialled call during the working day, and as little as 56p a minute at off-peak rates.

Back in 1927, too, calls were restricted to a few areas on both sides of the Atlantic. The service was available only between 1.30 pm and 6 pm, all calls had to be connected by the operator and, because there was only one public circuit, a time limit was placed on individual calls when other callers were waiting. Communications over the link, which used long wave radio, also suffered from interference such as "echo" and "singing" effects, and atmospheric conditions sometimes even prevented effective conversation.

In contrast, customers in Britain with International Subscriber Dialling today can dial their own calls to some 150 million telephones in 48 American States. Developments in submarine cables and satellites have increased the number of links to the extent that there are now more than 1,000 circuits between the two countries. And vast improvements in transmission quality resulting from dedicated research and development have made reception on transatlantic calls as good as 'phoning someone in the next street.

● To mark the 50th anniversary of the first transatlantic telephone call, a special link-up ceremony was held between London and New York. *(See Miscellany, page 33)*

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Cover: The European Space Agency's orbital test satellite due for launch this summer undergoes tests in France. The satellite, which will be used to evaluate new communication techniques, is covered with a solar blanket to counter the effects of radiation. (See page 21)

IT'S A GOOD DEAL EASIER

R Morris

Staff in London's City Telephone Area have developed a switching and control board to improve the special communications facilities essential to dealers in the money broking business.

LONDON is still one of the world's major money centres – despite the uncertain pound – and every minute of the working day millions of pounds change hands in the City business houses.

Although quite different in character and aims the Stock Exchange, merchant banks, money brokers, insurance underwriters and commodity brokers have one thing in common – the need for instant and extremely reliable communications.

In fact speed of connection is so important it can mean the difference between a deal that is struck and one that is lost.

Basically the job of a money broker is to put a borrower and a lender in touch with each other. Often several brokers are asked to provide this service and the first one to find two parties with mutually acceptable rates gets the job.

This is why over the years the business houses have built up a complex network of private circuits, because the public telephone system is neither swift nor direct enough.

The terminal equipment on which these private circuits are connected varies in size from a 10 line concentrator for the small company, up to installations of over 300 lines at the top end. The largest money broker uses something like 1,000 private circuits graded and multiplied over 60 consoles, each having access to 300 circuits.

Until now the only Post Office equipment available to provide a comparable service was the key and lamp unit. But with the exception of the Stock Exchange and several money brokers, who have had multiple 10-way units built into their office furniture, the Post Office share of the business has been limited to the smaller installations with 10 or 20 way key and lamp units standing on desks.

Most of the larger installations have been provided and maintained by three or four private firms specialising in this market and recently privately-supplied equipment has begun to appear in the smaller end of the market.

Although the dealing switchboards offered by the private suppliers have had several distinct advantages over key and lamp units – such as speed and compactness – there are problems facing customers.

Privately supplied dealing boards are not allowed to be connected to the public switched network. So a customer who rents a private dealing board for private circuits must terminate the exchange lines and PBX extensions on handset telephones, or more commonly on key and lamp units. Thus the customer has two maintenance organisations to deal with for his terminal equipment.

Also there is difficulty in deciding where the responsibility lies when faults happen since the Post Office always maintains the circuits themselves. This uncertainty can delay prompt fault clearance.

In spite of these problems the advantages of the privately supplied equipment have outweighed their disadvantages for quite a few City Area customers, and at the moment most of the large installations use private equipment.

Grasping the nettle, the City Area conducted a feasibility study in August, 1974 to see if a system could be developed within London. The terms of reference for the study were to report on feasibility and cost.

The design objectives of the Post Office dealer board were that each circuit should have a separate appearance on each console and that there should be push button keys with integral lamp signalling. The console faceplate should be as small as possible, consistent with clear circuit designations set into the key tops.

Connection of circuits through the system should be arranged so that only one circuit at a time could be connected to any console. Seizure of a second circuit would automatically release any circuit previously engaged.

The switching units and the console face layout were built up in a modular form from standard plug-in units. The largest console envisaged was of 300 circuit capacity, and the largest installation would cater for 60 dealer positions.

Keysending rather than dialling was specified for circuits extended to the public network or PABX systems and the application and release of the hold facility on exchange or PABX extension circuits was to be at least as simple in operation as the key and lamp unit.

Line signalling facilities were to be compatible with the standard key and lamp unit line terminations and the flashing signals generated by solid state devices.

By January 1975 a report had been prepared showing how it would be possible to produce such a system within City Area resources. It recommended that as an interim measure, the Post Office key and lamp unit terminating relay sets could be used, without modifications, to

provide the transmission bridge and signalling conditions.

Access to the line relay sets should be provided by a switching matrix employing miniature Post Office 23 type relays controlled by solid state elements to give the one circuit only at a time facility.

The switching elements and control circuits together with the necessary signal generators should be centralised and mounted in 62 type rack practice. It was also recommended that the console switches should use magnetic reed elements with illuminated press buttons.

After the recommendations of the report were accepted by the City Area Board, a small project team made up from the Area Drawing Office and the Customer Works Group staff was set up to engineer and design the system.

One of the important parts of the Post Office dealer board was that most of the components used in the system were available through normal Post Office supplies. The exception to this was the reed push button key, and acting on advice from Telecommunications HeadquartersDevelopmentDepartment an initial supply of 3,500 was bought.

The first order was placed by the London Telecommunications Regional Headquarters (LTR HQ) on a locally placed contract but since then orders for a further 40,000 have been placed by Purchasing and Supply Department.

The key and switching modules, which were needed in large quantities, were constructed by local contractors known to the Area. LTR HQ sought tenders and placed the contracts. Various other units, needed in lesser numbers were made up in the Area workshop.

The Post Office dealer boards are particularly suitable for any business that needs a large number of lines and speedy contact, and the circuits can be exchange lines, private circuits or extensions.

All the units are specially made to fit in the customer's desks or consoles and the colour range is wide. Rotary dials have been replaced by the smooth-working and time-saving push-button keypads and the boards have ring/recall – hold – release bars.

Every dealing position has access to every circuit which means a large number of calls can be handled quickly while during quiet periods a skeleton staff can handle the calls.

Engineering maintenance is kept virtually to routine checks because of the high reliability from the long-life reed switches and miniature relays used. If there is a fault the modular construction of the units makes it a simple task to replace the defective part.

By the end of November last year three dealer board installations had been installed by the Post Office. The first was put into service at the First Boston Bank of Europe. Although a comparatively small unit made up of five dealers' positions each with facilities for 45 private circuits and 15 exchange lines, the installation was later augmented to seven positions and proved successful.

At a City broker's office staff make constant use of the Post Office dealer boards neatly housed in desk-type consoles.

Post Office Technician Moreil Lacide examines a console control circuit in the apparatus room adjoining the dealer board installation.

Cater Ryder, which is one of the original discount broking companies, was a larger installation. It was commissioned in June 1976, and comprised 15 dealers' positions each with facilities for 30 exchange lines and 180 private circuits.

Astley Pearce (formerly Paul Murray-Jones) is one of the major money brokers in the City and its installation was brought into service in August 1976. This is the largest of the three and comprises 46 positions each with facilities for 300 private circuits and 30 exchange or PABX extension lines.

The City business community has consistently indicated its willingness to use Post Office equipment provided that it is the most up to date on the market and is competitive in price. The Area sales organisation is geared to exploit this potential market to the full. A demonstration model of the dealer board has been installed in the Area Sales Bureau and sales staff are busily ensuring that the customers are aware of what is on offer.

Several more firm orders have been taken and many other potential customers are showing a keen interest. Development work on improving the City dealer board and bringing down the cost is already well advanced, although the only certain way forward is for the Area to continue to respond to market forces.

Mr R. Morris is Area Engineer, Customer Works, in London's City Telephone Area and has been closely involved with the development of the City Dealer Board.

The source of supply

JS Whyte

TAKE SATELLITES or stamps, clothing or cables or the largest telephone exchange to the smallest item of microtechnology . . . that's the range of activity within the responsibility of the Post Office's Purchasing and Supply Department which every year deals with thousands of different items worth many millions of pounds for the Telecommunications Business.

The Department, which is shortly to be split into Contracts and Provisioning Departments, provides similar services for the other Post Office Businesses on an agency basis, and is therefore responsible in one way or another, for the provision, replacement or renovation of virtually every item in use by the Post Office.

At present, the Department comprises three large units – Contracts, Supplies and Factories Divisions. And smaller units – Value Analysis, Quality Assurance, Works Contract Control and Works Contract Efficiency Divisions, and Patents Branch – carry out vital supporting roles.

Overall there are 9,600 staff, of whom about 7,800 are employed in the Supplies and Factories Divisions' depots and factories, far removed from work normally associated with a Headquarters Department.

Contracts Division is the procurement unit. With certain exceptions, it is responsible for the conduct and conclusion of all commercial and contractual negotiations with any actual or potential supplier of goods, works or services, or purchaser of scrap or surplus stores. The exceptions are contracts for the conveyance of mails, and for buildings undertaken by the Public Services Agency, dealings with the Stationery Office and contracts delegated to other Headquarters Departments or to the Regions.

For stores procurement, Supplies Division provides a regular flow of requests to place contracts for stock replenishment, and for non-standard items, ranging from exchange equipment to customers' apparatus, which led in 1975-76 to contracts valued at £190 million. Headquarters planning departments request contracts for centrally controlled major works such as telephone exchanges and transmission systems, which in 1975-76 led to contracts valued at £167 million.

Other Headquarters Departments, Factories Division or Regions may require contracts for goods or services

Offices, Factories and Depots of the Purchasing and Supply Department

outside their local ordering powers. Similarly, Research and Development Departments may require development contracts to further their own work on future aspects of the telecommunications system.

These wide ranging requirements call for working relationships with a vast number of suppliers, and skill in identifying additional sources of supply as necessary. The procurement procedures recognise that genuine competition assures the best bargain for the Post Office in terms of price, quality and performance, and that any departure from competition – for instance where only one firm can supply – must be subject to stringent precautions.

There is, therefore, considerable consultation and judgement at the contract tendering and negotiation stages to ensure that the Post Office – and its customers – are getting what is wanted, when it is wanted and at the best possible price. Since contract procedure and terms of contract are matters of significance in the eye of the law, consultation with Patents Branch on industrial property rights, and with Solicitor's Office on legal aspects generally, is often necessary. The pricing aspects of contracts may also require the expert attention of the Division's own accountants and technical costing staff.

Contracts Division is responsible for follow up action in the event of breach of contract or if a variation in the provisions of the contract need to be negotiated. It reports on progress of stores contracts, and determines the prospects of deliveries to meet Supplies and other Divisions' requirements. On works contracts, other Divisions in Purchasing and Supply Department have a role to play.

On exchange equipment contracts the Works Contract Divisions advise for instance on contractor's capacity, take part in the adjudication of tenders, and maintain a watching brief on progress until each contract is completed. At present this involves about 1,250 separate jobs ranging from £15,000 to £30 million in value with a total current value of £570 million, in respect of which the Divisions provide forecasts of the annual outfalls of expenditure.

Supplies Division is responsible for provision, safe custody, and distribution of some 68,000 items of engineering, stationery, general, clothing and security stores. Reliable, systematic and economic provisioning requires close collaboration with Telecommunications Headquarters Departments to determine the quantity and range of requirements, and with Factories Division to verify the rate at which recovered stores will be renovated for further use. Procedures are geared to securing a quick and reliable service to users of stores in the field, while maintaining minimum stock holdings. This is no easy task with a fluctuating demand and uncertain delivery prospects for the items handled.

Typical flowline activity at one of the Post Office's eight factories.

Distribution of engineering stores to field units is facilitated by a network of Territorial Supply Depots where the 2,000 or so items in frequent use are stocked. These are situated at Crayford, Birmingham, Bridgwater, Hereford, Preston and in Scotland (Edinburgh and Newhouse). They are supported by Central Depots also at Crayford, Birmingham and Bridgwater for the 20,000 slower moving items.

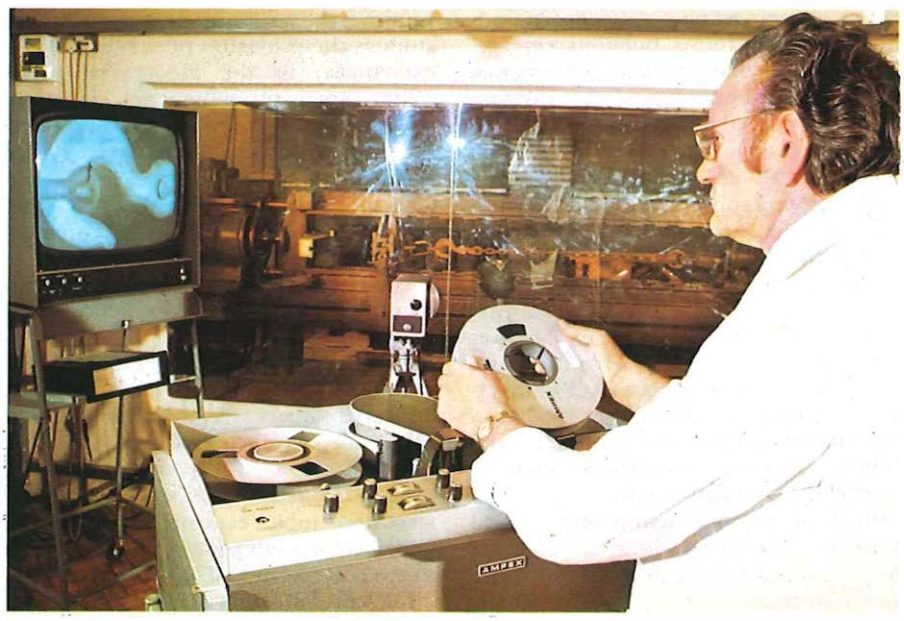
The system depends on the computerised control of stock, ledger and issue documents giving an up to date picture of the quantities and location of stores available for issue. Requisitions from Areas are processed in London and sent to depots by the quickest available means – the overnight Datapost service for instance.

Deliveries are then arranged by the Supplies Division's own fleet of vehicles operating scheduled runs to meet the particular needs of service areas. Equally important is the role of the Territorial Supply Depot Manager in providing liaison between the Areas he serves and the Supply organisation in general.

A purpose built stationery, general and clothing Depot at Swindon provides a direct service to General Managers' offices, Head Post Offices and some 22,000 Sub-offices (apart from Scotland, Northern Ireland and parts of Northern England which are supplied from Edinburgh Depot).

An important feature of the Division is the provision of security items – stamps, postal orders, licences, etc – through Hemel Hempstead and associated depots. This involves supervision by Supplies staff of contractors' printing, and control of security waste. The face

A technician at the London Test Section monitors tests on a 30-ton tensile testing machine using closed-circuit television and a video recorder.



A Supplies Division vehicle prepares to transport a former naval gun mounting from Smallford in Hertfordshire to Goonhilly earth station for use in supporting a dish aerial.

Right: Some of the many and varied activities undertaken within the Post Office's Purchasing and Supply Department.

value of the principal items of stores in this security category amounted to £2,133 million in 1975-76.

Supplies Division also provides a wide range of reprographic services, including printing of forms, booklets, reports, telephone exchange reference records, internal telephone directories, instructions and circulars. It also advises on drawing production and retrieval systems for TXE4 and System X, and provides photographic and illustration services for the Businesses.

Factories Division is responsible for a wide range of repair, servicing, modification, construction and manufacture. This is undertaken in eight factories situated in London, Birmingham, South Wales and Edinburgh. The diversity is enormous. Repairs of recovered equipment range from pole jacks and jointers' tents to telephones, teleprinters, and Datel equipment.

Flowline practice, using semi-skilled staff, is used where the quantities are large enough, but a fifth of the work involves small quantity jobbing repairs requiring skilled staff. Costs work out to less than half the value of the items repaired to a good as new condition.

Modifications to equipment also aim to improve the value of existing facilities such as the provision of STD on mobile exchanges, or the modernisation of older types of telephone exchange switchboard. This type of work often requires work to be done on site rather than in factories.

Factories Division provides a valuable service to the Business by manufacturing many items of equipment, such as specialised relay sets and testing equipment, which are required only in limited quantities.

Using a process developed in the Division over 28 million rigid and self-adhesive labels for switchboard and other purposes are produced annually. The Division also produces a wide range of "one-off" and small scale construction jobs, especially production and development prototypes to meet the needs of Regions and R&D Departments.

The diverse functions of these main

units is thus clearly apparent, but the picture would not be complete without further reference to the supporting Divisions mentioned at the beginning.

Value Analysis Division aims to secure savings by fostering the redesign of equipment to fulfill its main functions at lower cost. Potential savings of £11 million per annum have been identified and actual savings of £4 million per year have been realised. Technical Costs Officers in Contracts Division identify high cost areas in existing designs and provide estimates of the costs of alternative designs proposed by VA Division.

Quality Assurance Division, with separate Test and Materials Sections in London and Birmingham, is responsible for the quality of manufacture on Post Office contracts for engineering supplies. This requires close surveillance at contractors' works to verify that standards are maintained. Work is undertaken on behalf of overseas administrations on an agency basis.

An important service is the calibration, servicing, and repair of test equipment used throughout the Post Office to ensure continued reference to United Kingdom National Standards. Materials Section scientists are also responsible for the choice and limitations of materials used in specific applications.

In addition to progressing switching contracts, the Works Contract Divisions have a wide knowledge of industry performance capability and manpower capacity and provide an essential interface between industry, Regions and THQ Departments. The Works Control Efficiency Division liaises with industry on the reduction of times for the manufacture and installation of exchange equipment, on installation procedures and standards, and the production of technical documentation for works contracts.

The Patents and Licensing Branch safeguards the Industrial Property interests of the Post Office. This involves legal discussions with the Patent Office to protect Post Office inventions, designs and trade marks, and guidance and advice to help the Post Office avoid infringement of the Industrial Property Rights of others. An increasing amount of work is concerned with advice to Contracts Division and particularly the exploitation of rights derived from contracts and the fruits of Post Office research.

Purchasing and Supply Department, therefore, covers a wider field and serves other Post Office Departments in many more ways than might be realised. Future editions of the Journal will explore more thoroughly the activities of individual Divisions.

Mr J. S. Whyte was until recently Director of Purchasing and Supply Department. He is now Senior Director, Development, at Telecommunications Headquarters.

Key development for DQ service

AB Laing

The Directory Enquiry Service is to hold trials of an information retrieval system in which operators key customers' enquiries into a computer and receive the required numbers on visual display units. The system is designed to maintain efficiency in handling the ever-growing volume of Directory Enquiry work.

EVERY weekday 8,000 Post Office telephonists and supervisors handle one million directory enquiries at the 260 automanual centres and DQ bureaux throughout the country. To provide an efficient service they rely upon their memories, lists of frequently called numbers and, most important, upon directory records.

The average time taken to handle enquiries has shown much improvement in recent years, but it has been apparent for some time that growth in the telephone system will eventually negate the effort of the operators. Directory records, in fact, contain 14 million entries and are likely to grow to 17 million by 1980. Over the same period it is estimated that the number of directory

A telephonist at Leatherhead DQ bureau operates a keyboard and visual display unit which will be used in a trial of the new computer information retrieval system.

enquiries could increase by one third.

The increase in the bulk of directories is now such that it is no longer practicable to find enough space to accommodate a complete set of directory records in some places, and this situation will continue to deteriorate so that operators will have access to fewer of the directory records. Increase in the weight of directory records and keeping the growing records up to date are other problems.

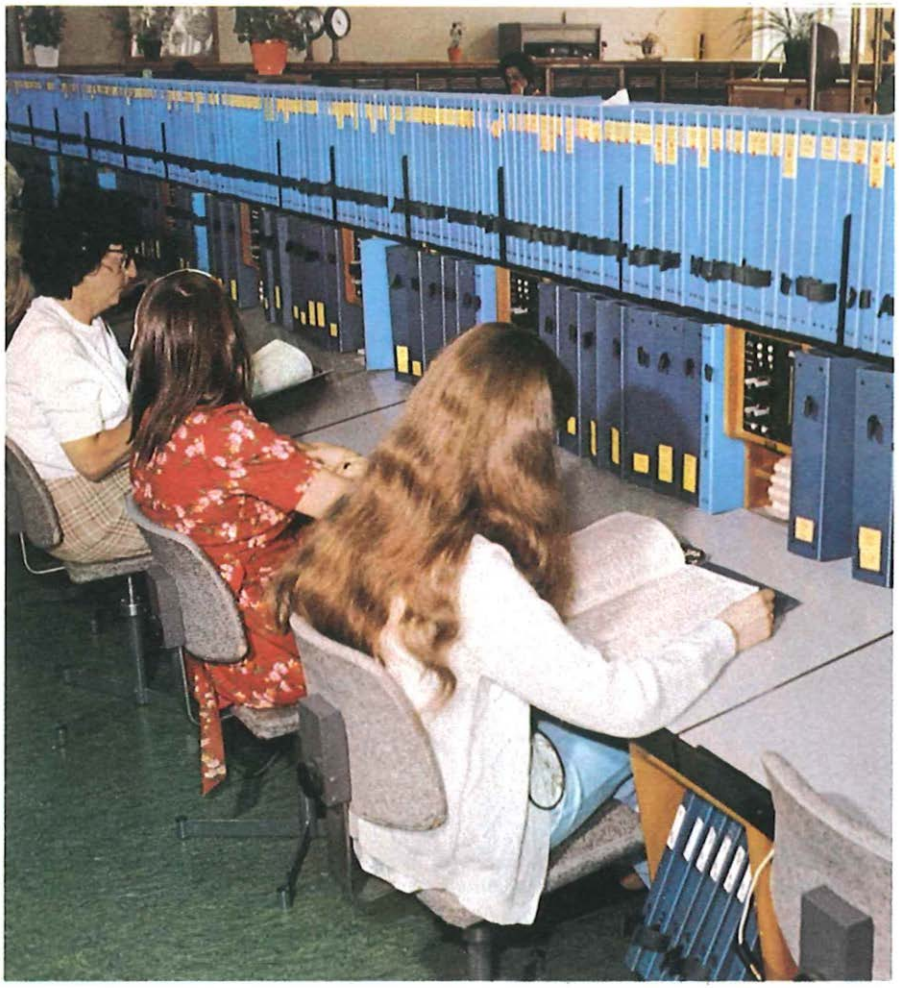
These problems were, of course, first anticipated several years ago and there has been considerable research and development into ways of producing a solution, at least until the year 2000, so that an efficient DQ service can be maintained. It was immediately obvious that the combination of problems could only be solved by a system which was both automated and could contain the directory information in less bulky form. The systems best meeting these criteria, and around which studies have centred both in this country and abroad, are based on the directory information either being stored on microfiche or magnetic discs.

In a fiche system a page of directory entries is replaced by a page of microfilm entries. Each fiche will normally incorporate between 50 and 150 pages of these microfilm entries depending upon the magnification available in the associated viewing equipment. The range of sophistication with this system is considerable. There is manual selection of fiche and an individual page, keyboard indexing and electromechanical selection and, ultimately, a computer assisted system where a keyboard is used to feed instructions to a mini-computer controlling the retrieval and display of the required fiche and page.

With magnetic discs a computer system utilises the storage capacity of the discs and its processing power to reach particular entries of directory information thus creating a computer information retrieval (CIR) system. The system works by means of a visual display unit (VDU) and associated alpha-numeric keyboard linked to the computer.

Some foreign administrations, notably France and Germany, already have manual microfiche systems and the Post Office is currently developing a system with the potential to provide an interim solution to the DQ service problem up to the early 1980s. (See Telecommunications Journal, Summer 1976.) Computer controlled fiche systems are also being used, particularly in the United States of America, Belgium and Spain. Most major administrations have expressed their intention to move to CIR systems eventually although until recently they had not proved successful.

The significant factor in any computer solution to the DQ problem is the size of the information file. While conventional computing techniques can produce a solution for administrations with one or two million entries, with larger files the cost of accessing data by conventional methods rises disproportionately, as does the information retrieval time. Previous Post Office studies confirmed these facts and in the USA the Bell Telephone Company experimented with both fiche and CIR systems before opting for the former on economic grounds.



The more traditional DQ system of working, in which operators need to have easy access to a large number of directories.

The current Post Office studies, which began in 1973, considered all major existing and potential automated systems. It was during this period that International Computers Ltd (ICL) demonstrated a new approach to computerised information retrieval from a large data base using their newly developed Content Addressed File Store (CAFS).

In conventional systems content addressing is usually achieved by constructing a number of indexes in the central processor unit (or main frame computer) to point to the required record. The CAFS approach is to adopt conventional disc storage facilities and to incorporate a mini-computer in the disc controller with the ability to process the records read internally in a continuous stream from a disc surface.

At the same time throughput is maximised by scanning multiple surfaces simultaneously. Detection, comparison and logic can be carried out within the disc controller without reference to the central processor unit, which means that searching is faster. CAFS is, in fact, basically a modified disc storage system designed to scan large quantities of data very rapidly at low cost.

In any information retrieval system the overall system performance will be related to the maximum transaction rate and the speed with which the computer can access the data on file. The CAFS development was considered to have sufficient potential to try it out in a "live" situation and an experiment took place in 1974 at Hemel Hempstead, Herts, using a small file, the Bedford Telephone Area directory, on one DQ position.

Although the arrangements were very basic anddiffered in many respects from a national system, the results were encouraging and indicated that the system had potential. Subsequently, authority was given for a CIR system using CAFS to be developed with a view to holding a comprehensive trial in the current year.

The Post Office Data Processing Service (DPS) has been the main force in the development work towards a CIR system and is currently completing the design work for a system incorporating CAFS for the forthcoming trial. The system will

A DQ operator at work during the first, small-scale computerised information retrieval experiment at Hemel Hempstead.

have access to about half of the national file of directory entries; a limitation dictated mainly by the cost involved. This should not be serious, however as the make-up of directory enquiries at a particular location is such that between 80 and 85 per cent of all enquiries can be answered from an appropriate 50 per cent of the directory records in the national file.

The trial of the CIR system devised by DPS will be run at Leatherhead DQ bureau in London Telecommunications Region and Leeds Basinghall automanual centre, North Eastern Telecommunications Region. Between eight and 10 positions at each location will be equipped to use the CIR system. The trial is scheduled to last for 10 weeks and will be run each weekday during the day and evening periods.

For the Hemel Hempstead experiment, operators were selected to provide a cross-section of abilities coupled with a variety of ages and experience. Past evidence suggests that operators should have no difficulty operating the system and there will be no special selection this time.

Each operator involved in the trial will be trained to use an alpha-numeric keyboard for the input of information offered by the customer. An associated VDU will display both the information keyed in by the operator and any information returned by the computer in response. The keyboard and VDU will be linked via a local controller and dedicated circuits to an ICL 1903 computer.

For some years now customers have been disciplined by the DQ operators' "initiative procedure" of presenting information to the operators in a certain form. The input procedures to be used by operators during the trial will allow this questioning technique to continue unaltered and the customer should be unaware that he is helping to test a CIR system. The operator will have six information fields into which information can be allocated; town, name, initials, street, number and miscellaneous fields. The number of fields used will vary from enquiry to enquiry, depending also upon operator expertise.

The fields are largely self-explanatory apart from the miscellaneous. This will enable the operator to input supplementary information to help specify the particular directory entry required. This could indicate a profession, a business classification, a department within a local authority, or any other additional information which might feature in the directory entry required. It is a particularly useful and powerful input parameter which should allow operators considerable flexibility in using their own initiative.

Information will not be keyed into the system in full. As a rule town, name and street will be sufficient but there will be times when more, and sometimes even less, information should be keyed in. It is expected that once operators have gained the necessary experience, their natural initiative will come to the fore and they will quickly learn how much information to put into the CIR system.

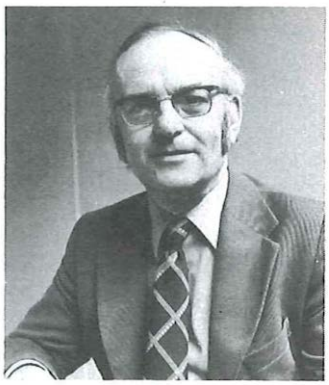
The initial response to any enquiry will include in the display the number of entries matching the input data and the total number of pages of output this represents. This will allow the operator, when faced with a screenful of entries, to decide whether further action such as paging forwards or backwards or alternatively keying in further data is needed to locate the required entry.

Similarly when dealing with a name with alternative spellings the operator can instruct the computer to miss a character in the customer record by keying in an asterisk at the appropriate point. RE*D for instance would match all entries covering READ, REED and REID. These refinements along with others when combined with the basic CIR system should provide the operator with a powerful tool to deal with problems facing the DQ service.

The trial should allow the Post Office to evaluate this tool in terms of system performance, operational acceptability, staff opinion, financial benefits, ergonomics and human factors aspects. If all these match up to expectation then this CIR system could form the basis of the DQ service until the next century.

Mr A. B. Laing is a head of group in Service Department at Telecommunications Headquarters responsible for long-term planning for the DQ and EQ Services.

Creating good relations



The Post Office's Public Relations Department is one of the smallest units in the organisation. Of its staff of 70, nearly half work full-time producing publications like Telecommunications Journal, Courier and the Post Office Gazette.
The Department, however, enjoys the distinction of being able to claim that everyone in the Telecommunications Business– and, indeed, the Post Office – is on its strength.
Here PETER H. YOUNG, Director of Public Relations, explains why he feels he can make this claim.
It is the first of the two articles discussing the role and importance of public relations in one of Britain's major industries.

ONE OF THE more rewarding aspects of being DPR is that I know I can count upon the support and goodwill of an army of ambassadors that is thousands strong. I call them ambassadors because that is precisely what a telephone engineer becomes the moment he knocks on a customer's front door; that is what a telephone operator is when she deals with a caller who might be upset, even distraught. It is the Post Office's unique privilege of serving every member of the community that puts each one of us at some time or other in the position of representing the organisation for which we work.

This leads me to my first main point: the "image" – or reputation – of the Telecommunications Business is not created by me or my Department. It is the sum total of the actions of everybody who works for the business – the managers who create and define the service we provide, those who come into contact with the customer – and the actions of a very important group of people who are outside the business, usually referred to as the opinion-formers. In broad terms these are various public figures, Members of Parliament, journalists and broadcasters – anybody with an opinion to voice and the means to make himself heard and a motivation that can range from a genuine appreciation of the organisation to the furtherance of narrow commercial or political objectives.

You might think that far too much notice is taken of this relatively small band of people, and that when they criticise us for some minor shortcomings we take their words too much to heart. As the man who is often in the position of having to find the right answers, I have to admit that I sometimes come close to endorsing this view. But looking at it objectively, this is all part of the society in which we operate; it is part of the clamour of the market-place and it must

A Post Office ambassador at work: Technical Officer John MacArthur discusses data printout from an IBM communications system at Roche Products, Welwyn Garden City. The equipment is maintained by the Post Office.

Post Office ambassadors all –

Top left: Sharon Lambert, a telephonist at Edmonton AMC in North London, gives assistance to a customer.

Top right: Technician Arthur Oates completes the installation of a telephone in the home of an elderly customer.

Bottom left: Sales Representative Ron Flood outlines the facilities of the Post Office radiopaging service to Norris McWhirter, Editor of the Guinness Book of Records.

Bottom right: In London's North Telephone Area, Sales Bureau Officer Fred Thomas describes the Keyphone to residential customers. The bureau has about 300 visitors every week.

be recognised that a monopoly public service such as Telecommunications is particularly vulnerable to criticism because by virtue of its proud traditions the public regards its success as theirs by right and any failures as a breach of faith. That is one of the reasons why so often we do not get all the credit we deserve.

By the nature of things most of our national opinion-formers are in London and this is a good reason why the public relations effort of the Post Office is concentrated in the Capital. But I do not wish to give the impression that the bulk of Post Office PR work is in London; indeed, two-thirds or more of the work is done outside London.

I shall return later to the details of the different responsibilities and functions of PRD and the Regional PR force. For the time being I would like to look broadly at the objectives, role and organisation of public relations in the Post Office.

The 1976 Corporate Plan defines the Post Office's PR objectives as being to create a favourable climate of staff and customer opinion, thus assisting the Corporation in achieving its declared objectives by projecting the Post Office to customers and staff as an organisation which:

- Cares for its customers and aims to give them the service they want at a fair price representing good value for money;
- Is efficient and forward-looking;
- Cares for its staff and aims to be a good employer.

These are very wide terms of reference and they mean that PRD has an interest in everything that affects the views and opinions which the public and our staff form about the organisation. I have expressed the PR objectives in Corporate terms but they are equally applicable to the business, particularly as the public sees the Post Office as a single entity, and in that sense, PR for the Telecommunications Business cannot be divorced from PR for the Post Office. The interdependence is seen at the very top of the organisation where the Chairman and Chief Executive is directly responsible for overall PR policy, strategy and practice throughout the Post Office.

It is my responsibility to develop and implement PR strategy on the basis of Corporation and business objectives and to do so I work directly to the Chairman, Deputy Chairman and other Board Members. My staff carries out all public relations work on behalf of the businesses at headquarters level.

In the Regions, the Public Relations Officers and their staffs provide PR support for the management. The work of the RPRO differs in one important respect from that of the typical PRD man in that it includes a big element of publicity and advertising. At headquarters, the publicity/advertising function is carried out within the businesses by the appropriate Marketing Department.

The definition of our objectives – to create a favourable climate of staff and customer opinion – is also a fair definition of PR itself. How do we set about creating this favourable climate?

The short answer is that we cannot do it at all if we are building on sand. If the service we are promoting is basically sound, PR can foster an image of an organisation that is inventive and innovative, bold, imaginative and forward-looking, fast growing, brilliantly successful and on the brink of new achievements, and obtain sympathetic understanding of our more stubborn problems.

This is the basis of successful public relations work; if the service is first-rate and our attitude to the customer sympathetic and caring, we can build an image and a reputation upon firm foundations. But there is no magic public relations wand that we can wave to bur-

nish the image of a service that fails to come up to the customer's justifiable expectations.

I have emphasised this point because there are some who tend to regard public relations as the last resort, the port of refuge when things go wrong and a management device only to be employed when all other remedies have failed. In PRD we refer to this attitude as the "Fire Brigade" approach and while there is generally some way in which public relations can take the heat out of a given situation the best solution is to prevent the fire starting in the first place.

This leads naturally to my second point: public relations is a management discipline, a vital management aid which must be given due weight when business policies and decisions are being formulated. In the past there have been examples of the unfortunate results of decisions made without consideration of the public relations factor.

However, I am happy to say that today there is a much closer working relationship between PRD and the business and we are having a much smoother ride in the media as a result. The fact that this coincides with a period of stability in telecommunications prices enables us to devote more time to projecting a positive picture of the business.

The communications explosion, about which so much has been written, is not confined to telecommunications – the media has an insatiable appetite for information. By taking the initiative in telling of our plans and achievements we not only do something to meet this demand for information; more importantly, we are able to ensure that attention is directed towards the positive aspects of the business.

We employ the full range of public relations activities in presenting a positive case. This includes press releases, which are sent to all national newspapers and radio and TV organisations by PRD (Regional Public Relations Officers adapt national press releases for local use); a continuous flow of feature articles and photographs for general and specialist newspapers and magazines; background briefing for MPs, leader writers and other selected groups of journalists; press conferences and "facilities" – visits to Post Office installations of special interest. And from our routine contacts with journalists and broadcasters we are able to add significantly to the knowledge of public attitudes which is so necessary in determining business strategies.

We cannot always take the initiative in putting over the Post Office case. Every now and then a newspaper will publish an article concerning the Post Office without consulting anyone in the organisation and our first knowledge of it comes when we see the article in print. Or, if we are lucky, the paper will ring up the Press Office at CHQ before it publishes. In the latter case there is a lot we can do to turn the situation to our own advantage by steering enquiries into more positive channels, providing authoritative information to correct possible misunderstandings, or even persuading the paper to drop the story altogether. We get something like 4,500 such enquiries a year and it is a tribute to the business itself and the skill with which these enquiries are handled that so few develop into adverse issues.

Once a critical story – or a reader's letter – has appeared, however, the question of a response becomes a matter of professional judgment. If one is called for, it is given. But although every critical, or misinformed item is considered for a possible reply, there are some occasions, happily few, when it is better not to react than to run the risk of provoking even more adverse coverage. When we make this decision – which is a conscious action and not an oversight – the point at issue is usually soon forgotten.

No less importance is attached to the internal side of public relations work. As I said at the beginning of this article, I know that we can count on the loyalty and goodwill of all our staff to represent effectively the Post Office case in their contacts with customers. But this can come about only as long as the Post Office acknowledges the obligation it has to bring staff fully into the picture when important decisions are made.

Much is done in this field already and it pays handsome dividends. There is a lot more that could be done and, for my part, I intend to see that even greater emphasis is placed on this crucial aspect of public relations. To adapt slightly a letter of mine which appeared in a recent issue of Management News, and which many readers of the Journal will have seen, if every one of the 240,000 staff of the Telecommunications Business can convince 10 friends, that represents two and a half million people who have been contacted personally. I think that it is an effort well worth making.

Thyristors boost power control

SF Humphreys

For the first time the Post Office is using small solid-state devices, called thyristors, in modular power plant to provide more economical control in converting public mains supply to direct current for telecommunications installations.

THE POST OFFICE decision seven years ago that all new telecommunications equipment should be designed to operate at direct current from a standard −50 volt supply and that no longer should exchanges, repeater stations or other installations be provided with a variety of power plants, led to the development of a single new modular power system. This system has now become an increasingly familiar sight at telecommunications centres throughout the country.

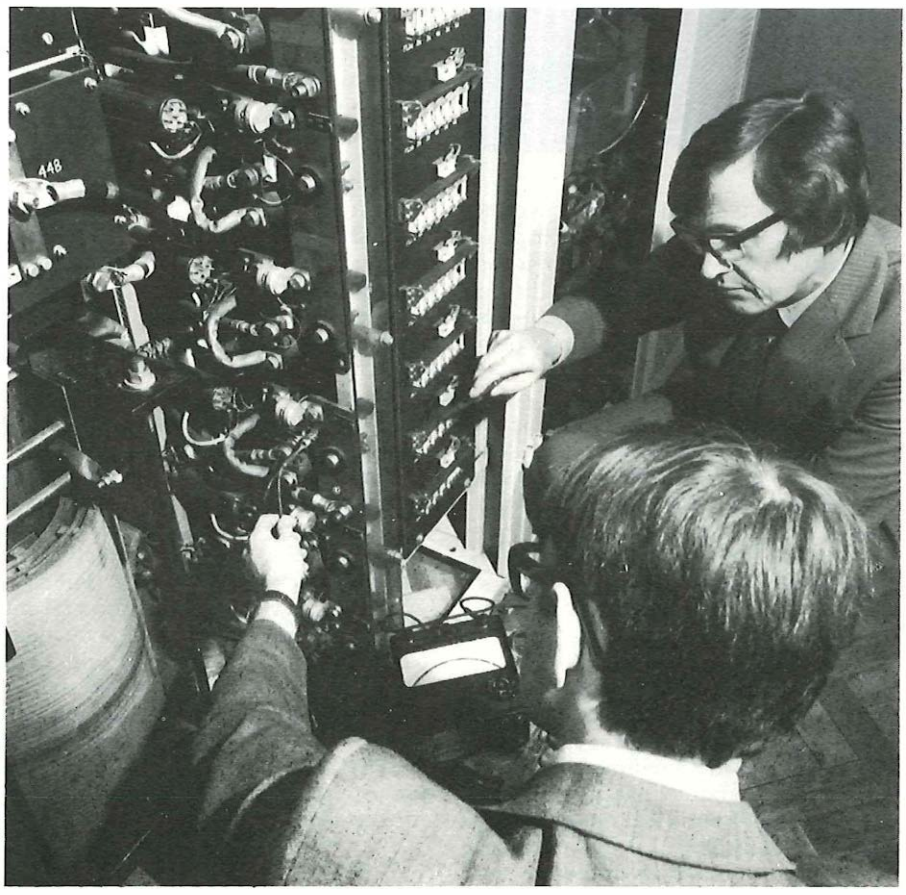
At the heart of modular power is a Power Plant No 233 which consists of self-contained fully-automatic power modules. Each module is made up of a rectifier cubicle and a lead acid battery. The rectifier converts the public alternating current supply into a −50 volt direct current supply for distribution throughout the building via overhead aluminium busbars. The battery stores sufficient energy to maintain service during short breaks in the public AC mains supply. For prolonged breaks, AC supplies are generated on site by an automatically started engine/alternator set. By this means the telephone service is always maintained during public supply failures.

The main advantage of modular power is that standard units (modules) can be linked together. This means that instead of having to equip a new exchange with one unit large enough to last for, say, 20 years, the Post Office can gradually increase the generated capacity of a station by using modules of lower rating. Normally, not more than four modules would be planned to meet the ultimate demand of a fully equipped building although technically more modules could be provided if necessary. The modular power concept embraces all the power equipment necessary from the public supply to the telecommunications equipment and includes diesel generators for AC standby, DC plant with a standby rectifier, batteries which provide reserve power for an hour and distribution busbars.

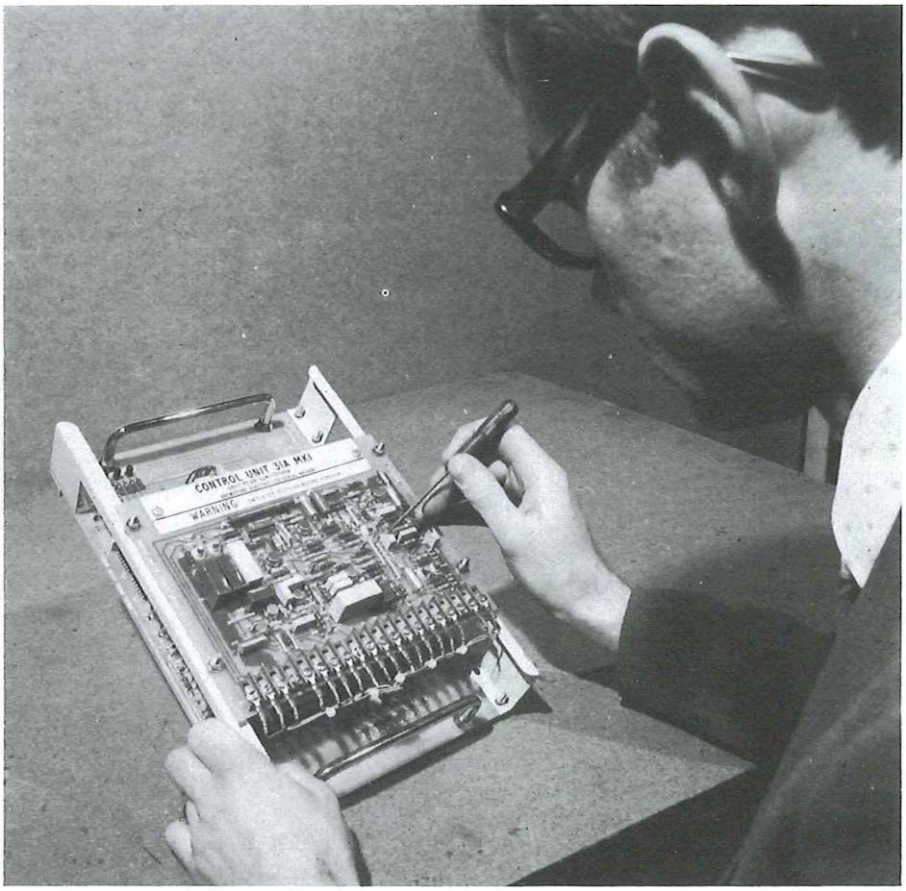
Development and production of the DC modular plant has proceeded in two stages. The first stage covered the development of modules with current outputs in the range 50 to 300 amperes. This development is now complete and the first plants are now in operation. More than 800 rectifiers have been manufactured and delivered to about 400 exchanges.

Rectifiers in the 50 to 300 amp range use silicon diode elements to convert the AC to DC. A silicon diode is a solid state device which allows current to pass in one direction only but it cannot control the amount of current rectified. To do this transductors are used which provide variable impedance in the path of the alternating current. Control by this method becomes uneconomic for very large rectifiers because of the amount of iron and copper used in the construction of transductors.

The second stage of development concerns modules in the size range 500 to 5,000 amps and now involves the Post Office in the use of power thyristors under digital control for the first time. A thyristor is a solid state device similar in appearance to a diode but it will only conduct when a signal is applied to a



Using a multimeter, the author (top) and Mr Bob Partridge check the voltage drop across a thyristor in the rectifier installed at a telephone exchange.



An adjustment is made to the voltage level of a thyristor control unit which can be used with all rectifiers in the 500 to 5,000 ampere range.

"gate" terminal. In the new equipment, electrical pulses generated by a control unit are amplified by pulse transformers to provide a high level of energy for a very short period to force the thyristors into conduction. In this manner controlled rectification is achieved without the use of bulky transductors.

Thyristor rectifiers have been used widely in industry for about 10 years and the Post Office is now confident they will prove quieter, cheaper and smaller than traditional transductor rectifiers for the larger equipments. There is also the bonus that they provide the opportunity to develop a standard control unit applicable to all sizes of rectifier. In the new equipment a significant cost advantage has been achieved by using a novel DC smoothing filter to avoid the use of traditional interphase transformers.

The thyristor control unit uses a printed circuit board divided into two separate sections. The first section amplifies errors in the output and by reference to a fixed standard provides a command signal to the second section. Here the information is translated into a train of 12 pulses synchronised to the incoming supply. This is necessary to reduce distortion of the public AC mains supply to below the level recommended by the Electricity Council.

These pulses are then fed to pulse amplifiers mounted adjacent to the thyristors and are advanced or retarded to compensate for changes in the input and output of the rectifier. This digital method of control is far more precise than traditional methods of thyristor control and as a result reduces the cost of the power filter necessary to limit background noise on the telephone system.

The digital approach also provides excellent possibilities for further simplification and cost reduction, by use of large scale integrated circuits such as those used in pocket calculators. This should reduce the complexity of construction and within 10 years it should be viable for manufacturers to produce the circuits specially for the Post Office.

Eventually, there will be a standard power circuit and control system for all sizes of equipment in the 50 to 5,000 amp range and the mechanical design will be standard for any one size. This range will also employ the same standard relay, control alarm circuit, and control panel layouts as at present used in the smaller transductor rectifiers.

Standardisation to this scale will reduce the cost of training maintenance staff and simplify service procedures, because any type of rectifier will be of the same construction irrespective of manufacturer and all sizes will use the same basic electrical circuitry. Additionally, the Post Office will own the fully documented design of these equipments which will also allow significant savings in rectifier costs and simplify quality control of production.

The most valuable aspect of the control system is that a control unit can, without adjustment, be fitted to any −50 v load rectifier or any −5 v auxiliary battery charger rectifier within the rectifier of the Power Plant No 233. The control units and pulse amplifiers in any one equipment are supplied by a small power unit. Light emitting diodes – semi conductor devices which glow when energised and go out when there is a fault – are used to assist in fault finding. One spare control unit is provided for each power plant and this is mounted within the standard rectifier of the Power Plant No 233.

Rectifiers of 3,000 amps and 5,000 amps are of a higher rating than any rectifiers previously used by the Post Office. A 5,000 amp rectifier is 6.3 metres long, 1.83 metres wide and 2 metres high. The complete unit weighs 10 tonnes. The battery used for a 5,000 amp module is made up of 25 cells with a capacity of 15,000 ampere hours. The physical size of this battery is about 1,000 times that of a car battery.

Because it is impractical to test fully these large thyristor rectifiers at the manufacturers' works it has been necessary to prove finally the prototype designs after installation with the help and co-operation of Regional Headquarters staff. For site test purposes water cooled load resistors are being employed to test these large rectifiers. It is expected that resistor units will be developed to absorb 2,000 amps each.

To ease transport and delivery, all single items of heavy equipment such as transformers and chokes are removable and can be handled separately. Disconnection of the rectifier component parts has been engineered to be as simple as possible. All the thyristor rectifiers can be dismantled into sections small enough to pass through standard access doors. Nevertheless, delivery of these large sections can be very difficult at sites where the access to the power room is restricted, or the intended location of the equipment is above or below ground floor level.

The first of the prototype rectifiers with a rating of 2,000 amps each are now on site at the Faraday International Exchange in London. Excellent co-operation has been given by the London Telecommunications Region and City Area staff alike to enable an extensive test programme to be carried out. The station load was transferred to this equipment during November last year.

Orders for the first production thyristor rectifiers have been placed with industry and the first deliveries began late last year. Within the next few years most of the larger telecommunication centres will be equipped with these modern, reliable and cost effective rectifiers.

Mr S. F. Humphreys is head of the group in Operational Programming Department at Telecommunications Headquarters responsible for direct current power plant development.

PO Telecommunications Journal, Winter 1976/77

COINBOX ON WHEELS MOVES AHEAD

BE Adams

A purpose-designed portable coinbox which can be mounted on a trolley has completed successful trials, and deliveries of the first production models are expected towards the end of this year.

IT WAS almost 11 years ago that the then Postmaster General, Anthony Wedgwood Benn returned from a seven day fact finding study of the Japanese telecommunications and postal systems particularly impressed by the number of public telephones that were available.

There were far fewer kiosks than in Britain, but the number of rented portable coinboxes in public use was much higher and Mr Benn was quick to suggest that a similar market might exist in the United Kingdom which could be a source of considerable additional income.

At the time there was no purpose-designed coinbox available with which to exploit readily this potential market. Thus it was decided to modify the Box Coin Collecting (BCC) 705, as used in kiosks, by painting it red and making it suitable for table or trolley mounting. Entitled the BCC 735, it was introduced in 1966 but proved to be unpopular and further modifications were decided upon. These entailed the fitting of a carrying handle and cord winding cleat and in its modified form, was made available during 1972.

Despite the changes the apparatus suffered several inherent disadvantages which proved to be marketing barriers. These were the small cash container which required frequent emptying, excessive weight 15 kg (33 lb), and considerable bulk and length, which tended to contradict the title of "Portable Coinbox". It was therefore decided to develop a purpose-designed, portable, renters' coinbox.

In conjunction with Telecommunications Development Department, Marketing Department prepared a Post Office Requirements document (POR) containing all the parameters for the new box. This was circulated to manufacturers inviting them to submit equipment which conformed to Post Office needs. Five companies responded to the invitation but three of the designs were unsuitable for use on the pay-on-answer system.

After looking carefully at the remaining two it was decided to award the contract to Aeronautical and General Instruments Ltd, the next object being to bring their offering up to the required technical standards and external appearance. This latter aspect was overseen by the THQ Design Section, who employed a commercial designer (David Carter Associates) to advise on this and also the design of a Post Office trolley. The trolley was intended as an optional accompaniment for use in places like restaurants and women's hairdressers instead of the existing arrangements whereby the customer had to produce his own trolley.

First prototypes of the coinbox were received during February 1974 when various modifications were proposed before a production contract for 250 items was placed in the summer of 1974. Unfortunately during production a number of manufacturing and assembly problems were encountered, the solutions to which delayed first deliveries until December 1975.

The design of the new box incorporated an integral carrying handle in the top and cord winding cleat on the back. Its prime colour was yellow with a stainless steel mechanism cover and matt black cord cleat and handset mounting section.

Coincidentally a contract was let for 75 trolleys which were of tubular steel construction and mounted on four castors for ease of movement. The design included a matt black finished metal box for directory stowage and this provided the shelf for the coinbox.

The first 50 coinboxes and 15 trolleys were used in a product trial, in Bradford and Leeds Telephone Areas, which began at the end of January 1976 and ran for three months. The object of the trial was to obtain customer reaction to the apparatus and to assess the in-service performance. It must be stressed however that three months is too short a period to get accurate results from such a small sample.

In the event 32 coinboxes and 14 trolleys were taken up by 22 customers who were already renters of BCC 735s. The locations ranged between a hospital, corner shops, public houses, a launderette and a restaurant. On the whole the coinbox and trolley performed well with only minor problems, such as the directory box working loose. This will be overcome in future production by the use of shakeproof washers.

Two more serious design defects however were discovered. The first was the ease with which the handset could be accidentally dislodged from its mounting cradle – the resultant crash to the ground causing damage to the handset moulding and, after several drops, an increase in transmitter faults. The second was that very little effort was needed to remove the dial mounting and thus obtain access to the coinbox circuitry. Both faults are in the process of being eradicated; the first one by a deeper, more wrap-around cradle and the second by an improved dial anchorage.

One of the features of the new box is a spring loaded security hasp at the back so that when not in use, or when shelf-mounted, the box may be chained or padlocked to some suitable fixture. Little use was made of this facility during the trial, probably due to its relative insignificance, and greater stress will need to be placed upon it in future promotional literature.

And although there was no incidence of vandalism, almost certainly due to the close supervision that renters' coinboxes receive, two were stolen – both

from the same customer. These boxes were on the forecourt of a petrol filling station and while the first was quickly recovered, virtually undamaged, the second was missing for longer. Although the cover casing was broken in three places the cash box appears to have been very difficult to break into – a pleasing and formerly unsuspected quality.

Both renters' and users' reaction to the apparatus was satisfactory with the design and colour schemes being acceptable to all but one of the triallists. The larger cash container and handset siting were particularly well received and just under half of the users said that the coinbox had been moved and was found easier to carry than the BCC 735. On conclusion of the trial 15 triallists (68 per cent) elected to retain the new box at the higher tariff, £9 per quarter instead of £5, and one the trolley. The remaining 13 trolleys were used in a hospital in place of their own and although the Post Office trolley was found entirely satisfactory the additional charges could not be justified.

Taken overall the trial, although highlighting the need for certain minor changes to the box and promotional literature, was considered a great success. As a result the remaining 200 coinboxes and 60 trolleys were forwarded to Telephone Areas in Midlands and North Eastern Telecommunications Regions and Wales and The Marches Telecommunications Board for an extended market trial. This began during the summer of 1976 and was planned to continue until this February, or when the stocks of the box exhaust, whichever is the earlier.

As a result of the trials Supplies Division has been asked to buy 2,000 of the new coinboxes and 500 trolleys which should be sufficient to support marketing activity for about 18 months. First deliveries are expected towards the end of 1977 at which time full instructions will be issued.

The coinboxes on this first major production contract will be slightly different in appearance from the 250 bought for the trials. The moulding required in the production tool to produce the integral carrying handle and its recess is very expensive and the site of the rear mounted cable cleat precludes wall-mounting. Both these problems have been overcome however by the use of a rucksack type, steel rod framework which will mount on the rear of the box and provide carrying handle, cord cleat and security hasp. The framework may be removed by undoing four screws on the inside of the box and the holes which remain can be used to mount the box on the wall. Thus the box will have a smooth outline at the rear and on top.

It seems likely there will be a considerable market for the new box in a variety of situations and it is with this in mind that the Post Office is currently investigating the possibility of introducing a suite of furniture to accompany it in prestige installations, like hotels and conference centres. A partition to provide privacy between boxes, some form of directory stowage and a durable dialling code booklet fixture are envisaged, all of which will be capable of installation by one man.

The idea is to project an overall Post Office image and hopefully replace the present "ad hoc" arrangements. Work is proceeding on this topic with a view to its introduction at the same time as the coinbox. In the past the renters' coinbox has tended to be a "Cinderella" product but if all goes well it, too, will have a happy, fruitful and profitable future.

Mr B. E. Adams is a product manager in the Telephone Market Research and Marketing Division at Telecommunications Headquarters.

PO Telecommunications Journal, Winter 1976/77

The advantages of the new-style portable coinbox are clearly demonstrated in this women's hairdressing salon.

MACs make for better service

ML Jamison

THE INTRODUCTION of the first Measurement and Analysis Centres together with their associated exchange based Post Office equipment during 1977 will provide a new systematic approach to quality of service measurement and maintenance of the telephone network.

It is planned that the Centres will eventually be provided on the basis of one per Telephone Area and they will automatically measure quality of service by sending and monitoring test calls as well as analysing the information that is obtained by this method.

The results of the analysis will be directly available to Telephone Area staff to highlight exchanges and routes which require special maintenance effort and will also be sent to a centralised data processing system where Regional and National statistics will be computed.

The current maintenance procedures are designed to detect failures before they can substantially affect service. The usual technique to achieve this is to carry out routine functional tests of plant wherever this is economically practical and to rectify malfunctions. To help in this work, use is made of call-failure detection equipment (CFDE) and exchange based call senders.

The effectiveness of this functional testing and routining is assessed from results of Telephone Service Observations (TSO) by operators who monitor telephone traffic originating at all but the smallest exchanges.

Within Telecommunications Headquarters Service Department, where staff have responsibility for the service offered to customers, it has long been considered that the information through TSO is useful as an indicator of general performance but, due to its character, has restricted value for day-to-day management and control of the Public Switched Telephone Network.

There is a practical limit to the number of calls which can be manually monitored due to the cost of equipment, staff and accommodation. Also it is impractical to sample a sufficiently large number of calls to obtain a meaningful statistic of all failures.

From the customer's point of view, faulty calls should be held and the failure information fed back immediately to the maintenance engineer so that he can trace and clear the faults. However, a conflict arises between the need to provide an accurate assessment of service and the correction of individual failures as the correction may affect the overall statistical relevance of the sampled calls. Hence TSO is of limited use to the maintenance engineer.

Measurement and Analysis Centres have been designed to overcome these problems. The Centre equipment of a MAC system is based on the GEC 2050 minicomputer connected to specially provided MAC test circuits which together are used in the setting up and monitoring of test calls within the Public Switched Telephone Network.

Each test circuit terminates within an exchange at a Post Office designed access equipment which acts as the interface between the MAC system and the telephone network. The test circuit can directly link the exchange to the Centre but it will be more usual for a number of exchanges to be connected to a Post Office designed concentrator inserted at a convenient location along the test circuit.

The link between the Centre and the concentrator is known as the test trunk and, as it will only be possible for a single test call to be in progress at any moment along this section, the exchanges connected to the concentrator must share the test trunk capacity to transmit calls.

Each MAC system will have a maximum of 30 test trunks and of 90 connected exchanges. The actual quantities and the configuration will depend on the number of exchanges and their locations. In a Director area a maximum of three exchanges to a test trunk will be permitted, while in a non-Director area five exchanges per test trunk is the limit. This is necessary as a larger number of test calls will be originated at each exchange in a Director area.

The MAC will generate test calls in patterns called sequences spread over a monthly period. Quality of service test calls are grouped in a series of measurement sequences and the follow-up or maintenance calls are grouped in a series of analysis sequences. All the calls within a sequence are of the same

Mr Bob Brown, an Executive Engineer on the MAC project, inspects a sender/receiver which forms the interface between the MAC equipment and the Post Office test circuits.

type and are generated for an exchange in a pseudo-random order repeated on a monthly basis. There are nine measurement sequences operating from local exchanges, Group Switching Centres or tandem exchanges.

Sequence number	Type	Originating exchange type
1	Own Exchange	Local
2	Local Dialling Area	Local
3	STD	Local
4	STD Originating	Local
5	STD Terminating	GSC
6	ISD	GSC
7	Tandem	Tandem
8	Transit Access	GSC
9	Transit Multi-Link	GSC

Measurement sequences operate between 08.00 and 18.00 in what is known as the day sending session and 18.00 to 21.00 during the so-called evening sending session.

Two analysis sequences are provided as a direct aid to maintenance. The first is used to investigate calls which fail during the operation of measurement sequences. When a measurement test call fails the full details of the call are passed, within the computer, to this sequence where the call is repeated up to 10 times from the same exchange. Should it fail during the cycle the MAC directs the access equipment to hold the call for tracing purposes. The details of the held call are printed on a terminal at the Centre and, in some cases, at the exchange concerned. This facility will satisfy the maintenance engineers' need for immediately available information without affecting the statistical validity of the measurements.

The second analysis sequence will be used for the investigation of any special maintenance problems. The significant difference between this sequence of test calls and other measurement and analysis sequences is that the test calls are sent as quickly as possible, making use of spare capacity on the test circuit.

The functions of sequencing, call set up and interpreting the results of all calls is the task of the Centre equipment. Within the Centre the processor, using information previously supplied by Telephone Area staff, will initiate a call to an exchange by passing information to a specially designed sender/receiver which acts as the interface to its test circuit. The sender transmits loop-disconnect pulses at 10pps as is generally in use within the Public Switched Telephone Network. The first group of digits is used to steer a path through the concentrator (if in use) and then via the access equipment to the required inlet of the exchange.

The receiver's function is the detection of three fixed frequencies which are 400 Hz and 1,000 Hz and 2,500 Hz. The concentrator and access equipment transmit 400 Hz and 1,000 Hz respectively to the Centre until their switching tasks are complete and by this means the MAC software ensures that the correct protocol has been obeyed.

The processor then initiates the sending of the actual test call digits which are transmitted by the sender to the exchange to set up the call. During this phase it is possible that supervisory tones will be returned by the PSTN which will be transmitted back from the exchange to the test circuit. These tones have distinctive cadences of 400 Hz pulses and are detected by the receiver during the inter-digital pauses.

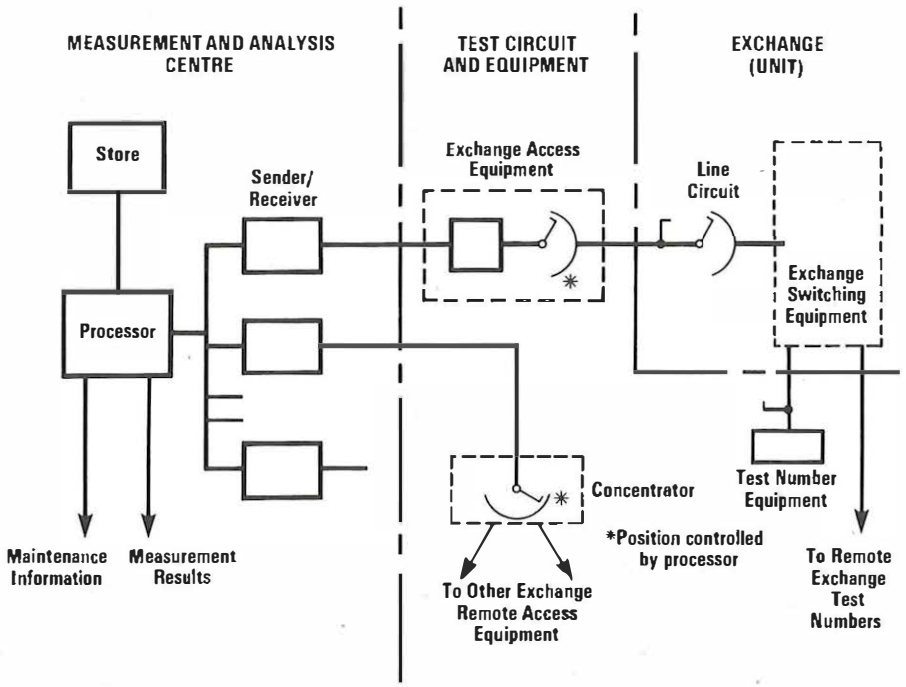
Upon detection of a tone during the interdigital pause the MAC delays the sending of the next digit and the processor attempts to identify the cadence. Should a tone be received which indicates a call failure (eg equipment engaged tone, congestion announcement, number unobtainable) the call is terminated and the details of the call and the failure information recorded.

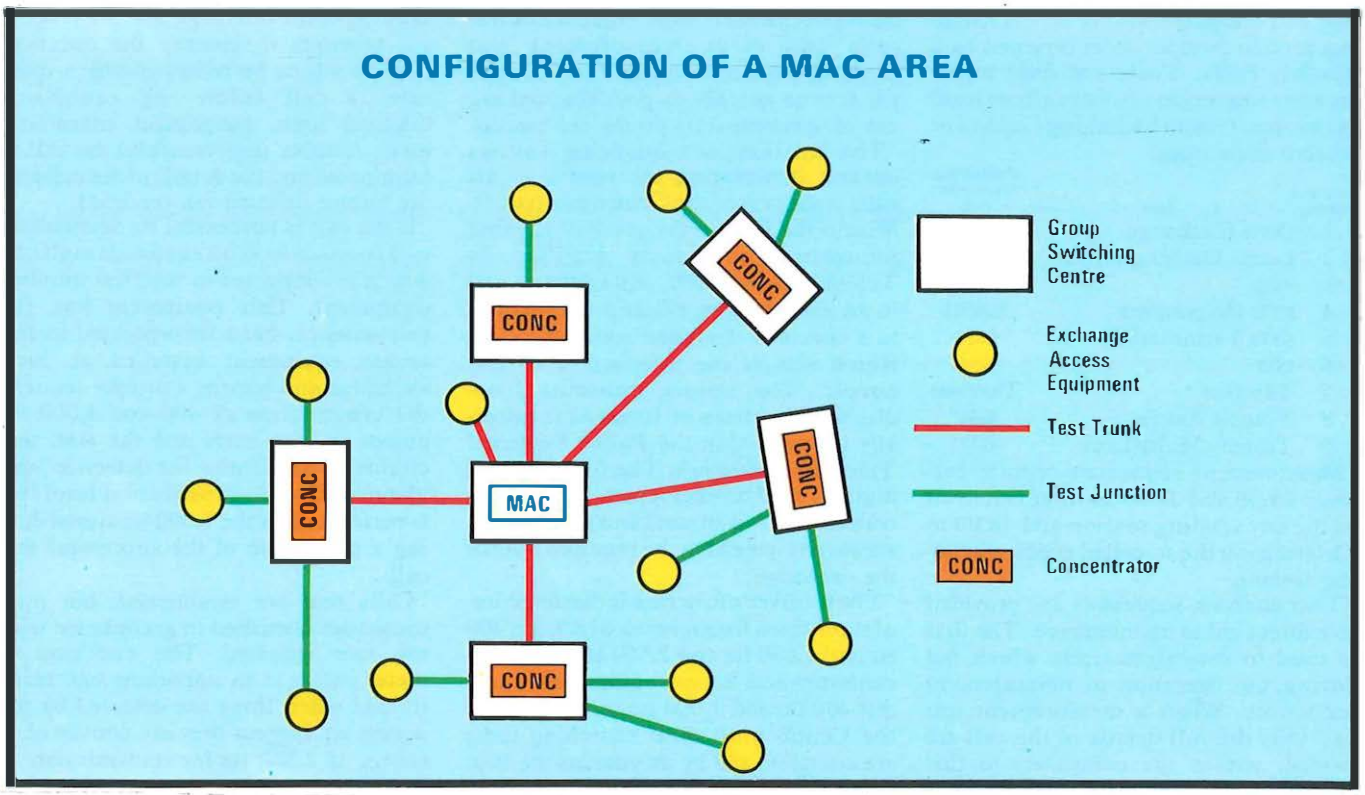
If the call is successful its destination will be an outlet of an exchange multiple which is connected to MAC test number equipment. This equipment has, for convenience, been incorporated in the access equipment installed at each exchange and returns a unique sequential combination of 400 and 1,000 Hz pulses via the PSTN and the MAC test circuit to the Centre for detection and identification. A transmission level test is performed on the 1,000 Hz signal during a proportion of the successful test calls.

Calls that are established, but misrouted are classified in accordance with the tone received. The checking of meter pulses is an important MAC facility and when these are detected by the access equipment they are converted to pulses of 2,500 Hz for transmission to the Centre where their occurrence is recorded.

All MACs provide an identical set of functions and facilities but are tailored to fit their particular Areas using control information supplied by Telephone Area staff. Initially the information describing, for example, the exchanges to be measured, test call sequences to be run, number of calls forming a sequence and test numbers is written on pre-printed forms and forwarded to a centralised Headquarters duty. The information is validated and then transferred to a magnetic tape cassette which is used

MAC SYSTEM CONFIGURATION





to convey the information to the computer at the Centre.

A key-to-cassette unit has been bought for translating and transferring the written information into a processor readable form. This device has been programmed by Telecommunications Headquarters staff to perform arithmetic and logical checks to verify that the information obeys certain rules. It checks for example, that hours of operation are defined in the correct ranges and exchange descriptions use valid codes. The cassettes which are produced by this operation contain all the information which is necessary for a MAC to operate in its Telephone Area.

The translation operation also checks that the format of the information on the tape matches that required by the MAC information input programs, thus eliminating the rejection of data at the Centre and easing its operation. A new cassette is read by the Centre equipment at the beginning of the operating month, if and when changes are considered necessary by the Telephone Area staff.

At the end of each month the MAC automatically produces printed results, expressed as percentages of the total number of calls sent, combined under the headings Plant defects; Plant engaged; Busy tone; Wrongly charged and Poor transmission. A result sheet is produced for the measurement sequences on each exchange for the day session, evening session and a selected busy period. Also aggregations of results for the various types of exchanges will be printed. Finally a total Area result is made available.

These results are primarily intended for the use of the Telephone Area staff but similar results will be passed, via a magnetic cassette, to a centralised data processing system where the Regional and National statistics will be computed. This system is currently being developed by the Post Office's Data Processing Service and will be known as the MAC National Processing System. It will be available by mid 1978.

Authority has been received from Managing Director's Committee Telecommunications for the provision of 10 MAC systems, nominally on the basis of one selected Area in each of the Telecomms Regions. The installation of a further 51 systems to provide a fully national scheme is dependent on the proven success of the initial MACs. Guildford Telephone Area, in the South Eastern Telecomms Region, will be the first non-Director area to receive a MAC, in the first half of 1977, closely followed by Ilford Area in the London Telecomms Region which will be the first Director area. Eight further Centres will be delivered, by the end of 1977, to Birmingham, Manchester, Newcastle-upon-Tyne, Exeter, Glasgow, Cambridge, London City/Centre and Cardiff.

The access equipments and concentrators have been designed in Telecommunications Development Department and are being built by the Post Office's Factories Division at their Birmingham factory. Installation of this equipment will be by direct labour.

MAC accommodation – including all services – environmental control and the test circuit links will be provided by the Post Office at each site in readiness for the delivery of the Centre equipment. The first two systems will be fully tested over a number of months in the working environment to check the operation of the software and specially developed hardware. The installation and testing of each of the remaining systems however will be performed in a much shorter period, followed by a phased introduction into full operational service.

It will not be necessary to wait until MAC is implemented nationally before benefits are received as these will be derived locally from the outset. As each Area receives a MAC system there is likely to be a localised improvement of service resulting from the opportunity to act promptly on information obtained from exchanges and routes having poor performance. Less time will be spent by exchange maintenance staff localising faults to other exchanges, leaving more time to localise and correct faults in their own exchange.

This improvement will be reinforced by staff having greater confidence in the measurement system when they see a more rapid change in measured performance as a result of their efforts.

MAC will furnish Area Managers with precise information on current performance of individual switching units and the network enabling them to regulate and verify the effectiveness of maintenance activity, concentrating on locations having an adverse effect on service. Finally Regional and Headquarters Managers will receive accurate and precise information on the total performance of the telephone service.

Mr M. L. Jamison is head of the group in Telecommunications Development Department responsible for development of the Measurement Analysis Centre system.

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Europe launches into space

JE Golding and RJ Kernot

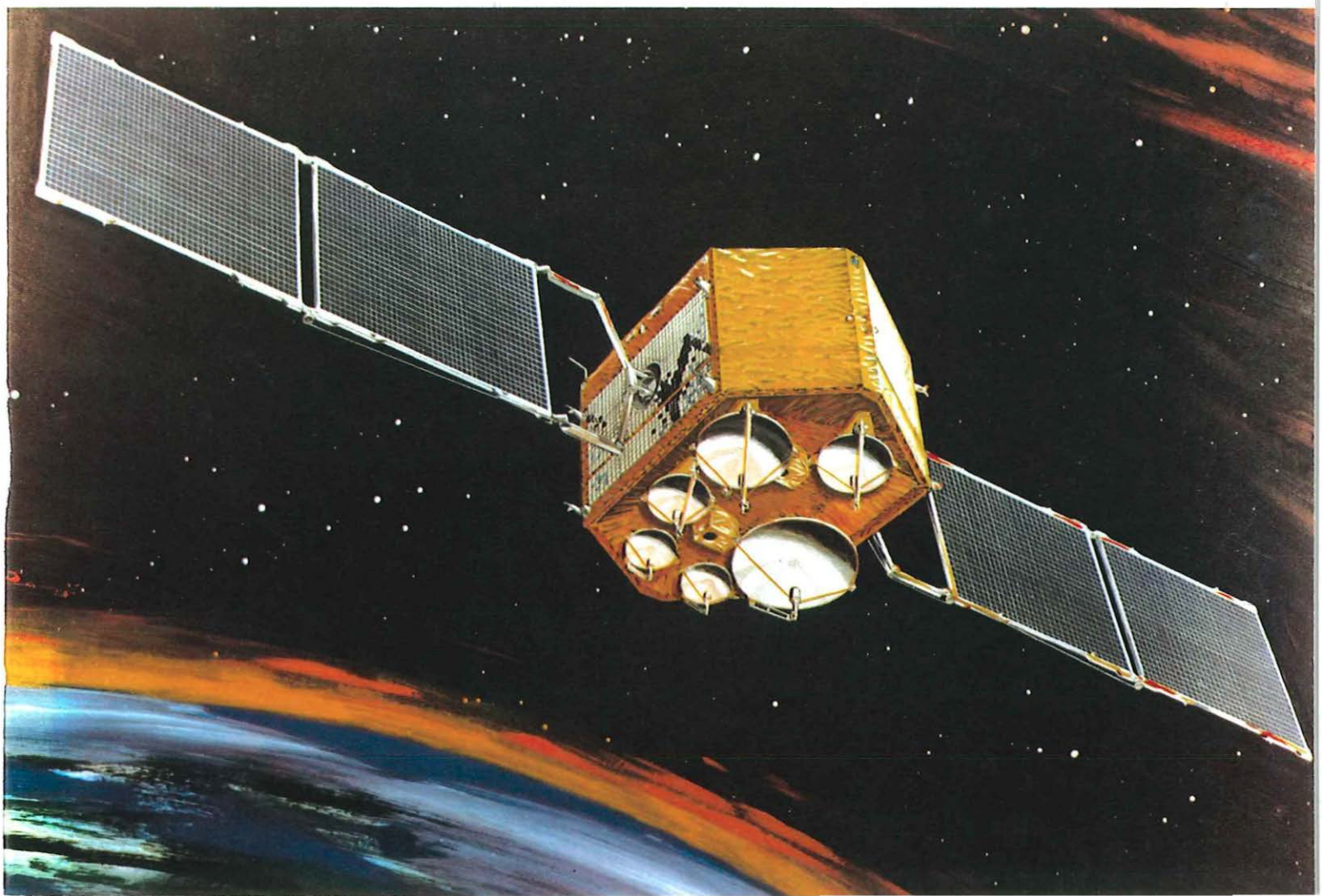
FROM THE SAME site at Cape Canavarel, Florida, where space age communications were first launched a dozen or so years ago, a test satellite for Europe will soon begin its journey into orbit. The big day is scheduled for 15 June this year and the launching of the satellite, designated OTS (Orbital Test Satellite), will be the culmination of seven years of industrial involvement in feasibility studies together with the manufacture of the specialised components necessary for space application.

The "count-down" began in 1970 when the European Space Agency (ESA) undertook studies with industry to define a European regional satellite for the transmission of intra-European telephony and Eurovision. A group of engineers from several European Telecommunications Administrations (including the British Post Office), known as the Permanent Nucleus, was assembled to work closely with ESA on these studies. Three industrial consortia studied different satellite designs with the objective of meeting the predicted requirements of the Telecommunication Administrations throughout the 1980s.

The conclusions of the studies indicated that the satellite should incorporate many technical aspects previously untried in communication satellites. Thus the idea of a test satellite, OTS, was born, which would be used to evaluate these new satellite and communication techniques. The satellite would have a planned lifetime of five years and would serve as a forerunner of a possible operational system for the 1980s.

The proposals for the test satellite indicated that it should have an in-orbit mass of about 450 kg, be located in a geosynchronous orbit (35,800 km above the equator) and be stabilised in such a way that its aerial system always pointed to the same part of the earth. Having fixed the orientation of the satellite body it would then be possible to use

An artist's impression of the European Space Agency's Orbital Test Satellite.



slowly rotating solar panel "wings", extending from two sides of the spacecraft, to provide the electrical power.

The majority of communication satellite systems in operation at the moment use the 6 GHz frequency bands. This new satellite system will use the 11 and 14 GHz frequency bands which will give rise to fewer interference problems with existing satellite and terrestrial systems. As the terrestrial network will eventually use digital transmission techniques, and in order to maximise the system capacity, it was thought advantageous to introduce these techniques from the start, thus making it simpler to integrate into the complete network.

Finally, as there has not yet been any opportunity to make practical measurements of the effect of atmospheric attenuation in the 11 and 14 GHz bands using a satellite source, the opportunity was taken to add a propagation experiment to the satellite payload.

The OTS satellite has been designed and manufactured by a European consortium under the prime contractor Hawker Siddeley Dynamics of Stevenage, Hertfordshire. The satellite is of modular construction, which makes it easily adaptable for other missions, and consists essentially of four modules. The heart of the satellite is the service module which contains the very heavy apogee boost motor for injecting the satellite into its final synchronous orbit, the equipment for stabilising and controlling the satellite in orbit, the power supply electronics, storage batteries, and the major part of the telemetry and command equipment.

Attached to opposite sides of the service module are the solar cell panels which track the sun and rotate once every 24 hours. These panels are capable of generating about 600 W of DC power.

Located immediately adjacent to the service module is the communication module. This contains all the electronic components for amplifying the very weak signals – of the order of a ten thousand-millionth of a watt – and converting them from the 14 GHz frequency band for retransmission to earth in the 11 GHz band. The satellite contains four of these amplifying chains, two of which have a bandwidth of 40 MHz and two of 120 MHz.

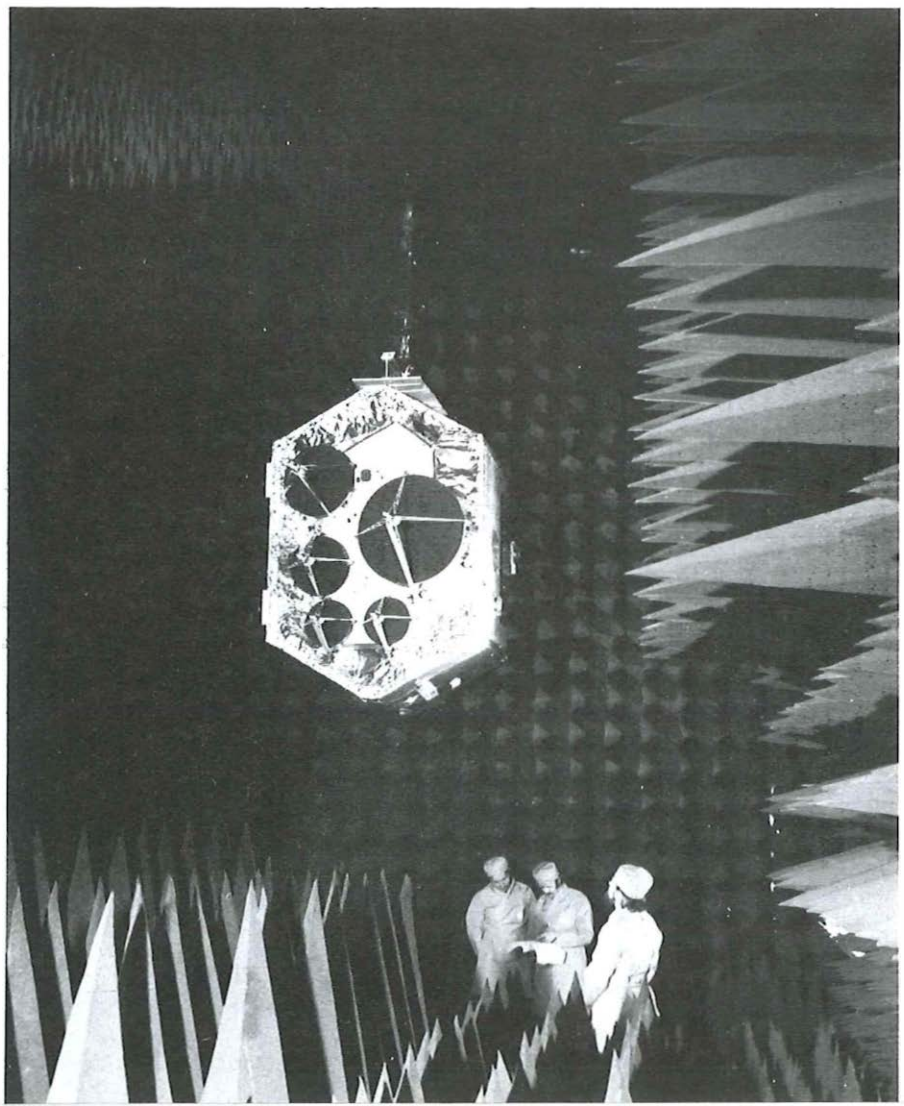
Also in the communication module are two 5 MHz wide amplifying chains, one of which will be primarily used for propagation measurements while the other is in redundancy standby. The chain used in the measurement can carry up to 10 single frequency signals transmitted from the earth. The signals are retransmitted by the satellite to the earth, so that the amount of attenuation on both up and down paths can be measured and related to meteorological conditions.

These signals, transmitted to and from the satellite, have near perfect circular polarisation, but as they traverse the atmosphere some of the energy is converted into circular polarisation with the opposite sense of rotation. By monitoring the signal power which is received on this opposite polarisation, depolarisation of the transmitted signal under various atmospheric conditions can be evaluated.

In addition a linearly polarised beacon transmitted from the satellite will be used to evaluate the degree of depolarisation of linearly polarised signals. If the level of depolarisation can be shown to be tolerable then it will be possible to use the same frequency band on both polarisations in the same satellite and thereby double the system capacity.

Adjacent to the communications module is the antenna module which accommodates six parabolic reflectors. Three of these are receiving aerials and three are transmitting aerials. The receive Eurobeam aerial, which covers the whole of Europe, the Middle East, the North African coast and the Atlantic Islands, is duplicated in order to improve the reliability of the satellite receiving system. On the transmitting side of the satellite there is a Spotbeam aerial, which covers the high density traffic areas in Europe and is connected

An engineering model of the Orbital Test Satellite undergoing tests in an anechoic chamber.



ORBITAL TEST SATELLITE – TECHNICAL CHARACTERISTICS

Spacecraft in-orbit mass (beginning of life)	456 Kg
Spacecraft size	2.2 m diametrical envelope, 2.1 m height, 8.6 m deployed solar arrays
Electrical Power	85 W transfer orbit 600 W Beginning of life on station 516 W three years on station
Operational lifetime	five years
In-orbit station keeping	± 0.1° north-south ± 0.1° east-west
Launch vehicle	US Thor Delta 3914
Communication modules	Up-link in 14 GHz frequency band Down link in 11 GHz frequency band
	Module A – Linearly polarised Two 40 MHz bandwidth transmission chains Two 120 MHz bandwidth transmission chains Frequency re-use by orthogonal linear polarisation. Telecommand beacon receivers and telemetry beacon transmitters
	Module B – circularly polarised Two 5 MHz bandwidth transmission chains Frequency re-use by orthogonal circular polarisation On board beacon signal generators
Antennas	Module A – Three Eurobeam A (two receive and one transmit) One spotbeam transmit
	Module B – Two Eurobeam B (one receive and one transmit)

to the 120 MHz amplifying system, and a Eurobeam aerial connected to the 40 MHz amplifying system. The other two aerials are used for the reception and transmission of the propagation signals.

The Post Office will be providing an earth terminal at Goonhilly, and four other Telecommunication Administrations (France, Germany, Italy and Spain) have plans well advanced for similar earth terminals. The Post Office terminal will be shared between the OTS satellite and the MAROTS satellite, a derivative of OTS which will be used for maritime communications. This new Goonhilly terminal will have a 19 m diameter aerial mounted on a circular track so that it can easily be moved to operate to satellites in other orbits.

To avoid mounting the transmitting and receiving equipment in a cabin at the rear of the dish a beam waveguide system has been developed which will enable the equipment to be located at ground level. The station will have two 2 kW transmitters which can be arranged to transmit telephony or television signals into any two of the four satellite channels. On the receive side two low noise receive amplifiers will enable signals to be received from any of the four satellite channels.

Once the satellite has been launched into its correct orbital position at a longitude of 10°E it will be necessary to confirm that all the equipment has safely survived its long journey and performs as well as it did in the tests on the ground. Tests will be made to ensure that the solar arrays are generating the correct amount of power, that the satellite aerials are pointing in the right direction, and that the amplifiers are producing the required output powers.

It will be the responsibility of ESA to assure the users that the satellite is performing correctly before the communication tests begin. The Permanent Nucleus have specified a comprehensive list of tests to be performed with the satellite and are currently devising a time schedule to enable the earth stations to participate in the tests as soon as they are ready. The tests are aimed at confirming the suitability of the system for the transmission of telephone signals coded in digital form between the main telephone switching centres in Europe. Experiments will be performed to determine the effects of the transmission medium on the signals under various atmospheric conditions.

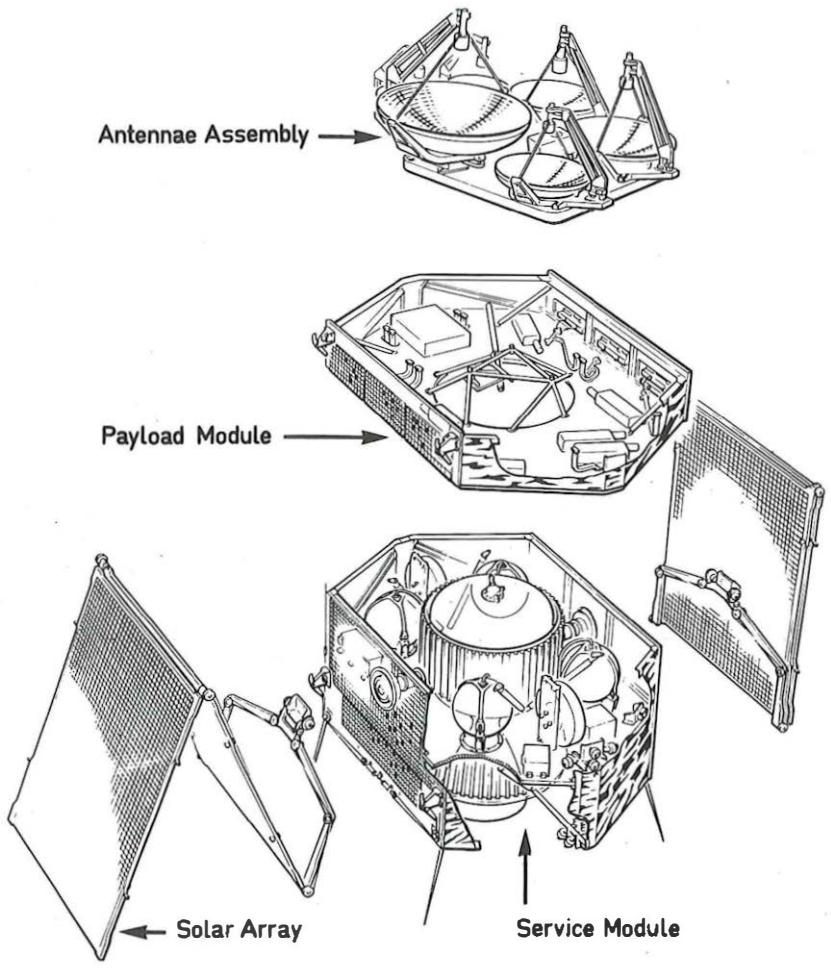
To enable several earth stations to access the same satellite channel a time divided multiple access technique has been developed. Timed bursts will be transmitted at binary digit rates of 60 Mbit/s and 120 Mbit/s and will use a modulation technique of changing the phase of a carrier to four 90 degree positions to represent different digital codes. Some live traffic tests will be performed in preparation for the operational system, but not through the Post Office earth station. A similar technique to the TASI system used on submarine cables has been developed, which only allows active talkers to occupy the system at any given instant. This technique increases the effective telephone capacity and is called digital speech interpolation.

One of the advantages of any satellite system is its ability to transmit the same signal over a very wide area. This makes a satellite an ideal transmission medium for Eurovision signals where one programme is required to be transmitted to many other countries. Television test signals and film material will be used to assess the suitability of the transmission system for Eurovision service.

The Post Office will also be participating in the propagation experiments using the existing 6 m diameter aerial situated at the Research Centre at Martlesham. Facilities are being provided to transmit to the satellite at 14 GHz, and to receive these signals retransmitted from the satellite at 11 GHz, together with the beacon signals generated in the satellite. The attenuation and depolarisation results will be extremely valuable when the design of an operational earth station is undertaken. Some 30 organisations throughout Europe will also be participating in the propagation experiments. In the United Kingdom the Universities of Bradford, Birmingham and Essex have indicated their intentions to participate in the experiments, as have the Science Research Council (Appleton Laboratory), the BBC and IBA.

Some high speed data experiments at 1 Mbit/s are also likely to take place using three metre diameter aerials. However, it is unlikely that this form of service will be provided in an OTS type operational system as the high signal levels could cause considerable interference into other satellite systems and terrestrial networks sharing the same frequency bands.

The Orbital Test Satellite will provide the means by which the Telecommunication Administrations can assess the feasibility of several new techniques of coding, modulation and transmission. It will enable much needed information to be obtained on attenuation and depolarisation in the 11 and 14 GHz frequency bands. It will be a step towards the implementation of a possible operational European communication satellite system and will establish confidence in European industry in this technology.



Mr J. E. Golding is head of the European communications satellite group in Telecommunications Development Department. He is also the Post Office representative on the Permanent Nucleus.
Mr R. J. Kernot is an Executive Engineer in the same group.

PO Telecommunications Journal, Winter 1976/77

A disabled woman touches the button on top of a special box connected to her telephone. The equipment alerts the operator who will then help set up a call.

Helping the handicapped keep in touch

MJ Hagerty

For many years the Post Office has been closely involved with helping handicapped people to use the telephone. At a hospital in Yorkshire trials are currently taking place of newly designed aids which may be added to those already supplied for the hard of hearing, the poorly sighted and those with mobility restrictions.

A FRAIL pensioner, her hands crippled with arthritis, reaches forward from her wheelchair. She lifts the handset from her telephone and lightly touches a button on top of a special box-like apparatus nearby. Within seconds the Post Office operator is on the line and the pensioner, despite not being able to dial a single digit is able to make her call.

The equipment which gives the disabled this independent link with the outside world is a direct result of the Post Office's concern for the handicapped. The special box is, in fact, just one of many types of specially designed equipment aimed at making use of the telephone a simple, realistic – and enjoyable – experience for people who are blind, deaf, restricted in movement or have speech problems, as well as those with more than one disability.

But, of course, it is not only elderly people who are affected. Disability affects all classes in different age and social groups and can have dramatic and far reaching consequences.

Take the business man for instance, struck down by illness or injury. For him the telephone plays a particularly important role. It can, in fact, be the vital link in his continuing to earn a living. For others, perhaps, in need of vital medical help it can be a life-line.

Accordingly the Post Office adopts a practical, sympathetic and humane approach to the handicapped. Earliest records show that the Post Office first became involved in this highly specialised field with St Dunstans during the First World War. The work involved modifying switchboards for blind operators, many of whom had lost their sight during the fighting.

From this beginning some 60 years ago the Post Office has made steady progress in the field of aids for the handicapped. It has striven to develop a comprehensive range of standard aids to help customers overcome their disabilities and allow them to make as normal use as

Undergoing trials at Pinderfields Hospital is this adjustable Handset Holding Aid designed for use by people unable to hold the telephone in the usual manner.

possible of the telephone facilities.

It has encouraged the use of local initiative to produce apparatus for individual requirements where customer needs could not be met by standard apparatus. In such situations the customer is visited at home by trained and experienced staff who usually resolve the problem by modifying standard apparatus. Local staff and management take great pride in their one-off efforts.

Because the Post Office does not have the medical expertise necessary to evaluate newly designed aids, a liaison committee was formed by the Post Office and Department of Health and Social Security (DHSS) in February 1974. Its prime function is to co-ordinate matters of mutual interest in respect of aids for handicapped people in the field of telecommunications.

To date the committee has arranged evaluation trials at Pinderfields General Hospital in Wakefield, Yorkshire. Here a variety of new aids, designed to assist people with mobility problems are undergoing tests.

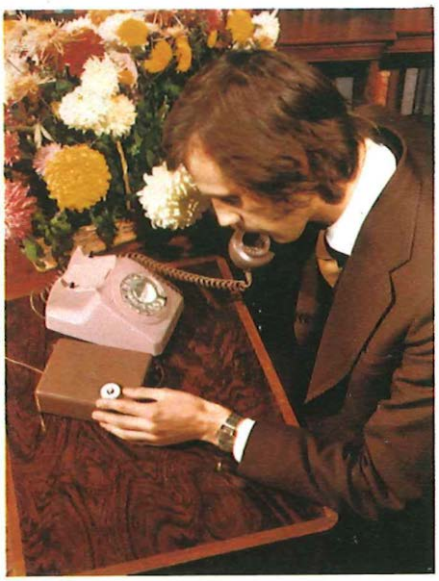
The committee has also made arrangements for trials of other aids. These include an inductive coupler which is fitted inside the standard telephone handset receiver and is designed to be compatible with the recently introduced DHSS behind-the-ear hearing aid for the deaf. An enlarged numeral dial ring to help the visually handicapped is also being developed.

The trials will also include an improved Servophone for the severely handicapped. This loudspeaking equipment enables users to make and receive calls and even adjust the volume by a simple suck-blow technique.

A successful outcome of these trials would create confidence in Post Office aids for the handicapped and would be the equivalent of a medical seal of approval.

As well as the DHSS liaison committee there is the Post Office Research Department's Human Factors group which has a permanent commitment and interest in evaluating aids for the handicapped. Current projects include the enlarged numeral dial ring, and a Keyphone guide which recesses the keys to enable those without positive control of their fingers to depress the correct keys. The group is also providing technical support for the medical authorities in the Pinderfields trials.

This unit has an easily adjusted volume control to amplify outgoing speech.



The Post Office is, of course, a member of the Conference of European Postal and Telecommunications Administrations (CEPT) and the International Telegraph and Telephone Consultative Committee (CCITT). These international bodies take a keen interest in the problems of the handicapped, and through regular contacts the Post Office is able to keep abreast of international developments for the handicapped.

Along with the growth of telecommunications there have been similar advances in medicine and care of the sick, culminating in The Chronically Sick and Disabled Persons Act 1970. This proved a major step forward for the disabled, and for the first time, local authorities were empowered to provide a telephone and any special equipment necessary for its use.

Its effect on Post Office services has been considerable, and it is estimated that more than 100,000 exchange lines have so far been provided for local authorities as a direct result of the Act. With an estimated 52 per cent of households (19.45 million) now having telephones it seems reasonable to assume that most homes will have a telephone by the year 2000. The telephone then, as now, will play a very important part in the life style of the handicapped.

Policy concerning aids for the handicapped is the responsibility of a small team at THQ. Their work includes product management of aids and initiating

The Servophone enables the severely mobility handicapped to "dial" their own telephone calls and adjust the volume by a simple suck/blow technique.

market research and development of new products. Arrangements are also made for the manufacture of prototypes and their testing, in conjunction with the DHSS.

Evaluating trial results and arranging for the manufacture and supply of new products is another aspect of the team's work. Equally important is liaison with Regional Headquarters and Area General Managers' staff, DHSS, Royal National Institute for the Blind and Royal National Institute for the Deaf, as well as social and welfare organisations at national and local level who are concerned with the handicapped.

Product managers at THQ are aware of the needs of the handicapped and these are fully considered and taken into account at the design stage of all new products. Much of the day-to-day work centres around new products which if they are to find their way into the standard range must first undergo stringent tests. Currently at this stage is a range of easy-to-use dials to help customers who experience difficulty in using the standard telephone dial.

There is also a device to enable people who spend most of their lives in wheelchairs, to use a coinbox unaided. The device feeds coins into the box by the operation of a capstan, and a specially designed flap retrieves coins if this is necessary.

Other new aids include a loudspeaking telephone (Servophone LST 7A) to help the severely handicapped, the inductive coupler and enlarged numeral dial ring already described and a device to assist those who cannot hold the normal telephone handset. There is also the simple guide to assist Keyphone users who suffer from tremor.

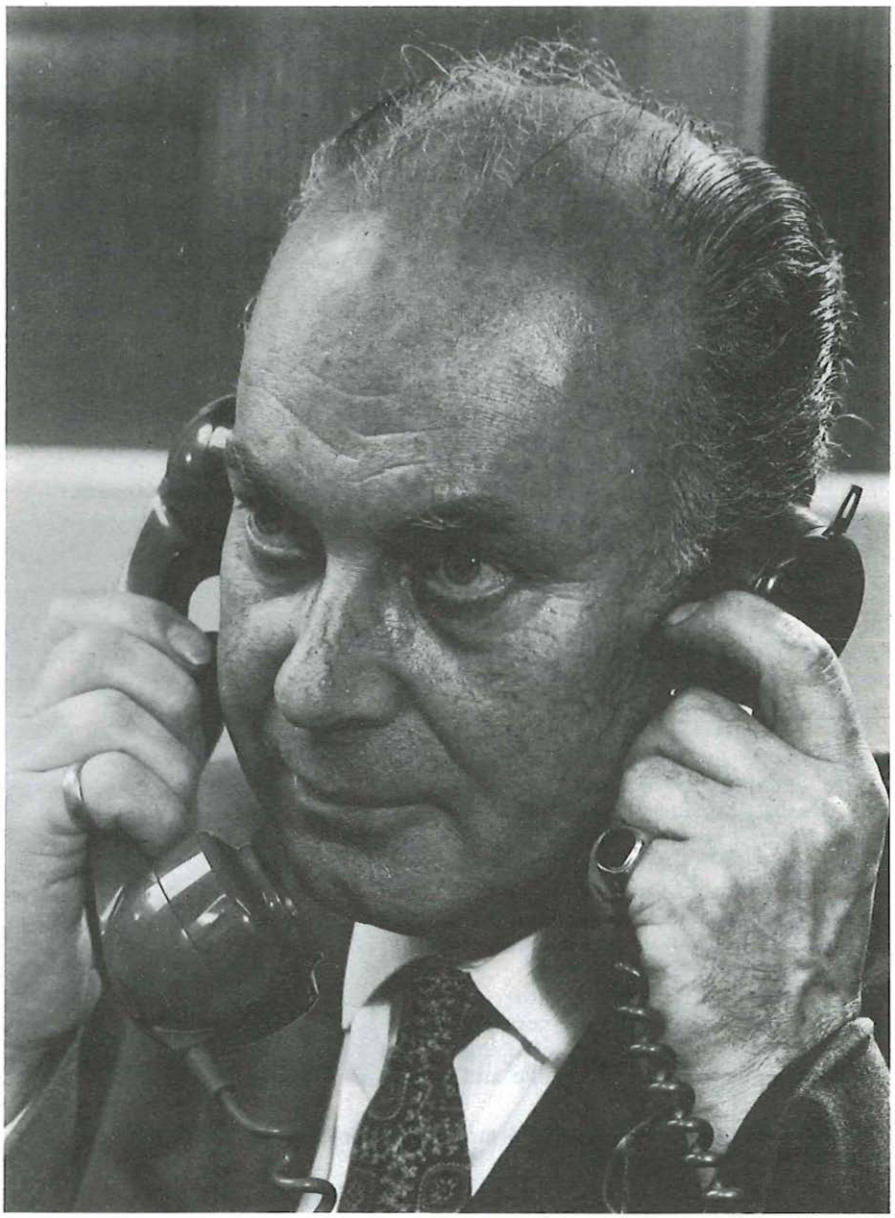
Publicity plays a part in the campaign to aid the handicapped, because the patients themselves are not always aware of the facilities available. The Post Office makes strenuous efforts to overcome the problem by providing a comprehensive range of leaflets. These leaflets are freely available from every General Manager's office throughout the country.

In addition, two new portable exhibits have been designed and are available for both large and small exhibitions. The large exhibit consists of 18 display panels illustrating the aids, and is supported by working apparatus. The small exhibit consists of three display panels showing a selection of available aids.

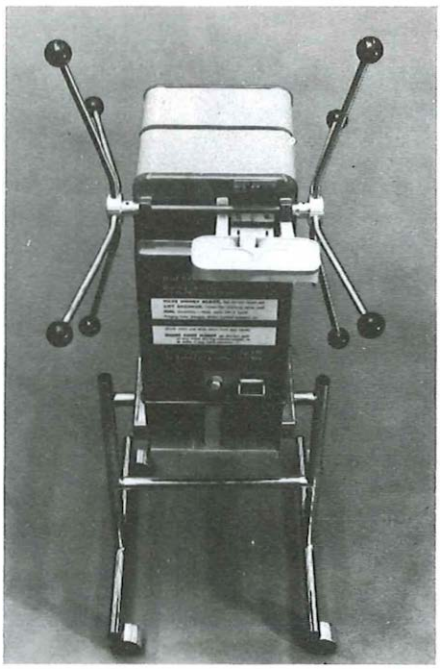
The large exhibit will be shown at national exhibitions for the handicapped, while the small exhibit is designed to meet the needs of specialist organisations and to support General Managers in publicity ventures. A permanent exhibition is also provided at the Disabled Living Foundation in Kensington, London, and consideration is being given to provide similar exhibitions at other centres throughout the country.

As well as publicity leaflets, and portable and permanent exhibitions, the Post Office is commissioning a film, the theme of which will be "Help for the Handicapped". It is planned to be ready in Spring.

To be successful any aid must be easy to use, efficient and durable in operation and cheap to produce. Finally it must gain the full approval of the DHSS and the Post Office during trials. While the aids can never restore users' normal faculties, they go a long way to restore confidence, give greater independence and help people to enjoy life more fully.



The telephone Watch Receiver enables a person with hearing difficulties to listen with both ears. It can also be held against the microphone of certain hearing aids.



Left: On trial at Pinderfields Hospital is this coinbox guide designed for people who have difficulty inserting money into the coinbox slots.

Mr M. J. Hagerty is a Senior Sales Superintendent in Telecommunications Marketing Department responsible for the development of aids for the handicapped.

PRIVATE TELEGRAPHS SWITCH INTO NEW ERA

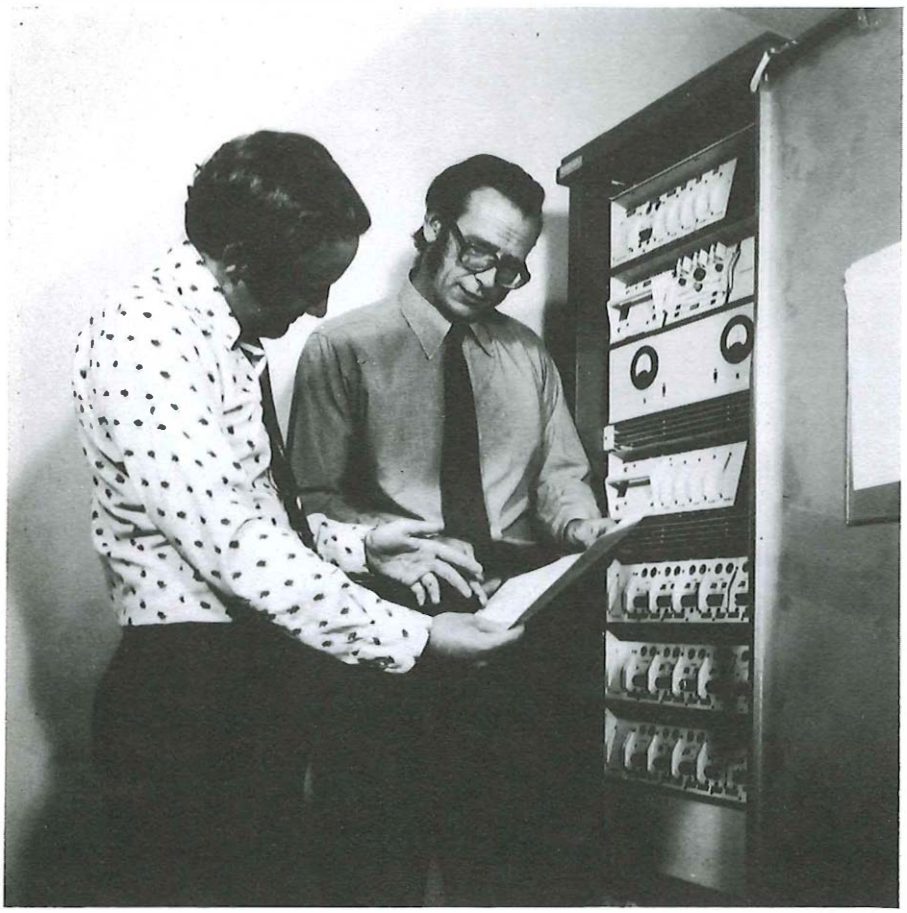
R Wilkins

PRIVATE AUTOMATIC telegraph exchanges (PATX) used mainly by businesses, the police and banks for interconnecting teleprinters within a building or over private circuits, have now moved into the processor era with the development by the Post Office of a second generation circuit switching exchange. This new electronic equipment supersedes the electromechanical PATX 1A which was first to provide these automatic links.

The new equipment is smaller, lighter, can be housed in a single cabinet, and incorporates many new facilities. And even taking into account these improvements, it is expected that the cost will be comparable with the PATX 1A for production quantities. All this makes the new exchange much more attractive to customers than its predecessor.

One of the most important facility additions is interworking with the telex network on a fully automatic basis, thus making it a branch exchange of the telex system. This major change is signified in the coded title for the new equipment which is Private Automatic Telegraph Branch Exchange No 2A (PATBX 2A). Teleprinter extensions have access to telex customers throughout the world. Conversely telex customers have direct access to teleprinter extensions by adding the digits corresponding to the teleprinter extension, to the national telex number allocated to the private exchange. Calls with invalid added digits automatically overflow to nominated teleprinters.

Sales Superintendents Chris Ward and George Dudley of Telecommunications Marketing Department discuss details about the switching equipment housed in the new PATBX 2A cabinet.



The PATBX 2A has a maximum of 48 teleprinter ports, as against 20 on the PATX 1A, some of which will be used for telex lines. A two-digit numerical numbering scheme for extensions is therefore sufficient. This gives a more than adequate numbering range capacity for interconnection of other PATBXs and PATXs to form a private network. It is envisaged that any one customer may have four or five interconnected private exchanges using a non-linked numbering scheme for extension to extension working.

To gain access to the telex network a teleprinter extension user types a letter prefix "T" to indicate the service required and then follows this with the national telex number. Other letter prefixes in general use are B (Broadcast), G (Preselected Broadcast Group) and P (Priority). Special teleprinter extension equipment is not required since the PATBX has been designed to interface with standard signalling units. The new exchange regenerates all teleprinter signals which pass through it on established connections.

To set up a call, the teleprinter extension user presses the call button on the signalling unit. The exchange responds by printing a colon character (:) on the teleprinter to advise the caller to enter the number required. All calls are set up by using the teleprinter keyboard. This form of selection coupled with the fast call processing within the new exchange, gives a much faster call set-up when compared with the dial selection and electromechanical switching used in the PATX 1A.

Should the caller realise that the wrong number has been entered he may cancel the selection by typing in the slash (/) character. The caller is required to type in the plus (+) character to indicate that the required number has been entered. Should the user omit to type in a number or, perhaps, type part of a number and omit the plus character the exchange will, after a delay of 51 seconds, forcibly clear the calling extension.

Connection to the called extension is established by the exchange within a few milliseconds of receiving the plus character and the answer back of the called extension is returned to the calling teleprinter automatically, indicating

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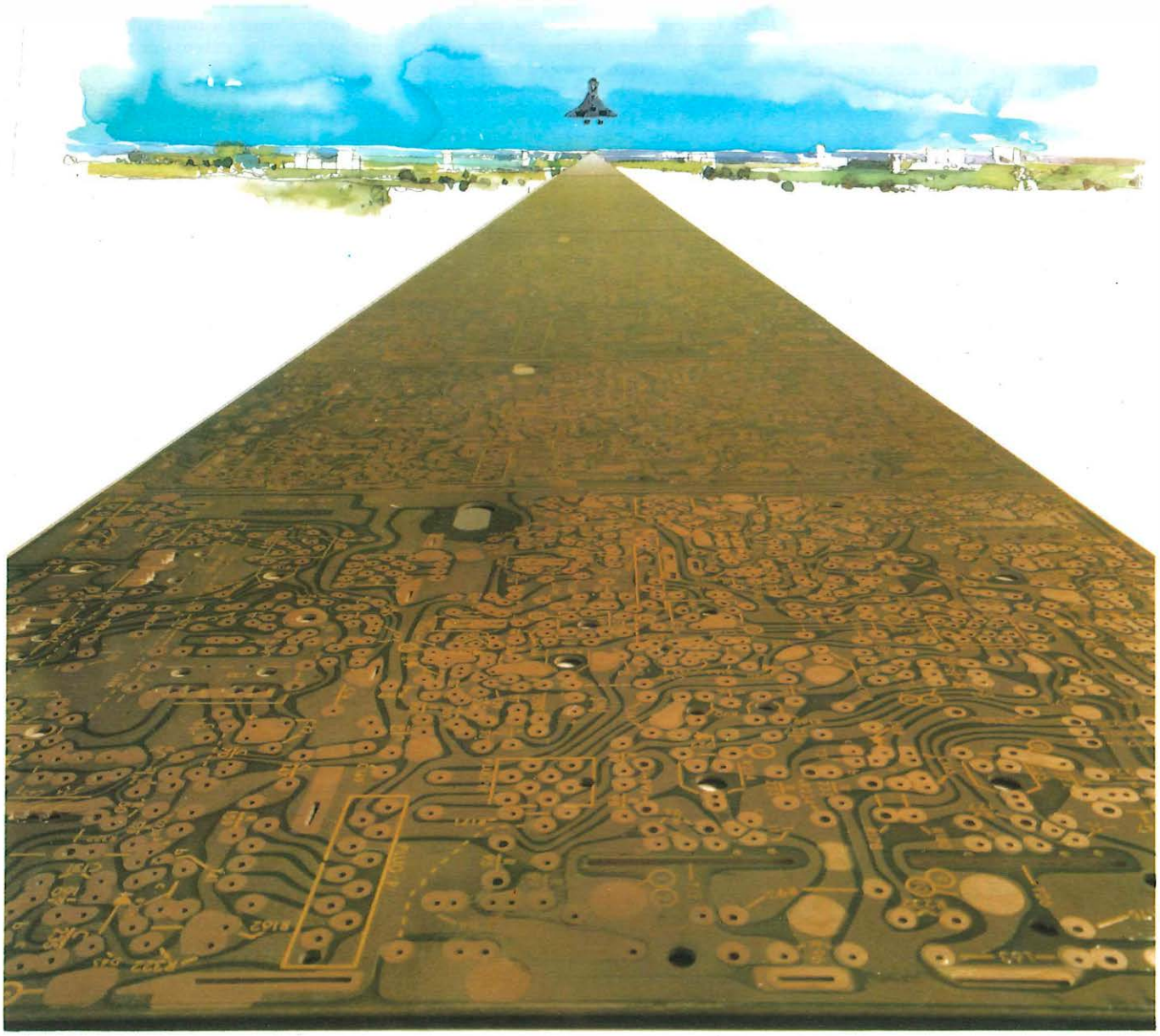

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that conversation may begin. Established connections may be cleared by either party simply by pressing the appropriate button on the signalling unit. In the event of a connection not being established by the PATBX, it will print the appropriate service message such as OCC for an engaged extension, on the caller's teleprinter. Immediately after the message has been sent, it clears the teleprinter extension.

Extensions communicate with each other using International Telegraph Alphabet No 2 at a modulation rate of 50 bauds. The same alphabet and modulation rate is used for the national and international telex networks so that speed and code conversion is not required when interconnecting an extension to the telex network. The existing national telex network, however, is predominantly a step by step Strowger system and the PATBX has to carry out the conversion from teleprinter characters to dial selection pulses. The new exchange prints a full stop character on the calling teleprinter for each dial selection pulse train sent to the telex exchange. This reassures the user that the equipment is functioning during the post-selection delay.

It is expected that in future, as the Strowger exchanges are replaced, the national telex system will be changed to allow customers to set up calls using the teleprinter keyboard. The design of the PATBX has taken this into account and the present conversion from teleprinter characters to dial selection can easily be removed without affecting the PATBX customer's service. The maximum number of simultaneous established connections which the PATBX can carry, including calls to and from the telex network, is 15.

Broadcast calls are set up in the same way as extension to extension calls. The caller, after receiving the colon character on the teleprinter, types B+ to indicate to the central processing unit that a broadcast call is required and then types the first extension number and waits for connection.

The exchange establishes the call and prints the answer back code of the called extension, or alternatively returns the appropriate service message, without clearing the calling extension. In both cases the exchange will print the colon character to invite further extension numbers when it has completed all processing on the previous number entered. The extension user can continue to type in further extension numbers, including repeats of those numbers which caused service messages to be printed. All the extensions on the private network can be connected for a broadcast call. When this number of extensions or less have been connected the caller types the equals (=) character and can then send the message, which is simultaneously received on all called extensions.

The caller will know which of the extensions selected have been connected because there will be a printed record of each call attempt, on the teleprinter. At no time throughout a broadcast call are the called extensions allowed to initiate a clear; furthermore, until the equals character is typed in, the transmission path from the calling to called extensions is not completed. Any character typed on the keyboards of the called teleprinters will be absorbed in the exchange. The broadcast call is cleared down by the calling extension. Broadcasts are limited to extensions of the private network at present and cannot include destinations in the telex network.

In addition to the broadcast facility the PATBX customer can have an optional facility of pre-selected broadcast. The caller types in the B+ and follows this with prefix letter 'G', a digit number and plus character. The exchange goes ahead to establish connection to a predesignated group of teleprinter extensions without the need for further typed information from the customer. As in the previous case, the caller will have a printed record of established connections and can connect the transmission path by typing in the equals character. The groups can be combined with or supplemented by additional individually selected extensions. The PATBX provides a maximum of five pre-selected broadcast groups. The exchange capacity for handling broadcast calls is additional to that for normal extension to extension calls.

Nominated extensions may have priority which is obtained by these extension users typing the prefix letter P followed by the number of the required extension. If the latter is engaged on an extension to extension call this is cleared down and the connection established in the normal way. If, however, the called extension is engaged on an incoming or outgoing telex call, the priority facility is not brought into use and a service message is returned to the caller.

The new exchange incorporates a purpose designed central processing unit (CPU) and provides circuit switching. The technique used is time division sampling and the CPU is continually looking at each line. The sampling rate is about once every 20 ms but increases to once every 1.25 ms when a line is in use. According to the condition of the line at the time of sampling the CPU can set a corresponding system condition for each line.

The system condition will be maintained until the CPU detects a change of line condition, when it then changes the system condition. This technique allows the use of a simple line interface circuit (one for each line connected) with the more complex control equipment being shared between all lines.

In general terms the maximum number of simultaneous connections which can be carried is limited by the speed of line sampling and the number of lines to be sampled. Thus by reducing the number of lines to be sampled the new exchange could establish connections at higher baud speeds. Interconnection with telex would not be possible under these circumstances.

The PATBX 2A occupies 1.22 m of a standard 1.95 m high rack which has a smart stainless steel door and other decor in line with modern office furniture. It is powered from one mains socket outlet provided by the customer. Connections to the various shelves of equipment are by plugs and sockets for the lines and signal wires and by screw

A bank of teleprinters at a customer's premises showing how the new PATBX equipment cabinet, in the background, blends easily into the office environment.

terminals or bolted tags for the electrical power. This means that pre-wired shelves can be fitted or changed very quickly.

The equipment does not use electric fans for cooling and requires no routine maintenance. It recovers automatically from transient faults including power interruptions and corruptions of the processor's read-write memory, thus avoiding abortive maintenance visits. Faulty modules are identified largely by the symptoms, although special programs are included which enable any obscure or difficult faults, particularly those in the processor's memory, to be easily identified. No module is larger than a shoe box and the transport of replacements therefore is not a serious problem.

The new exchange is built from a set of modules called the Telegraph Processing System 1 (TPS1), the in-house development of which was started early in 1974. The prototype modules together with the necessary software were working by mid 1975 followed by the first product trial early in 1976. The main module of TPS1 is a specialised CPU which unlike conventional mini or micro computers has separate data highways to the program memory, data memory and the inputs or outputs.

The unusual design of TPS1 reduces the amount of program required by about 70 per cent while achieving an average instruction time of 0.7 us. This high speed together with its special, real time and telegraph (teleprinter) orientated instructions means that TPS1 can directly control its inputs and outputs without requiring complex interface control units. The function and performance of the CPU can be adapted for each application by changing a few plug-in components and re-arranging some internal connections – a simple task which avoids the need to stock a variety of units.

The first use of TPS1 is the PATBX 2A and satisfactory product trials of two exchanges have been carried out. It is currently being used on several other projects, one of which is a telegraph exchange for switching the 80 engineering service circuits associated with the new satellite earth station at Madley in Herefordshire.

The Post Office development of the PATBX 2A has been accomplished in a short time and it uses many standard parts. It is expected that subsequent construction contracts will result in early deliveries at reasonable cost allowing the Post Office to remain competitive in the field of private telegraph network switching.

Mr R. Wilkins is an Executive Engineer in Telecommunications Development Department responsible for private and international telex exchanges.

PO Telecommunications Journal, Winter 1976/77

PROF. MERRIMAN RETIRES... AND SO DOES DOLLIS HILL

TWO prominent eras in Post Office research and development have ended with the retirement of Professor J. H. H. Merriman, Board Member for Technology and Senior Director Development, and the closing of Dollis Hill Research Station in London.

Prof Merriman, CB, OBE, MSc, FKC, DSc(Hon), MInstP, CEng, FIEE, FITE, left the Post Office in December after a 40-year career, most of which centred on research, development, planning and direction of national and international communications. And Dollis Hill, the "home" of Post Office research from 1921 until the new centre was established at Martlesham Heath, Suffolk, finally closed its doors at the end of last year.

It was, in fact, at Dollis Hill that Prof Merriman joined the Post Office in 1936. Early in his career he was engaged in ionospheric work aimed at improving the telephone circuits between London and New York – "working all hours day and night to try to crack some of the mysteries of nature". By 1939 this work had resulted in a fourfold increase in the usability of the transatlantic circuits.

During the Second World War and until 1948, Prof Merriman was in charge of a communications research laboratory at Castleton, Gwent, where he led teams which developed equipment to confuse and distort the navigation patterns of enemy aircraft. Returning to London, he led work on the then new science of VHF and microwave communications.

Following a year's secondment to the Imperial Defence College in 1954, Prof Merriman was seconded to the Treasury for four years as Deputy Director, Organisation and Methods, with particular responsibility for computing and automation policy in laying the foundations for the use of computers in Government.

In 1963 he was appointed Assistant Engineer-in-Chief to the Post Office, and in March 1967 promoted to Deputy Engineer-in-Chief. On the creation of the Post Office Corporation in 1969 he

was appointed Board Member for Technology and Senior Director Development, leading development of new communications techniques such as the millimetric waveguide, fibre optics and System X – the Post Office switching system of the future.

A prominent figure for many years in professional and academic roles related to telecommunications and allied disciplines, Prof Merriman will continue to be engaged in a wide range of activities.

In April he succeeds Sir Robert Cockburn as Chairman of the National Computing Centre. He is also serving on the Department of Education and Science's Computer Board, and is President of the Institution of Electrical and Electronics Technical Engineers.

A past President of the Institution of Electrical Engineers, Prof Merriman is currently chairing the IEE's Committee of Enquiry into the qualifications, career opportunities and responsibilities of professional electrical engineers in the United Kingdom. He is also Chairman of the Board of INSPEC, the IEE's international information section, a Governor of Imperial College (University of London) and visiting professor at the University of Strathclyde.

MISCELLANY

Developing waveguides

THE Post Office is evaluating proposals for installing a fully operational long-distance millimetric waveguide transmission link between Bristol and Reading. And it is also getting together with British industry to form a team devoted to selling the waveguide system to other countries.

These plans follow the successful field trial of a 14.2 km waveguide system in East Anglia between the Post Office Research Centre at Martlesham Heath and Wickham Market (see Telecommunications Journal, Spring 1976). This system, developed in close co-operation with BICC and Marconi, has been in operation for more than a year.

A decade of research by the Post Office has demonstrated that waveguides are a practicable proposition for long-distance communications between centres of population. The huge traffic capacity enables hundreds of thousands of two-way telephone circuits together with colour television pictures, telex messages and computer data to be carried at the same time.

The waveguide system to be offered for export – and which could also be used for the Bristol-Reading link – is based on the trial system. The waveguide would be supplied and installed by BICC, while the terminals and other electronic equipment would be provided by Marconi.

The Post Office's export role would be that of consultant, carrying out the design of particular systems between different places. It is already playing a similar consultancy role for the Libyan Posts and Telecommunications Corporation, designing a new high-capacity combined submarine and land cable system between Benghazi and Tripoli.

● World experts attending an international conference on millimetric waveguides at the Institution of Electrical Engineers in London, recently visited Martlesham Research Centre to see a demonstration of the trial system.

Contract

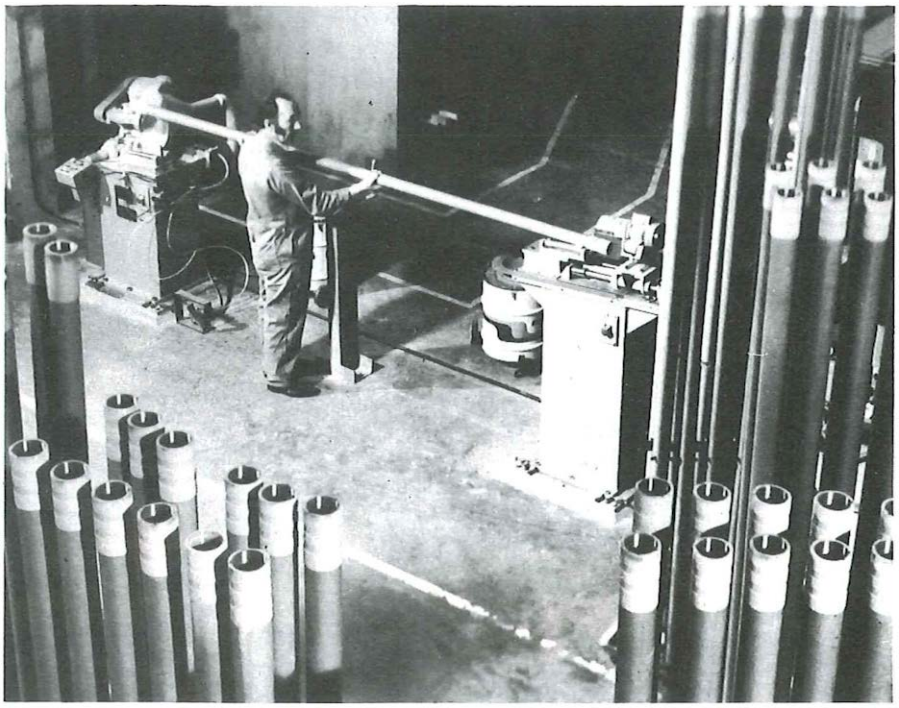
Marconi Communication Systems Ltd – Nearly £1 million to supply 24-channel pulse code modulation (PCM) systems for use in the Eastern, Northern Ireland, Wales and South Western Telecommunications Regions. The contract also covers the provision of a quantity of equipment designed to protect PCM line systems from high induced voltages such as those caused by lightning. Delivery of all the equipment is scheduled for completion by the end of July.

More ISD links

FURTHER direct-dialling extensions provided under the £200 million programme to cater for growth in Britain's international telephone services bring to 46 the number of countries which can be dialled direct from users of the United Kingdom's 15 million telephones with International Subscriber Dialling (ISD).

The latest countries to get direct dialling from Britain are Tunisia and five of the United Arab Emirates – Ajman, Dubai, Fujairah, Umm al Qaiwain and Sharjah. They follow the introduction of ISD to Japan, Iraq, the German Democratic Republic, Austria, Portugal, Moscow, Bombay and Trinidad and Tobago. As a result UK users now have direct access to some 310 million telephones around the world – about 80 per cent of the global total.

Within the UK, there are now 133 centres with ISD, covering about three-quarters of the nation's telephones. All but six of these places have been added in the last four years, and under current plans virtually all centres in the UK should get ISD by 1980.



A length of millimetric waveguide of the type used by the Post Office is prepared for jointing at a BICC factory. (See Developing waveguides)

North Sea calling

ANOTHER major step to bring North Sea oil workers more closely in touch with the rest of the world was taken by the Post Office with the opening of a public telephone service to the Occidental Consortium's Piper platform.

Piper, located 175 km (110 miles) north-east of Aberdeen, became the first customer for the Post Office radio station at Fraserburgh and the second North Sea platform to have automatic telephone service to Britain's inland network, and from there to other countries. First on the line was Mobil's Beryl platform – 150 km (95 miles) east of the Shetlands – which is served by a station on South Shetland.

A link associated with the Piper field, to a manifold platform on the pipeline from Total's Frigg field, is due to start working in the Spring, and a link to Frigg itself should be in service later this year. In addition, service to Occidental's second North Sea platform – Claymore, 30 km (18 miles) west of the Piper field – was due to start working early this year with signals being relayed from the Piper platform.

Appointments

Mr J. S. Whyte is the Post Office's new Senior Director of Development, succeeding Professor J. H. H. Merriman, who retired at the end of December (see page 30). Mr Whyte was previously Director of Purchasing and Supply.

Mr K. E. Spurlock has been appointed chairman of Wales and the Marches Telecommunications Board. Formerly head postmaster at Cardiff and a member of Wales and the Marches Postal Board, he succeeds Mr T. H. Davies, who has retired.

Mr R. E. G. Back has become Director of Service Department at Post Office Telecommunications Headquarters in succession to Mr J. E. Golothan, who has retired. Mr Back was previously Deputy Director of Service Department.

Mr D. Wray, Director of the External Telecommunications Executive, has become Director of Telecommunications Development Department.

Mr G. J. Pocock, has succeeded Mr Wray as Director of ETE. He was previously the ETE's Deputy Director.

Egypt automatically

WITH the introduction of automatic telex service to Egypt, Britain's telex users can now dial direct to 103 countries instead of having to be connected by an operator.

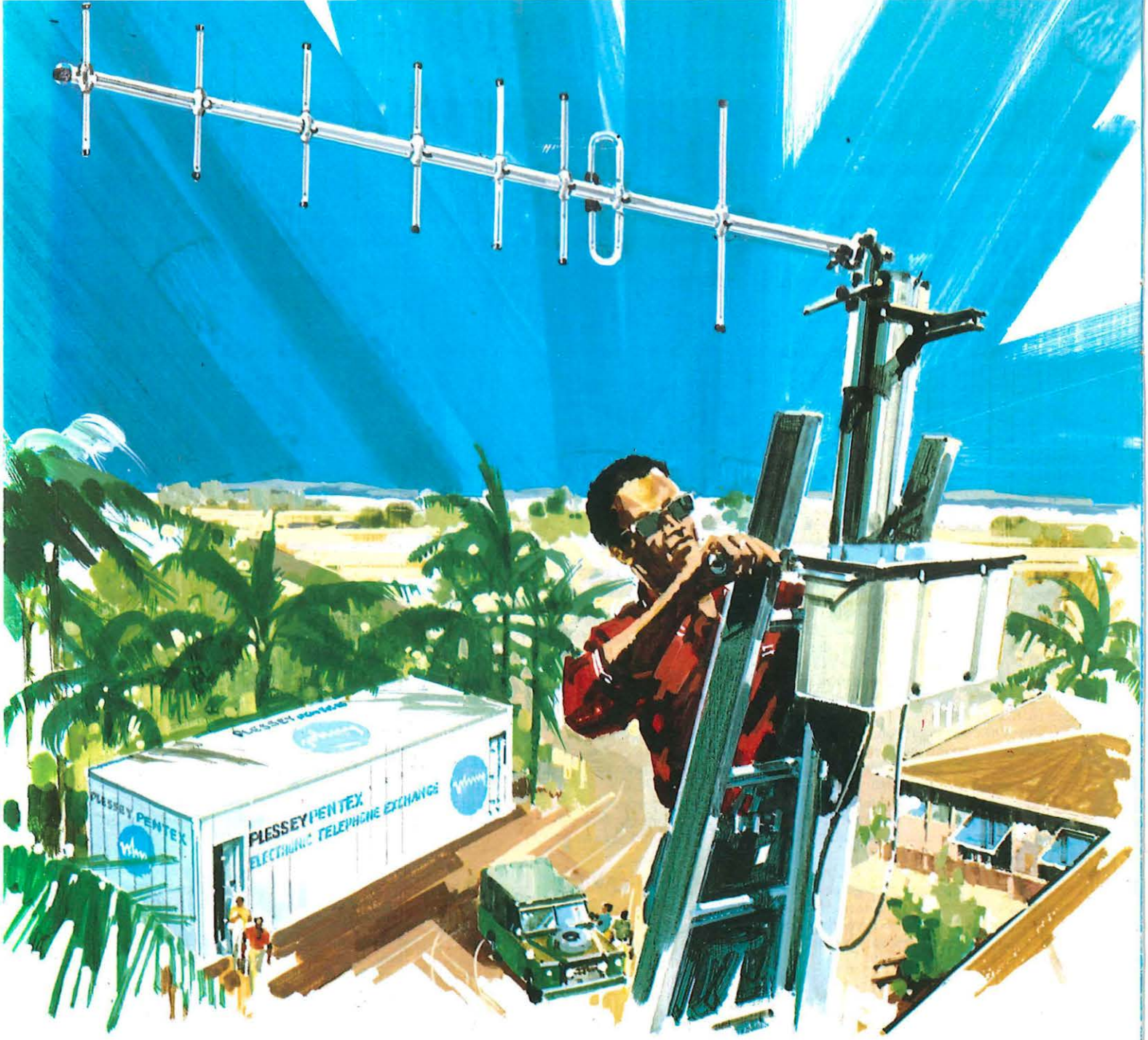
British firms have been making about 12,000 operator-connected calls a month to Egypt. Major users include the cotton, oil and chemical industries, and invisible export interests.

Eurodata Foundation

SEVENTEEN telecommunications organisations, including the Post Office, have formed a new body to work together to study and meet the needs of Europe's rapidly expanding data communications market. The organisation is called Eurodata Foundation and has head offices in The Hague.

Creation of the Foundation stems from a massive study in 1972 when the 17 authorities pooled their resources to produce a report on Europe's data communications needs – the Eurodata Study. The Foundation's main role is to take over from the consultants of the Study the custody and maintenance of the Eurodata database.

Through its ownership and upkeep of the



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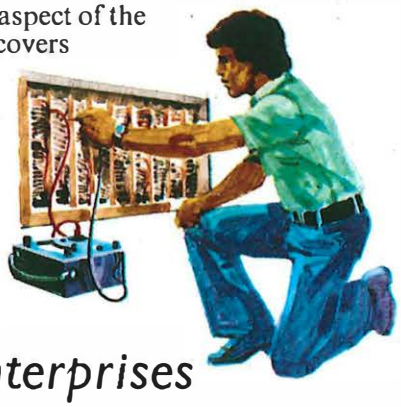
Meeting its customers' needs is basic to Plessey policy. From a carefully-planned equipment range, Plessey ensures that each customer gets the right system for the requirement, and at the time required. Take the Plessey Pentex System – a versatile family of exchanges designed to cater for the need, from a village exchange to a large city switching centre. And with the flexibility to provide exactly the right mix of facilities needed at any level.

Matching the system to the customer's exact requirement is only one aspect of the Plessey package, which covers every stage of telecommunications planning, supply, staffing, maintenance and continued development.



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database the Foundation will offer to clients – both telecommunications divisions and outside bodies – a range of information services within the field of data communications and related telecommunications. It will also conduct and control market studies for clients.

The Foundation aims to be financially self-supporting and will charge all clients commercial rates for its services.

Planning aid

TO enable customers of the Post Office's Experimental Packet-Switched Service (EPSS) to plan ahead more accurately, details of tariffs it plans to introduce have been announced.

Tariffs for the service, Europe's first packet-switched data transmission system for the public, will come into effect in 1978 following 12 months of full EPSS operation. Initially customers will pay only for their modems and access circuits – and at specially reduced rates.

Compiling expertise

THE computerised method which has halved the production time of Britain's telephone directories is to be used in New Zealand. Post Office computer programs and complete documentary back-up have been bought by the New Zealand Post Office under licence.

The computer-controlled compiling process, developed by the Post Office and Her Majesty's Stationery Office, integrated with computerised photocomposition, enables the average telephone book to be prepared ready for printing in about four weeks compared with the previous time of eight weeks.

The Post Office Data Processing Service is reproducing the software system – held on discs in the PODPS centre at Leeds – on magnetic tape which will be sent to Wellington. With it will go all the necessary documentation, including system and program specifications, operating instructions and clerical procedures.

Change for Athens

BRITAIN'S telephone users with International Subscriber Dialling need to dial a new code when calling Athens and nearby towns. The country code for Greece – 010 30 – is unaltered, but the area code for Athens, Piraeus and the surrounding district has been changed from 21 to 1.

Just over half the two million ISD calls made every year to Greece are to the towns involved, which are: Aiantion, Athens, Elefsis, Glyka Nera Paianias, Koropion, Kropia, Leontarion, Paianias, Paiania, Pallini, Pikermion, Piraeus, Salamis and Spata Attikis.

The 50th anniversary of the first transatlantic telephone call on 7 January was a day to remember not only for the Post Office but also for 74-year-old Miss Ivy Baker, a former telephonist who helped connect many of the early calls.

In a special telephone link-up to mark the anniversary Miss Baker, in London, spoke for the first time in many years to Miss Rose de Palma, 73, a former operator in New York. When transatlantic phoning began they connected many of the calls and built up a friendship but have never met.

Our picture shows Miss Baker revisiting an international telephone exchange in London. (See also page 1)

Key autodialler

A NEW telephone automatic dialling instrument has been developed for the Post Office by Pye TMC Ltd, and the first order for 2,000 units has been placed. The dialler, known as the Key Callmaker, provides storage for up to 48 most frequently called telephone numbers each of which can be up to 21 digits in length.

Storing the pre-determined number is easily effected by the subscriber by using the keypad provided which can also be used for calling numbers not held in the memory store. Internal and external numbers can be stored in the Key Callmaker.

Dialling any one of the stored numbers is achieved automatically by pressing one key only. Each stored number is identified by the called party's name printed on the appropriate key. A further time-saving facility is the "try-again" key which enables numbers previously manually dialled out and unobtainable to be re-called any number of times by pressing one key only.

Telex at sea

LAND'S End Radio is now able to link ships' teleprinter machines with the United Kingdom's mainland telex network and also those of many other countries. This extension of the Post Office's medium-range Radiotelex service brings to six the number of British coastal radio stations which operate the Radiotelex for vessels at sea. The others are Wick, Stonehaven, Cullercoats, North Foreland and Burnham.

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Correspondence:
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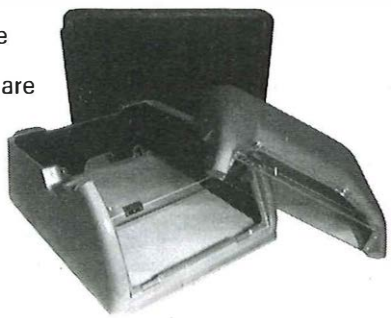
Specifically for use with Post Office Type 15 models the Acoustic Hood not only reduces teleprinter chatter dramatically, it is also designed for operator convenience.

A large front flap, with built-in lectern, allows unrestricted keyboard operation.

The fully detachable top means roll changing is still as easy and the top is self-locating when refitted.

Special non jam paper tape channels are built in and there is even a paper deflecter for use when external paper feed systems are fitted. Naturally, our Acoustic Hood is compatible with other Boyden Telex accessories.



The Boyden S.T.K. Acoustic Hood is a lightweight unit which, after exhaustive tests, is Post Office permitted for use on all P.O. Type 15 units.

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INDEX TO VOLUME 28

Spring 1976 to Winter 1976-77

ALPHABETICAL INDEX

GROUP INDEX

AVION CASE, CB, CBE, MBIM, General Secretary,
Hospital Saving Association.

A personal message to all HSA Contributors

The Hospital Saving Association's Standard Scheme (5p a week), to which many thousand members of the Post Office belong, was set up over 50 years ago to bring financial security to ordinary working people during times of sickness.

With the passage of time and with the recent onset of inflation, the Benefits that it is possible to pay under the Standard Scheme have become entirely inadequate for your needs.

The Hospital Saving Association's alternative CROWN PLAN, introduced a few years ago, provides much greater and a larger range of Benefits – Benefits that are in tune with your circumstances today.

For example, should you or your wife (or husband) become an In-Patient, CROWN PLAN pays out £21 a week; should you both be in Hospital at the same time, £42 a week is payable up to a maximum of £546 in any one year. Moreover, both husband and wife may enjoy separate memberships, and so by both claiming, benefit entitlement is effectively doubled.

Two new CROWN PLAN Benefits have been introduced from lst January, 1977, a Dental Treatment Benefit, and a Recuperation at Home Grant which is payable after 14 nights or more in Hospital with an acute illness. There are also numerous other Benefits protecting you and your family which contribute towards the costs of Spectacles, Home Help and Maternity etc, etc.

Clearly, it is in your interests to transfer your membership NOW to the CROWN PLAN as 15,000 of your Post Office colleagues have already done, provided that you are eligible by health and age to do so; the 65 age limit will unfortunately preclude most Post Office Pensioners from eligibility to join CROWN PLAN.

The HSA Executive Council has, therefore, decided that Standard Scheme Group payroll deduction facilities should cease as soon as practicable, and all those Contributors who are willing to do so should transfer into the CROWN PLAN with an immediate entitlement to all CROWN PLAN Benefits from the date of transfer. Deductions from pay will then be at the CROWN PLAN rate only (25p a week or £1.08 a month). New payroll deduction mandates will be necessary.

Arrangements are being concluded with your HSA Honorary Group Secretary for this block transfer of Post Office Standard Scheme Groups to the CROWN PLAN. Not all Groups can be actioned immediately, and you will be receiving a personal notification of the arrangements for your Group in due course, together with full details of the CROWN PLAN. In the meantime, you may, of course, contact your HSA Honorary Group Secretary to arrange your individual transfer to CROWN PLAN as soon as you like.

If you wish to opt out of your Group transfer to the CROWN PLAN and remain in the Standard Scheme, you may do so by becoming a Direct Contributor to the HSA Head Office. All you need to do is contact your HSA Honorary Group Secretary and complete a Transfer Form sending it to the HSA Head Office with your annual contribution of £2.60, and cancel your HSA deduction authority.

I hope that all Post Office HSA Contributors will wish to join CROWN PLAN and enjoy the better benefits and security that it brings.

Avion Case.

HOSPITAL SAVING ASSOCIATION

30 LANCASTER GATE LONDON W2

The non-profit-making Benevolent Association bringing help in time of sickness.

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