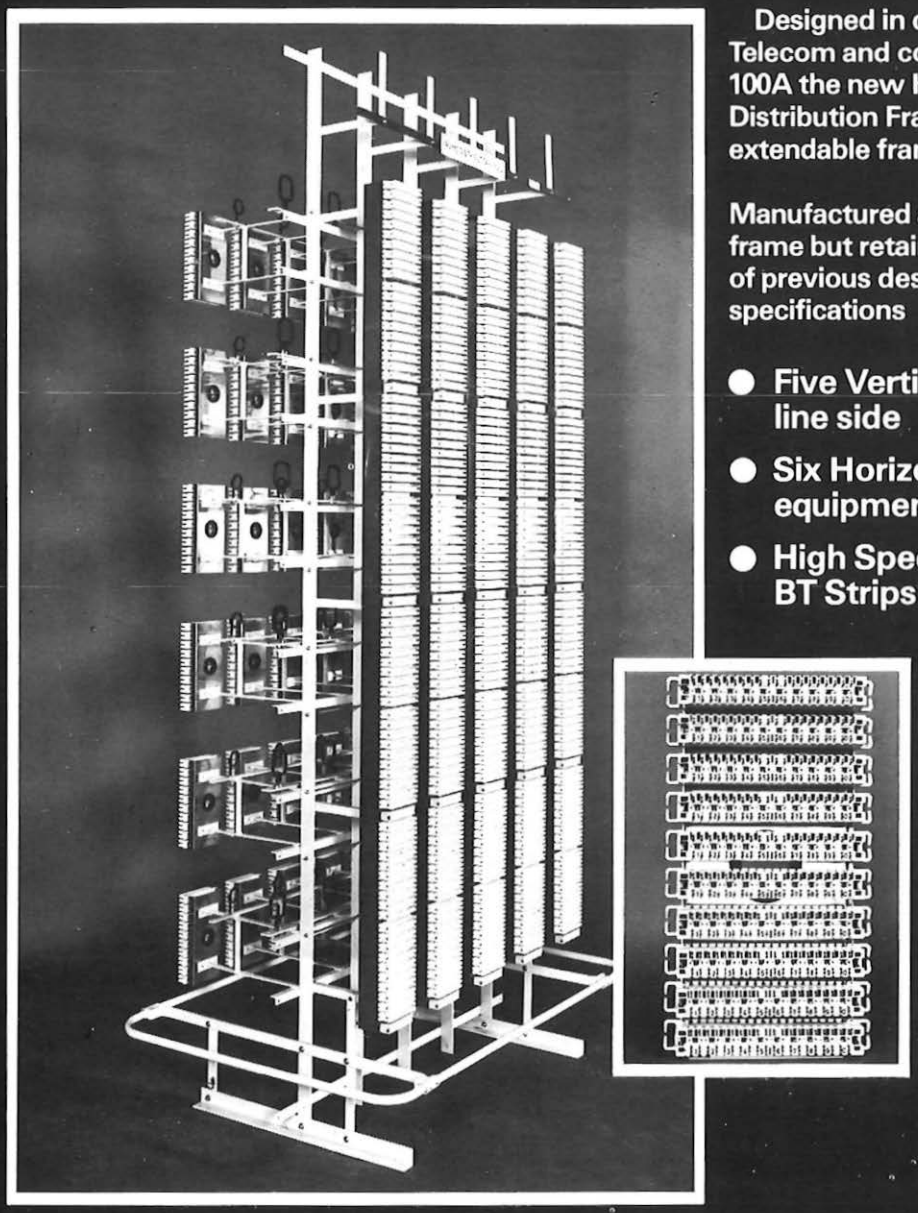
Spring 1982 Volume 3 Number 1 Price 30p

British TELECOM Journal

KRONE

FRAMEABILITY



Designed in conjunction with British Telecom and coded Frame, Distribution 100A the new Krone B.D.F. (Building Distribution Frame) is the latest in extendable frame units.

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All within a compact, but easily accessible 2600 × 1050 × 650 mm unit.

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Technology with co-operation

A practical guide to business telecommunications

"How to get the right telecommunications at the right price is an essential part of running a business. Here – in clear and factual terms written by experts for experts and non experts alike is the practical guide to business needs." Gordon Pocock, Chief Executive of Business Products and Systems for British Telecomms

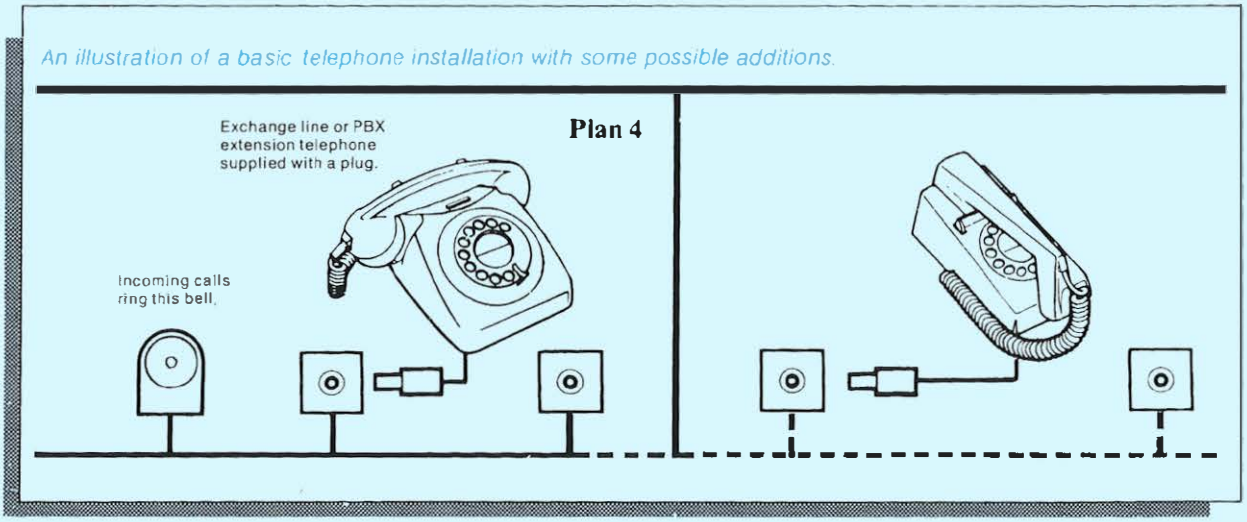
THE TELECOMMS USERS' HANDBOOK

Will you still be in the driving seat by the mid-eighties? Or will the revolution in information technology have left you on the side-lines, at the mercy of competitors because you failed to grasp the enormous opportunities for increased efficiency and lower costs that business telecommunications offer?

These opportunities are with us **now** and they are increasing every day. With the liberalisation of the British Telecoms monopoly of equipment and services and the publicity being given to Information Technology Year, your office is going to be faced with an unprecedented campaign by manufacturers and suppliers to invest in the new equipment.

Do you know enough to make the necessary decisions? There is a lot of money involved and they are as different in level from old-style decisions about buying business equipment as a word processor is different from an electric typewriter.

An illustration of a basic telephone installation with some possible additions.



Where is this conversation going to end?

It will be Britain's telephone users of the *future* who get the full benefit of the biggest change the telecommunications network of this country has ever known. As well as for ordinary conversations, they'll use it for a host of data services too; shopping, banking, information.

We're talking about System X – the unparalleled British achievement in telephone technology which can help build the integrated digital communications networks that the world needs. Right into the next century.

In this change to digital systems – which is now really gathering momentum – Plessey is helping to set the pace.

Plessey is one of the companies which joined forces with British Telecom to develop System X. It's a major factor in our national export strategy and Plessey is fully committed to promoting it worldwide, and selling it hard.

One of a series of advertisements for the general public about the achievements of the British telecommunications industry.

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telecommunications & office systems

Ahead in business communications

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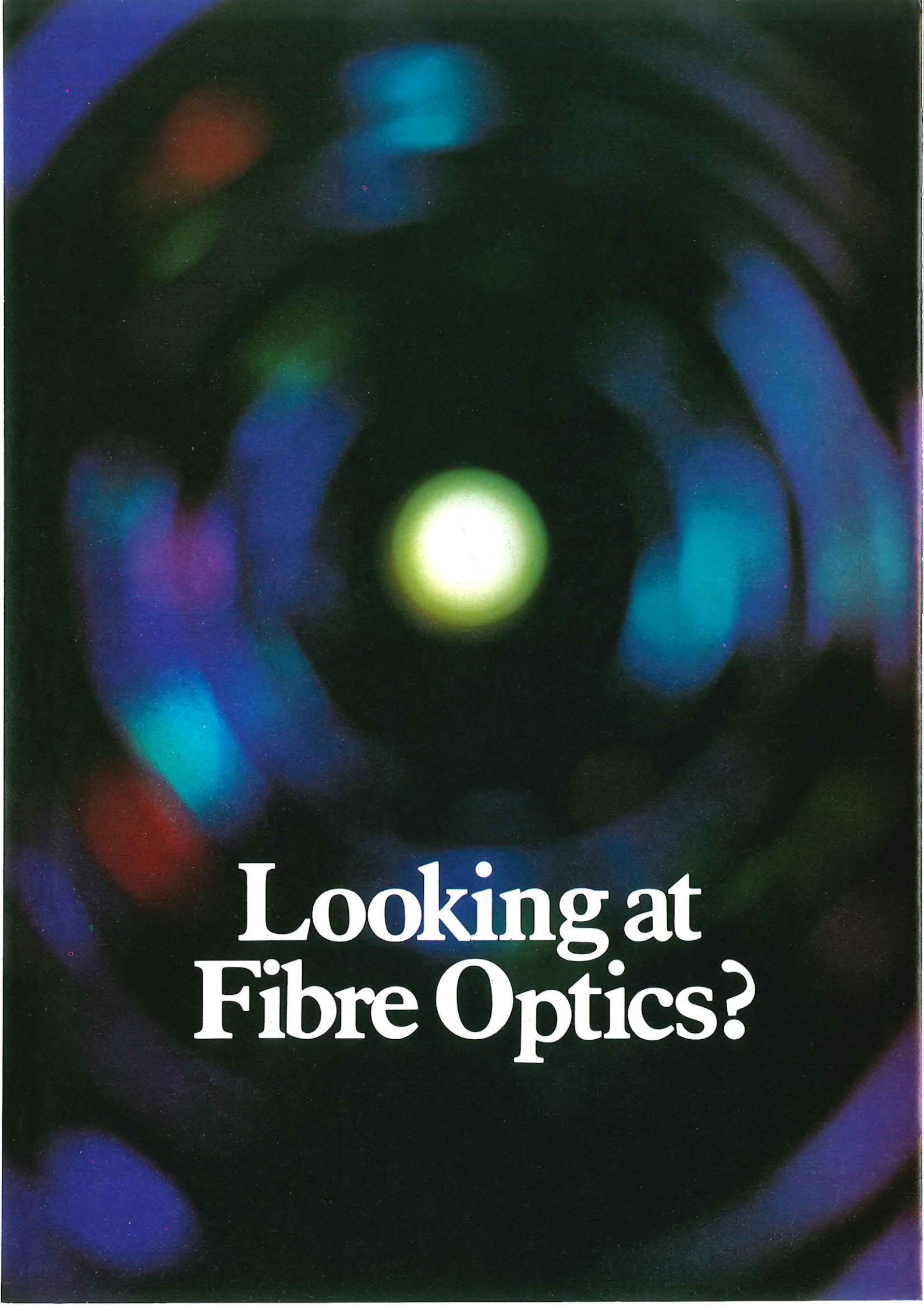


Looking at Fibre Optics?

Then look at STC.

The technology involved in STC's current contracts for the installation of optical systems is laying the foundation for the networks of the 21st century.

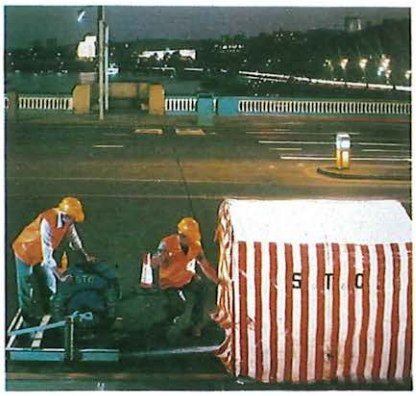
Today, subscribers are benefiting from the elimination of crosstalk and electrical interference. Business users are moving towards integrated voice anddata networks. Administrations are benefiting from lower costs, easier cable installation and system maintenance.

STC – the clear choice

Optical systems will play a major role in future transmission networks and British Telecom, recognising the value of optical communications, has placed major orders for optical fibre systems for the UK telecommunications network. So far 52 STC systems are planned for 19 routes throughout the UK, using 5000 km of optical fibre. STC will also be supplying Britain's first commercial monomode cable link. For the 27 km route no intermediate regenerators will be required.

Systems Capability

In 1966, two STC scientists conceived the principle of optical



communication, and since then STC has directed its considerable resources to developing a comprehensive capability in this new technology. For a wide range of applications, STC manufactures optical fibres, and cables, optical sources, detectors, connectors, line terminals and regenerators, and optical test sets. STC also offers turnkey project management, including systems planning, installation, test and commissioning services and customer engineer training.

Landline and Submarine Systems

STC supplies complete optical landline systems for the trunk and junction areas compatible with established CCITT digital transmission hierachy currently used in the world's communication networks. These range from local low bit rate systems to long distance high capacity systems.

STC is currently developing high capacity systems for submarine applications, and has already laid a trial optical system in deep water off the North West Coast of Scotland. A six-fibre cable was laid and tests have shown that the tube containing the fibres can withstand pressures of 100,000 kilonewtons.

Planning for the future

Optical fibre technology is advancing so rapidly that many new applications will soon be possible. STC, using its major research and development facilities, is conducting advanced research into a number of areas including longwavelength systems, analogue systems, direct transducers, integrated optics and wavelength multiplexing.

STC are planning for future demand by updating traditional products and developing new ones which will serve the customer and industry better.

For more detailed information on how STC's telecommunications systems can help you improve network and subscriber service, complete the coupon or attach it to your letterhead.

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BTJ5/82

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R&P 049

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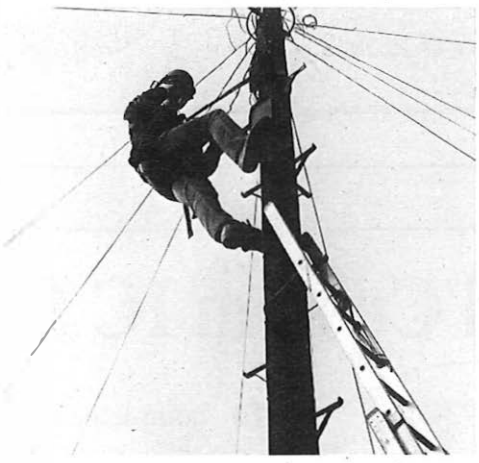
HOW EUROPEAN PTT's AND PHONE COMPANIES WILL FIND FAULTS BEFORE THEIR CUSTOMERS DO



With the latest automatic testing technology for subscriber lines – the **Series III 4TEL System.**

4TEL automatically tests every line every night: and provides powerful diagnostic testing for fault finding, every day.

The Series III 4TEL System includes:

- Advanced system refinements based on many years of user experience.
- The latest technology in microprocessors and communications.
- New testing features designed for the needs of European PTT's.
- Testing from the field with computer generated voice response.

Fast Measurements

Using distributed microcomputer control, 4TEL measures at unrivalled speed and accuracy – 600 measurements a minute. In a service area with 100,000 subscribers, that means more than 2.5 million measurements in six hours.

Right First Time

In the daytime, 4TEL's line testing and line diagnostic capabilities allow faults to be distributed to the right faultsman first time. On each line test 4TEL is able to distinguish the nature and severity of the fault. 4TEL's powerful fault location capabilities then lead him quickly to the vicinity of the fault – capabilities made possible by eight years of hardware and software development.

Savings

Substantial savings can be made by achieving accurate fault distribution, avoiding costly cable repairs by early fault detection and preventive maintenance and the elimination of wasteful pair changeovers when faults cannot be found by conventional methods.

Centralised Testing

Installing 4 TEL means that the entire Repair Service Control operation can be centralised and effective in controlling field personnel.

Accurate test information is displayed on a screen or printer in the RSC in plain language so that it can be acted on immediately. A faultsman can not only be directed to the fault, but he can verify the repair while he's still on the scene.

4TEL immediately permits major improvements in quality of service through more efficient responsive and preventive maintenance.

4TEL from Teradyne, one of the world's leading manufacturers of computer controlled test equipment, has been field proven in rural and urban environments and is testing millions of lines now.

For full data write or call:

TERADYNE

Teradyne Ltd.,
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The Mitel Superswitch family are the most advanced telephone switching systems available.

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They use microprocessor control and Mitel's own world-leading ISO-CMOS technology to outperform any comparable systems on the market. They provide more facilities, more reliably. They take less space and less power. They're easier to install, operate and maintain.

All of which means they not only cost less in the beginning, but in the long run too.

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British Telecom Journal
Spring 1982 Volume 3 Number 1

Published by British Telecom to promote and extend knowledge of the operation and management of telecommunications.

Cover: Seadog, British Telecom International Marine Division's new, remotely-controlled submersible, capable of inspecting and burying submarine cables in water depths down to 300 metres, has recently undergone first-stage evaluation trials in Scotland. Here, the craft, which will operate initially from *CS Monarch* following completion of trials, is lowered into the waters of Loch Linnhe.

The Mercury challenge

With the Mercury project now having been given the Government's green light, British Telecom finds itself, for the first time in 60 years, face to face with the challenge of competition. In short the new era of change has begun.

But if the rallying call of Chairman Sir George Jefferson is heeded, the stimulus created by the new order should, if properly harnessed, speed the provision of new products and services and go a long way towards maintaining the full confidence of all British Telecom customers.

Mercury, of course, is the £50 million joint venture between Cable and Wireless, BP and Barclays Merchant Bank whose initial plan is to link seven major business centres in Britain using optical fibre cables alongside British Rail tracks.

In a message to staff about the Mercury project, Sir George said that while British Telecom should not be afraid of competition he was concerned to ensure that it was fair competition. It was important that the arrangements for accommodating the Mercury network with British Telecom's system were placed on a sound commercial basis and gave a fair deal to British Telecom's customers and staff.

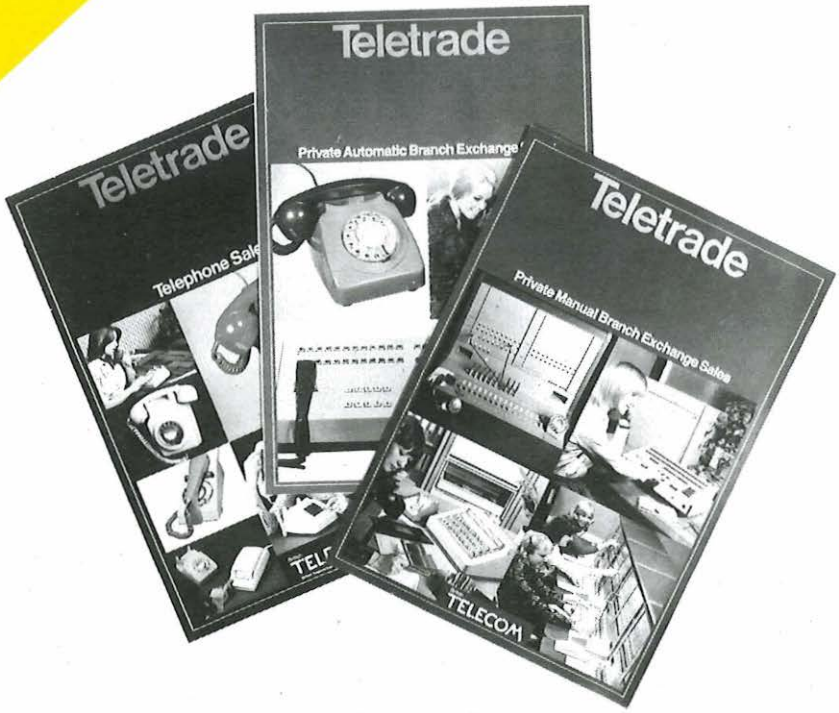
On the question of interconnection with British Telecom's inland system, Sir George said there would be no 'carte blanche'. The degree of interconnection would depend on the extent to which British Telecom could reach mutually acceptable financial and technical arrangements in further negotiations with Cable and Wireless.

On international services, Sir George stressed that the Government had re-affirmed that British Telecom would remain the UK's sole international operator. Mercury, where it operated, would do so as agents of British Telecom and within the international arrangements negotiated by British Telecom on behalf of the United Kingdom.

And there was definitely no doubting Sir George's overall mood as he told staff: "I believe that with our invaluable marketing base and our international reputation, we can confidently meet this new challenge. At the same time we must recognise the facts of competitive life and make the most of our opportunities because there is no doubt that Mercury will result in competition. We must leave our customers in no doubt that we have our own excellent range of services and products to meet their needs – and that we should remain their natural first choice."

Equipment to order!

DJ Holmes



Promotional material is sent around the world.

With British Telecom fully committed to modernising the UK telephone network, some of its redundant Strowger apparatus is now being sold to overseas administrations under the marketing name Teletrade.

Modernisation of the UK telecommunications network is gaining momentum. A positive start has already been made towards establishing an integrated digital switching and transmission network and the latest technology is being used more and more in customer's equipment. Although the programme will take many years to implement it will result in the recovery of equipment which can still provide efficient service – particularly in those countries with relatively basic telecommunications requirements and a plentiful supply of labour.

Such equipment includes Strowger exchange-switching apparatus, dial-operated telephones, and many designs of both private manual and automatic exchanges. Most of this is still being overhauled and refurbished at British Telecom's factories and reused in the UK network. And although Strowger and other equipment will be used in the network for many years to come, its gradual phasing out will result in more and more surplus. Although it would be easy to destroy or to sell as scrap, the sensible approach is to continue refurbishing equipment and sell it overseas.

British Telecom's policy to seek overseas markets was boosted by the knowledge that most principal UK manufacturers of telecommunications equipment had made it clear that they wanted to stop manufacturing Strowger and related equipment in favour of high-technology designs. But there are many areas of the world in which telecommunication authorities do not yet have the money or the means to move into the field of high technology – particularly many third-world countries. Information collected by representatives of British Telconsult – the international consultancy arm of British Telecom which provides world-wide consultancy services – soon confirmed this view.

Head of group Dennis Holmes, author of this article, checks items of equipment against sales literature with head of Teletrade Geoff Price (seated).

In March last year, the Overseas Liaison and Consultancy Department (OLCD) promoted a market survey to assess the level of potential business. The survey itself stimulated interest and before long, business worth £1 million was contracted, mainly to African and Far East markets. Teletrade was underway. Now it is controlled by a management committee with representatives from Network Executive, British Telecom factories, Procurement Executive and Finance Department.

Teletrade is well supported in British Telecom, and is given day-to-day support to identify, sell, transport, refurbish and ship a wide range of equipment – which includes Strowger exchange switching equipment (from constituent items to complete turnkey exchanges), telephone instruments, PMBXs, PABXs, sleeve-control switchboards, modems, and electromechanical teleprinters.

Equipment is, of course, offered in good-working order and is 'as new' in appearance. Refurbishment work is carried out by British Telecom Factories to the same high standard as set for equipment used in the UK telephone network. And,

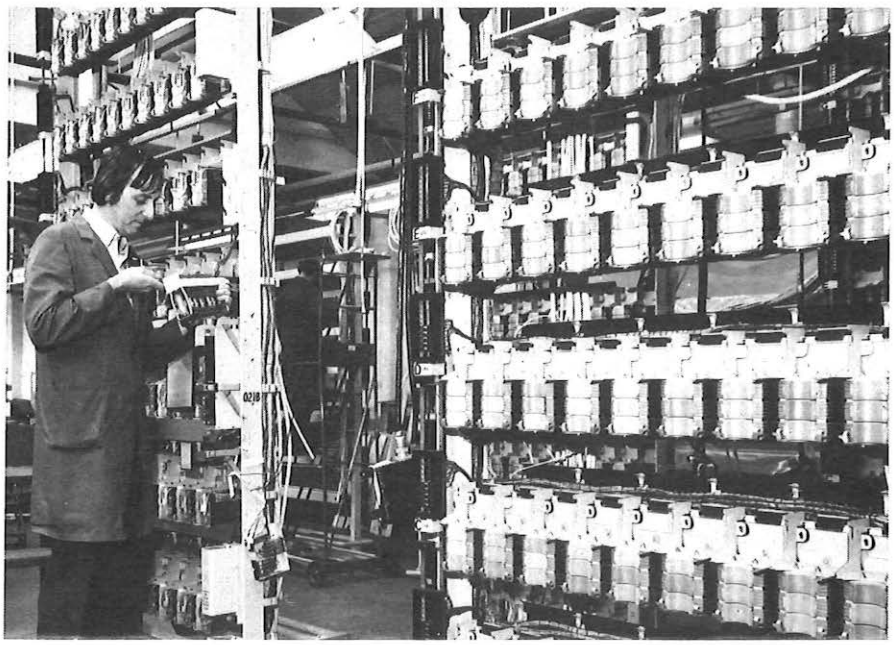
**Sleeve-controlled switchboards are also in demand.
This one, at Fordrough Lane in Birmingham, is being restored by factory technician Don Green.**

subject to negotiation, Teletrade can also supply equipment in an 'as found' condition as recovered in good-working order from the network.

Quality of recovered Strowger equipment does not depend on its age because maintenance procedures for the UK network ensure good-working order at all times. Although the age of equipment offered to overseas markets varies, most items are less than 10 years old. With worn parts replaced, equipment should give good service for many years. Warranty and after-sales service are available and, of course, plenty of spare parts can be provided.

It is particularly in the area of Strowger exchange switching that Teletrade comes into its own. It can offer all the equipment to form complete turnkey exchanges from 200 to more than 10,000 lines. Exchange installation can be arranged by separate contract, using either British Telecom or local staff. Where local staff are employed, a British Telecom work supervisor would be appointed to control and monitor the installation. Support services, training of local staff and spares holding can all be provided.

**Entire Strowger exchanges can be purchased through Teletrade.
Here factory technician John Downing checks a Strowger uniselector rack.**



One important aspect of selling to some countries is the ability to offer finance. Supported by the UK Export Credit Guarantee Department, and international banking institutions, Teletrade can arrange attractive finance terms. In contracts valued at £1 million currently being negotiated to supply turnkey Strowger exchanges, terms offered provide for repayment within three to six years with loan interest at the prevailing consensus rate (currently 10¼ per cent). The Teletrade sales office operates as part of OLCD and has already sold to 12 countries and has circulated promotional literature to another 40.

That Teletrade generates valuable income for British Telecom is beyond doubt. The price received from overseas customers is higher than could ever be raised by other means of disposal, and even after allowance is made for sales and marketing effort, refurbishment work and reimbursement to the source of the equipment – often a telephone area – Teletrade is a profitable business. So as well as providing continuing work for British Telecom's Factories, it generates a positive cash-flow, is modestly helping reduce British Telecom's external financing requirement and can make a positive contribution to the support and growth of telecommunications facilities in underdeveloped countries.

The early success of Teletrade has been greatly helped by the goodwill and co-operation of area, regional, factory and BTHQ staff who have responded positively to the project. The scheme makes good use of surplus equipment, generates an income for British Telecom and has potential to make a positive contribution to the support and growth of telecommunications facilities in underdeveloped countries.

The Teletrade sales office is located at 55 Old Broad Street, London EC2M 1RX, England. Telephone National, 01-588 5872; International, +44 1 588 5872; Telex 887523.

Mr D. J. Holmes is head of the consultative services and Teletrade sales group based in British Telecom Headquarters' Overseas Liaison and Consultancy Department.

The digital advance

G H Bennett

British Telecom is committed to a programme of modernisation which will virtually eliminate analogue transmission from the main trunk network by the early 1990s. This article looks at the difficulties in changing to a digital system while meeting the vigorous growth which business users in particular are expected to generate.

The present telex service, the more modern packet switched data service and a range of 'datel' services are all digital in their origins but transmitted by analogue means. The first truly digital data service planned for introduction towards the end of this year, is the private circuit digital data service – now called KiloStream 1. Based on a 2 Mbit/s multiplex having 31 channels each of 64 kbit/s, it can provide the whole of the present range of datel services by digital means.

Data signals generated at any of the standard rates by the customer terminal equipment are transmitted over the local network using a special line signal which is particularly robust and suitable for use in the hostile environment of local pair cables. In the KiloStream 1 terminal equipment, these signals are restored to binary and then reiterated – that is, repeated several times to bring each to the standard rate of 64 kbit/s.

Although the original intention was always to install the multiplex on British Telecom premises, it is now evident that for larger users there may be advantages in locating the multiplex at the customer's office. Arrangements are in hand for the multiplex and associated power supplies to be fitted in a cabinet similar to that used for the Monarch 120 making it compatible with modern customer presentation.

Although KiloStream 1 was originally envisaged as a data service, the idea of installing the multiplex on customer premises also makes it attractive to use some of the channels for voice instead of data. Consequently, a plug-in-card incorporating a single channel voice encoder is to be introduced to give the customer more flexibility in the use of this equipment. The 2 Mbit/s signals generated by the multiplex will be carried on the main digital network multiplexed with other digital traffic at bearer rates up to 140 Mbit/s.

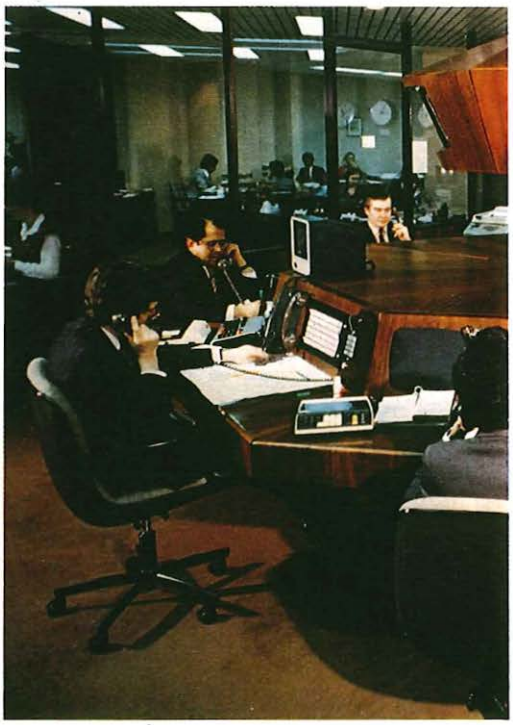
At a number of designated 'cross-connect sites', it will be possible to interconnect 64 kbit/s paths on a manual patching basis. To achieve this it is necessary for the whole KiloStream 1 network to be synchronised and this is done in much the same way as System X is to be synchronised using the same high-stability caesium reference clock.

Although there is a steady increase in demand for private data circuits which KiloStream 1 was specifically designed to meet, there is also an enormous market for private voice circuits. Until now, these have been carried on the analogue network in the same way as the public switched service.

As the digital network grows, it is increasingly important to be able to transfer the analogue private circuits to the digital network and so provide the customer with the higher quality of circuit achieved by pulse code modulation (PCM). As with KiloStream 1, the PCM equipment now coming into service is intended for British Telecom

This three-metre dish aerial was installed on the roof of the Financial Times building in London at the start of satellite trials for the British Telecom SatStream service.

Purpose-built dealer boards using British Telecom digital links will help business boom in the City of London.



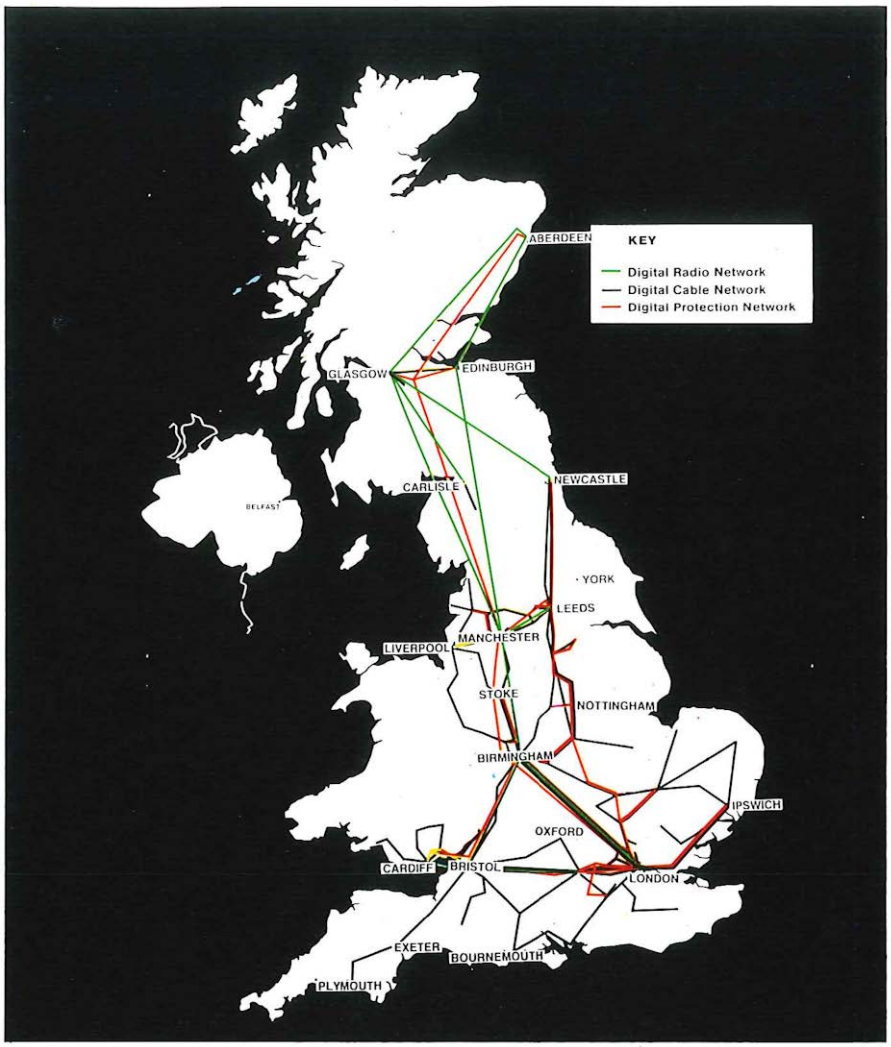
premises. But for customers with a large number of private voice circuits there can be economic advantages in the installation of the PCM multiplex at the customer's premises and, as in KiloStream 1, using a Monarch-style cabinet to make it acceptable to the customer.

Whereas KiloStream 1 is seen as providing mainly data with a small number of voice circuits if required, the converse is true of PCM which will be used where the greatest need is for voice circuits. But provision of a small number of data circuits is also needed and this is realised by replacing a voice channel card by a data card which interfaces through the CCITT-recommended 64 kbit/s co-directional interface. This can then, by the use of intermediary apparatus, appear to the customer as exactly the same service facility as that achieved by KiloStream 1.

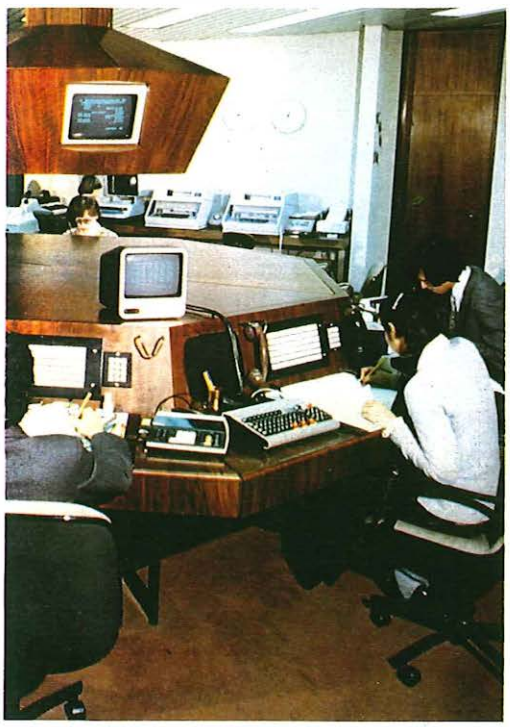
Combinations of these services are being marketed as part of the 'X-Stream' private network now being offered to leading business customers. X-Stream also embraces the KiloStream, Mega-Stream, SwitchStream and SatStream 1 services. (See *British Telecom Journal*, Winter 1981/82.)

KiloStream will embrace the present datel rates of 2.4, 4.8, 9.6 and 48 kbit/s, adding to these 64 kbit/s bearers which is the full capacity of a digital channel time slot. It is also possible to provide a number of 64 kbit/s integral blocks which are particularly useful for specialist applications such as broadcast sound

NATIONAL DIGITAL NETWORK



Printed circuit boards are a vital element in British Telecom digital services.



X-STREAM SERVICES	OPERATING BY	USED FOR
SwitchStream	SwitchStream One (BT's packet-switched service) brought into full commercial operation on 20 August 1981. Linked to international packet-switched service from early 1982. SwitchStream Two pilot service starts late 1983.	Remote order processing. Credit verification. Intermittent data transfer.
MegaStream	Already working in its basic form on London Overlay. Will extend to Midlands for voice use in 1982, and cover Britain's principal business centres in 1983.	PABX to PABX. Data and data and voice joint transmission. Video conferences. Large private networks. High speed data.
KiloStream	Will extend to Midlands for voice use during 1982, and will cover Britain's principal business centres in 1983. KiloStream digital service will become available nationally in January 1983, and extend internationally during 1983 and 1984.	Data transmission. Credit verification. Slow scan TV. High speed facsimile. High speed data.
SatStream	First trials took place in November 1981. Generally available by January 1984.	Voice and data multi-point transmission. Facsimile. Services to remote locations. High speed data.

programmes. MegaStream will make available to the customer digital transmission paths at 2 Mbit/s and 8 Mbit/s. Specialist users like the broadcasting companies will also need to access the higher rates in the network of 34 Mbit/s, 68 Mbit/s and 140 Mbit/s, but these are chiefly for television services and are not expected to be widely used.

SwitchStream 1 is the present packet switched service, whereas SwitchStream 2 depends for its implementation on the availability of System X switches and consequently can only be introduced as System X is installed. Towards the end of next year, a pilot SwitchStream 2 scheme is planned for introduction to selected business users and will use a System X switch in the Baynard House complex. At present there is no digital transmission available between the UK and Europe and the earliest available path will be provided by satellite, probably in 1984.

Later this decade, there could be an optical fibre cable across the Channel, particularly as the technology for monomode fibre and related devices should be sufficiently well advanced to permit an unrepeatered link to be installed. The already well-established CCITT recommendations for digital transmission and data services which have been adopted throughout Europe will permit the introduction of business services as soon as the transmission paths can be made available.

Within the UK, the use of satellites is also a possibility, but at present the main network is being provided at 140 Mbit/s on a balanced mix of coaxial cable, microwave radio and optical fibre, the latter being the most advantageous for digital transmission. In city centres, particularly where urgent provision is required, British Telecom already has a transportable 19 GHz microwave radio system which can provide either 2 Mbit/s or 8 Mbit/s. Light in weight and using a small dish antenna, it can easily be installed on a roof-top by a small team.

Maintenance of the private circuit network has always been a difficult task, particularly as the services provided are wide ranging in the facilities and signalling methods. Making the most efficient use of maintenance staff and giving the man in the field the best possible support in analysing faults, requires specialist advice from the testing staff. As a positive move to achieve this in the mid-1980s, the introduction of a remote access test equipment system is planned. This allows a test engineer to access a circuit from a remote control centre and to carry out a range of objective tests aimed at determining as accurately as possible the location and cause of a fault.

Aimed initially at the many thousands of analogue circuits now in existence, the new system will be updated to provide testing facilities for digital circuits. Digital access is more complex than for analogue, since the digital/test facility must necessarily be synchronised with the signal to be tested.

One possible approach to the problem is that used by American Telephone & Telegraph in association with their digital access cross-connect system – (DACS) which is essentially a programmable 64 kbit/s digital distribution frame with the capability of accessing the 64 kbit/s cross-connects for testing from a remote centre. This approach has many advantages, not least of which is that DACS allows rapid changes to be made in the cross-connects, either locally or remotely, and can thus expedite circuit provision and rearrangements by avoiding the need to run wire jumpers on a distribution frame. The possibility of introducing this concept into the British Telecom digital private circuit network is being actively pursued.

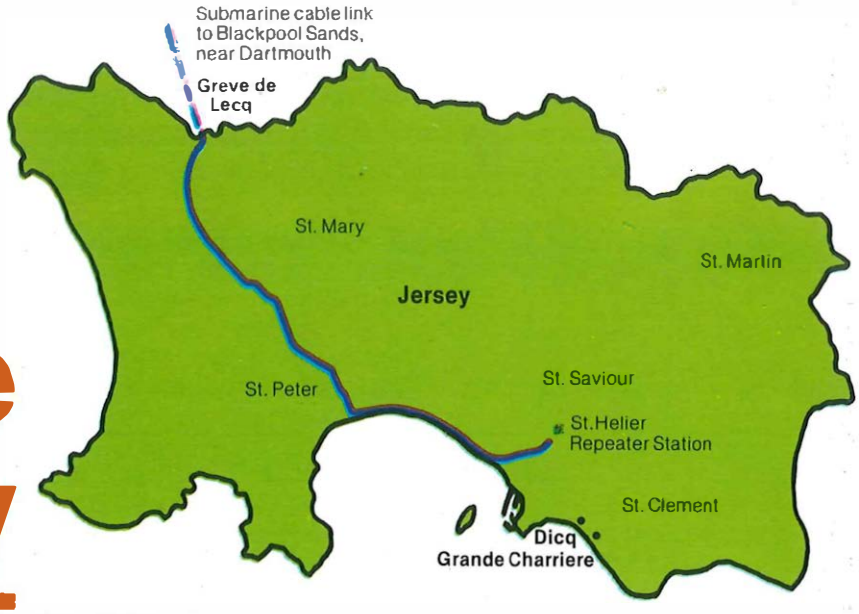
Although the present main thrust of effort is towards providing modern digital services for the business customer, there is likely in future to be a need to consider digital communications for the private user. The advantages are less obvious than for the business data user but the potential services can range from the 'office-in-the-home' to accessing a multiplicity of television channels by switching these to a customer in response to a call for a particular channel.

The idea of a telephone with its own voice encoder and digital path connecting to a digital switching system has been widely explored, but as yet there is no clear indication of this supplanting the present technically simple method of a telephone analogue connected to the exchange and powered over the traditional copper pair.

Forecasting the future is notoriously difficult and the rate of evolution and introduction of new ideas will inevitably accelerate as technological progress makes more and more ideas feasible and economical. The 1980s are undoubtedly the era of change from analogue to digital technology with all that this will mean for the customer. The 1990s can be expected to consolidate the digital theme and spread the advantages it offers to even more British Telecom customers.

Mr G. H. Bennett is head of main network transmission development in Network Executive responsible for transmission systems on cable, optical fibre and microwave radio.

British Telecom Journal, Spring 1982



The Jersey connection

P S Bridle and K B Kilsby

A new 1,380 circuit submarine cable to serve the Channel Islands is to be laid this summer from the South Devon coast to Jersey – with Guernsey benefiting via the Jersey-Guernsey microwave link.
This article looks at the work involved in the planning and installation of the land section cable.

When in 1978, the decision was made to augment the 2,000 circuits provided by existing submarine cables from the mainland to the Channel Islands, first considerations were reliability and security. To achieve this and create diversity, it was decided to follow a new sea route and provide new landing points at both ends of the system.

On the beach at Blackpool Sands near Dartmouth, Exeter Area staff prepare to attach rope to a hawser before bringing the cable ashore.

The vital land section

Whenever a new submarine system is installed, most of the publicity inevitably focuses on the long distance underwater section with scant attention paid to the less spectacular but equally important land sections which complete the link between beach and repeater station.

Not surprisingly, the land sections have their own particular requirements and these are the responsibility of the submarine cable jointing group of British Telecom's Network Executive. The group's involvement in this work dates back to the installation of the first transatlantic telephone cable system (TAT1) in 1956.

It was decided then to centralise within headquarters the resources required for the various activities associated with submarine cable land sections and since that time the group has been responsible for both the planning and execution of all submarine system land sections. This includes provision of equipment and installation and jointing of the cable as well as providing facilities for training in the relevant jointing techniques.

With training and equipment supply, the group's function is widened to cover the worldwide supply of specialist jointing equipment and the training required for all aspects of submarine cable jointing including sea sections and repeater joints. The Submarine Cable Jointing School, part of British Telecom's External Plant Development Division at Wembley provides training not only for British Telecom staff but also, on an agency basis, for staff from overseas administrations.

The specialised experience gained by the group often leads to requests for advice and help with an overseas land section from partners in a submarine cable project and this is the basis of the group's involvement with the Jersey land section.

Staff and students at work in the Submarine Cable Jointing School at Carlton House, Wembley.

The requirement for the system originated in the trunk transmission planning division of British Telecom's Network Executive who commissioned British Telecom International to provide a submarine system. The system has been bought from Standard Telephones and Cables by British Telecom and States of Jersey Telecommunications Board who are acting jointly with the States Telecommunications Board of Guernsey.

In the past, telegraph cables serving the Channel Islands have been landed on the mainland at Compass Cove near Dartmouth. But sheer rock faces rise on either side of this beach and access to the road at the top is difficult. There is also the constant threat of erosion. A number of alternative landing sites were surveyed but all had practical limitations except Blackpool Sands, close to Dartmouth. This satisfied the requirements for landing the sea cable as well as providing good access for the land section duct track and cable.

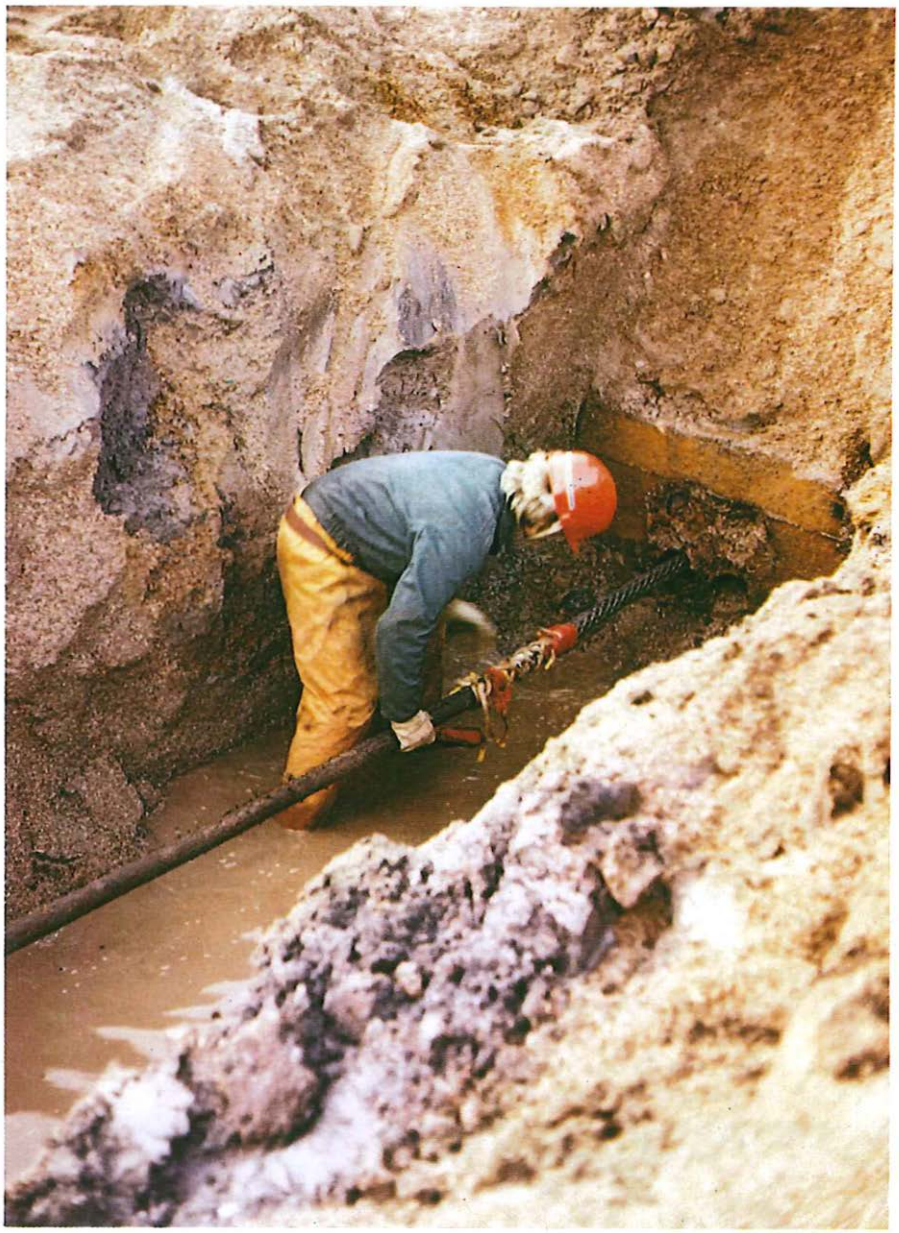
A further advantage was that South-West Telecommunications Board had recently built a telephone exchange at Stoke Fleming and this could easily be extended to include the terminal for the new submarine system. This meant the length of the submarine cable land section would be limited to 1.4 km and therefore eliminate any need for a land-based repeater.

Installation of land sections for earlier submarine cable systems in the Channel Islands had previously been the direct responsibility of the then UK Post Office.

Under the new administrative arrangements, however, the States of Jersey Telecommunications Board is now responsible for the land section of the new cable in Jersey but British Telecom were invited to submit an estimate for the planning and installation of the Jersey land section on a repayment basis.

The preliminary survey was carried out by the submarine cable jointing group. (See previous page.) The terminal in Jersey is at St Helier repeater station and the existing submarine cables land at The Dicq and Grande Charriere. To satisfy the diversity considerations, however, a new landing site was sought and Greve de Lecq on the north-west coast of the island was found to meet all requirements.

Although this landing gave a shorter undersea section, it resulted in a land section of some 13 km back to St Helier repeater station requiring two repeaters. In addition it was proposed that the potential hazard to the shore-end cable because of offshore rocks, would be countered by a layer of specially applied armour wires known as 'rock armour'.



The cable is guided into a duct under the beach at Blackpool Sands so that it can be connected to the land section cable.

The British Telecom proposals and estimate to engineer the land section were accepted. It was agreed that the supply and installation of the duct, jointing chambers and repeater pits were to be the responsibility of the States of Jersey Telecommunications Board. The submarine cable jointing group would supervise the duct and cable installations, provide specialist jointing staff, equipment and vehicles and carry out all cable jointing and terminations.

The route finally chosen between Greve D'Lecq and St Helier repeater station offered the highest degree of security for the dedicated two-way PVC duct track. The section will contain two land-based repeaters at three and 12 km respectively from the repeater station.

Cabling and jointing work should be completed in early spring this year and laying of the sea cable is planned to begin during summer this year and will use the British Telecom International cableship *Alert*.

The whole system is expected to be operational by the end of the year and will create an important addition to communications with the Channel Islands, maintaining their prestige as a financial and tourist centre.

Mr P. S. Bridle is head of the submarine cable jointing group in British Telecom's Network Executive and is based at Carlton House in Wembley.

Mr K. B. Kilsby is an executive engineer in the same group responsible for the land section project work.

British Telecom Journal, Spring 1982

Shopping by phone

M de Smith

As a marketing medium the telephone has great untapped potential. About threequarters of UK households now have a telephone and more and more people are finding the idea of calling firms directly to order goods increasingly attractive. In the comfort of his or her own home, a telephone-shopper can 'ring around' alternative shops to get the best price and place an order.

On the other hand, a company representative selling by telephone can seek orders all over the country (or abroad) in the same morning – impossible for a salesman on the road. Since telephone sales contact usually saves time and money for businesses *and* their called customers, it is easy to see why this is a keen growth area. It can be a highly profitable business as well as a greatly appreciated service.

British Telecom has already recognised the use of the telephone in this way as an area for further development, and has introduced a new regionally-based consultancy service called Phonepower (see *British Telecom Journal*, Winter 1980/81). Designed to help customers use the telephone more effectively, Phonepower is a service which aims to help businesses by optimising the time of sales staff, consequently achieving better market coverage and accelerating cash flow. One way in which it can do this is by encouraging people at home to use the telephone to shop.

Indeed, every day, thousands of private individuals use their home telephone to order goods and services: they buy everything from food to fuel oil, tickets to towels, electrical goods to insurance. They place orders in response to advertisements in the Sunday colour supplements, newspapers, magazines, catalogues, Yellow Pages or simply to retailers they already know. They generally pay for goods by cheque or quote their credit card number, although some prefer cash-on-collection or cash-on-delivery as an option.

Without having to set foot outside her home, a shopper can order the goods she wants simply by making a phone call.

Recent research has shown that the potential for taking orders by telephone is very large. Over one third of adults in the UK have bought goods by mail order in the last year, and many of these would have preferred to have ordered by telephone. For the retailer there are several attractions to accepting telephone orders:

- Enquiries about the availability of a particular product can be converted into firm orders on the spot.
- For companies currently offering goods by mail order, introducing a telephone ordering facility can increase sales by up to 10 per cent, and significantly reduce the percentage of returned goods. Many companies are now taking 20 per cent of their orders by telephone, with each operator handling 25 or more confirmed orders daily.
- Accepting payment by credit card can increase sales by between 20 to 25 per cent for many products, and this is the ideal payment method for use in conjunction with telephone orders. It not only provides the retailer with fast payment, but makes it highly unlikely that the buyer will subsequently change his or her mind about the order they have placed.
- Accepting telephone orders can increase customer loyalty by offering a friendly, easy-to-use, and efficient service.

Since ordering by telephone and payment by credit card are complementary services, products offered will be most successful if they aim at the credit card market, and particularly at male cardholders. One quarter of Britain's adult population now has some form of credit card, and two thirds of these live in south east England or the Midlands. Cardholders are typically in the higher income and socio-economic brackets and primarily use their cards for higher value purchases – typically for items costing £15 or more.

A recent national survey showed that

By using the Yellow Pages directory, a telephone shopper can ensure he buys goods at the best possible price.

Shopping by phone is very much a growth industry, and staff at the Freeman's mail order firm in London are kept busy dealing with agents through their Orderline scheme.

the items consumers would most like to buy by telephone were tickets – over half would like to be able to buy their theatre or cinema tickets easily this way – and over 20 per cent would like to buy food and general household items.

What would encourage them to do this? The biggest deterrent is simply not knowing who offers the facility. A second factor that would encourage almost half the respondents in the British Telecom survey to order by telephone would be the offer of free calls.

Advertising the availability of goods and services over the telephone combined with the offer to pay for the call if an order is made could be just the stimulus consumers need.

For out-of-hours business, an answering machine is desirable for the supplier. If many products are on offer, orders should not be sought – taking the caller's name and telephone number and returning the call, or asking them to call back is more satisfactory. As many as 20 per cent of potential customers may wish to call out of hours, but properly-handled answering devices should not dissuade more than two or three per cent of these from placing an order by telephone.

Many businesses have started to seek orders by telephoning potential customers at home. Experienced telephone marketing companies have found that the cost of calling potential customers in this way is between £1 and £3 per successful call, and the cost per sale may be anything from £5 to £10 if 20 to 30 per cent of consumers agree to buy. Currently this is generally only viable for products or services valued at more than £20. For the highest success rates a really attractive offer, to a known list of potential buyers, with acceptance of payment by credit card are all key points to aim for.

British Telecom's Phonepower consultants are on hand around the country to advise companies who wish to make greater use of the telephone. They can provide advice on what telephone equipment is best suited to a particular application, and assist in the design and implementation of an efficient telephone order-taking organisation. Obviously, greater use of the telephone in this way is beneficial not only to British Telecom, but to the growth of the commercial sector of the UK.

Mr M. de Smith is managing director of Joan de Smith Systems, a specialist consultancy company which advises British Telecom.

British Telecom Journal, Spring 1982

The changing picture

The changing picture

The changing picture

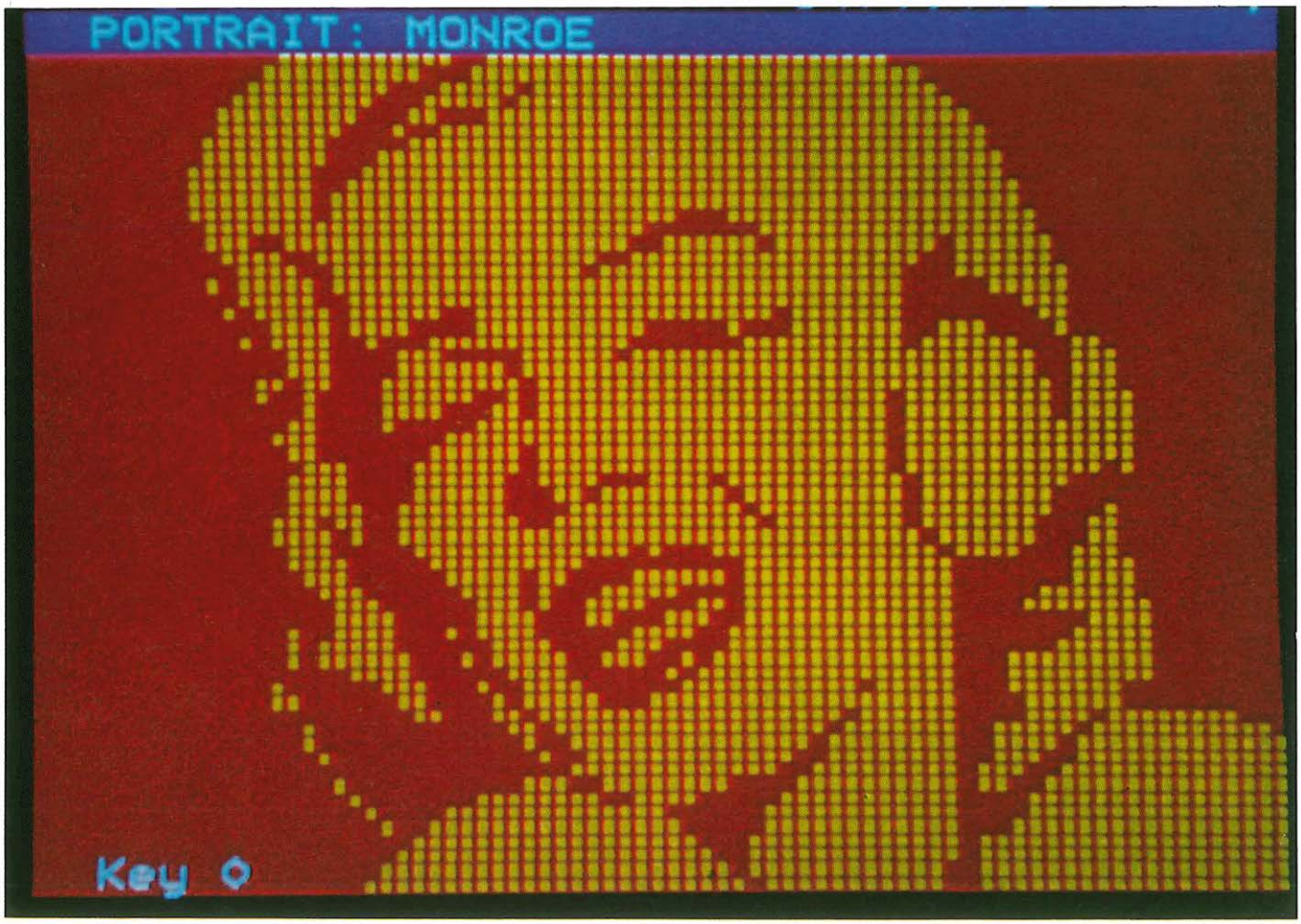
Since the invention of the world's first viewdata system at the Post Office Research Centre some seven years ago, several different videotex systems have been introduced. This article looks at possible future developments.

Videotex is the generic name adopted within the Geneva-based telephone and telegraph consultative committee (CCITT) for text communication systems having the added capability of pictorial display and which use the telephone network and the television screen. The first commercial service to be developed is British Telecom's Prestel system. All videotex systems use similar techniques but there are several ways of presenting stylised pictorial information.

The first is mosaic, in which pictures are defined by filling character positions on the screen with mosaic elements. Secondly, there is the geometric method, in which pictures are defined in terms of geometric components. But the most exciting is photographic, which uses slow-scan TV technology. It permits the information provider to place a high resolution, full colour picture, anywhere in the videotex frame.

When the first videotex system was announced by the Post Office in 1975, discussions with the UK broadcasting authorities and the television set manufacturers resulted in an agreement to adopt a common display standard which associates certain attributes such as colour with each alpha-mosaic character. A simple rule was adopted under which display 'attribute' changes would be stored in the same memory as the characters. This means that the terminal's display memory can be kept to a minimum (for low cost) but this memory limitation means that a change of attribute is only possible at a space in a line of text. (In alpha-mosiac pictures the

This portrait of Marilyn Monroe shows the picture capability of the current Prestel alpha-mosaic standard.



The changing picture

The changing picture

KE Clarke and GHL Childs

space can be hidden by a special control called graphics hold.)

Much interest was generated in many parts of the world and a number of countries have bought the UK system for both evaluation and public service, while others have developed viewdata systems of their own using the UK standards. Other countries, however, notably France and Canada, felt that cost was not as important as improved stylised graphics.

At the British Telecom Research Laboratories at Martlesham, work is continuing to develop new display systems and dynamically redefinable character sets (DRCS). Prextend (extended Prestel), telesoftware, photographic techniques, encryption and animation are schemes currently being studied.

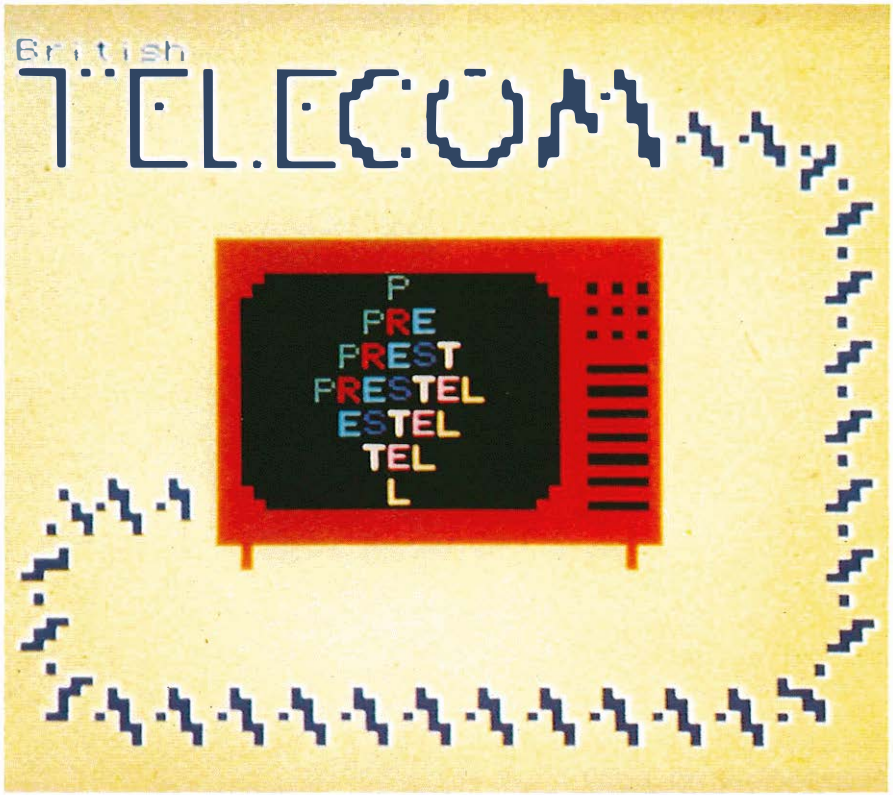
With DRCS, any set of symbols can be sent from the computer to the terminal for display as required. This method may be used for displaying alpha-numeric character sets not defined in the terminal, different founts from the normal character sets, or picture elements.

A typical example of use of this method would be the display of the pages of a railway timetable. DRCS characters could be defined by the computer to print, for example, crossed knives and forks and the range of other special symbols normally encountered in printed timetables.

Work is now in progress in British Telecom Research Laboratories to produce an efficient input terminal for information providers.

Prextend (extended Prestel) has been built to demonstrate that the Prestel computer and display standard can transmit the so called parallel attributes for international customers who wish to evaluate the technique or who do not share UK reservations on costs. For this, the terminal memory limitation has been removed and adjacent characters may have a number of different colour attributes.

No changes in the Prestel codes are needed to operate Prextend although some compatible improvements are being considered at the same time. Existing terminals give a fully acceptable



The new CEPT alpha-mosaic standard which includes non-spacing colour changes to be used by second generation Prestel.

presentation of the Prextend frames.

With telesoftware, it is possible to transmit computer programs (software) instead of information frames from the viewdata computer to the user's terminal. If the terminal contains a microprocessor, it can store and execute this program instead of storing and displaying a normal viewdata frame. Many applications have been envisaged for this technique, and some commercial applications are already available for telesoftware which can be housed in standard Prestel frames.

Using photographic techniques, high-quality colour pictures are defined by the transmission of luminance and chrominance information for individual picture elements (pixels). The first system of this type is British Telecom's Picture Prestel whose prototype terminals have used differential pulse code modulation (DPCM) and transform coding schemes based on slow-scan TV technology. This offers very high pictorial quality and a resolution approaching that of broadcast television. One important application of Picture Prestel is in advertising. A supplier will have the means of displaying his product and describing it on the picture frame. Another is signature verification.

Many users of viewdata systems require confidentiality of their information. A good measure is already available by means of the closed user group facility provided by Prestel, whereby only designated users may access certain frames. But some potential users have information which is so sensitive that it should ideally be enciphered at the IP's terminal and kept in the coded form at all stages, including storage on disk, so that only users in possession of the keyword can display the frames intelligibly. This is known as encryption.

As far as animation is concerned, it is already possible to place moving videotex pictures on a user's screen with the current UK alpha-mosaic codes. Complete freedom to position the cursor anywhere on the screen is an integral part

of the present terminal specification which is not presently exploited by the Prestel software. To animate the scene, the cursor could be moved backwards and forwards over the picture area overwriting the earlier information and thereby changing the position of objects, although at present a timing instruction is missing.

The computers accessed by the users are distributed across the country, and it is Prestel's objective to offer local call service to most of its users. At present, information providers update their information by accessing the 'update centre' computer in London, and a network has been established by which the transactions are distributed to the retrieval or 'users' computers. At present all machines carry the same database.

All the systems so far described use the public switched telephone or data networks as the basis for service and videotex applications are limited by the capabilities of those networks. The advent of packet switched services will ease considerably the design of videotex networks, and other important developments are in hand. Although the basic telephone network is continually evolving, major steps do occur, such as the change from manual to automatic telephony and the addition of subscriber trunk dialling and international direct dialling capabilities.

This trend is continuing with the planned changeover in the UK to digital transmission, stored program control digital exchanges, and common channel inter-exchange signalling which together form an integrated digital network (IDN). The next major step will be the extension of the IDN capabilities into the customer's premises with the provision of additional network features in the creation of a general purpose, high capability integrated services digital network (ISDN). Second generation Prestel (Prestel II) will be starting on the ISDN in 1983. Users will benefit from all the elements to the display standards and networking mentioned above.

ISDN is being designed to cater for the new terminal equipment now becoming available. This includes facsimile, electronic mail, teletex (intercommunicating word processors), data transmission between computers, digitised speech and new videotex services. The 'office of the future' will require much high speed data transmission and for the future, CCITT has specified data rates of 2.4, 4.8, 9.6 and 48 and 80 kbit/s as well as the lower rates possible with existing datel services.

The stored program control digital exchanges being introduced are private branch exchanges (PBXs) such as Monarch for installation in a customers' premises to provide between four and 120 lines; small digital public exchanges with a few hundred lines providing all the telephone and data service requirements for a small community; and large public exchanges – System X – which are now beginning to enter service. They may be configured to provide capacities in a range of between 2,000 and 60,000 customer lines at local exchanges and even higher (85,000 lines) in trunk exchanges.

Computer identity checking, merchandising and advertising are just three applications which illustrate the Picture Prestel standard.

It is expected that five million connections (over a quarter of the present number) will be made to System X exchanges by 1990 with the connection rate still accelerating. Customers with access to System X will benefit by having as a standard connection direct to their premises one 64 kbit/s information path for voice or data; one 8 kbit/s information path for data, and one 8 kbit/s path for signalling (including dialling). They will also benefit from a wide new range of available exchange services and facilities such as abbreviated dialling, fast call set-up, three-way calling, dialled conference, busy line transfer and 'don't disturb'. (See *British Telecom Journal*, Autumn 1981.) In all, 57 services are possible.

All these facilities, of course, are likely to have a direct impact on videotex services. With the data channel and the voice/data channel both being available to the customer, it will technically be possible, if the commercial need exists, to operate a viewdata terminal (at 8 kbit/s) and simultaneously make or receive ordinary telephone calls on the same line.

It will also be possible to transmit co-ordinated viewdata frames (8 kbit/s) and speech. In education, for example, this could be useful in providing two simultaneous learning stimuli to a pupil. And it will be possible to transmit viewdata on the 64 kbit/s channel. The average Prestel frame would be completely transferred to the terminal in less than one-tenth of a second. A full frame of Picture Prestel could be completely transferred in 11.25 seconds and animation of selected areas of Picture Prestel becomes a real possibility.

Both CCITT and CEPT have recognised videotex as a new service for standardisation and recommendations have been produced and ratified. The CCITT document includes references to all the modes of operation of videotex but is more completely specified for alpha-mosaic (both Prestel and the French Antiope system are included) than for the other options. One form of alpha-geometric system (Telidon) is specified, but other forms may also be included later.

Mr K. E. Clarke, who helped draft the original viewdata specification, is head of the Viewdata Division at British Telecom Research Laboratories, Martlesham.

Dr G. H. L. Childs was until recently head of viewdata development for Prestel and has been deeply involved in the efforts being made to obtain worldwide standardisation for videotex.

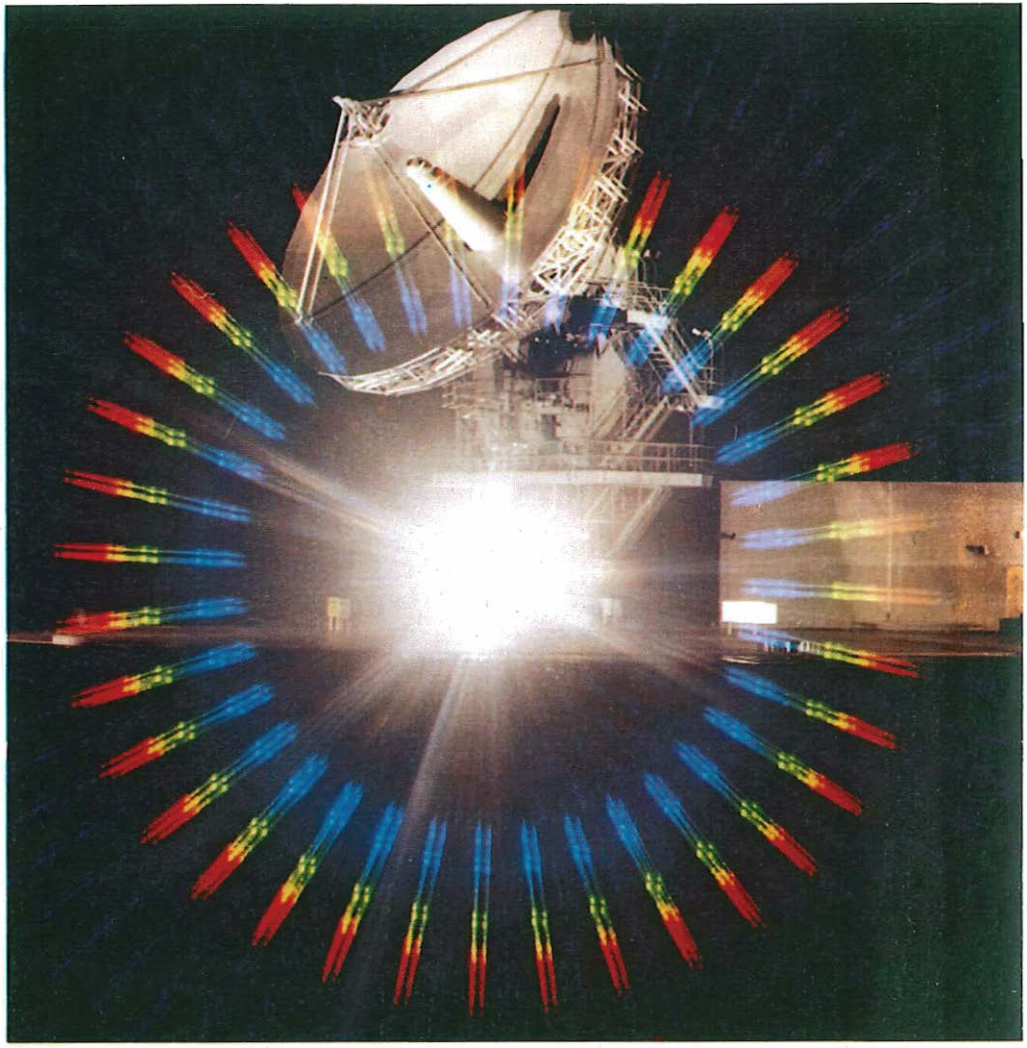
British Telecom Journal, Spring 1982

Calling all ships

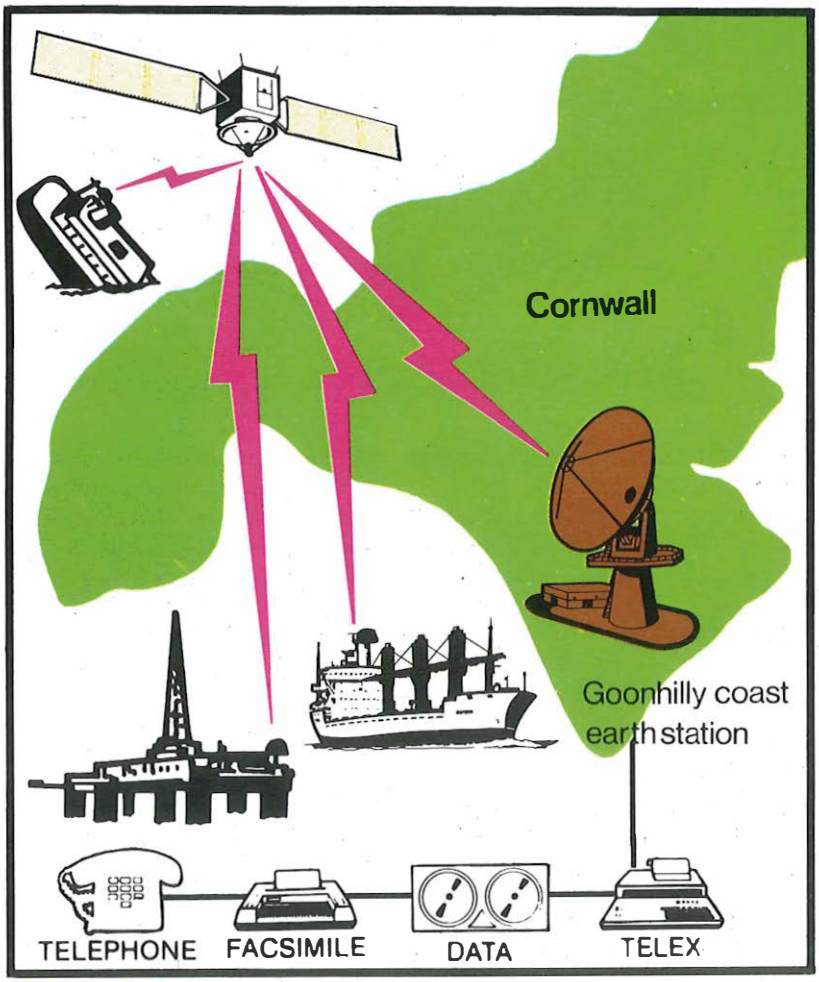
J W Wall and
R A Cooper

A major step towards improving and expanding communications between ships and shore has been taken with the launch of a new global maritime satellite system run by the 37-nation international maritime satellite organisation (Inmarsat) based in London. Britain, with British Telecom as signatory, holds the largest investment share in western Europe and is the third largest, behind the United States and the USSR, in the world.

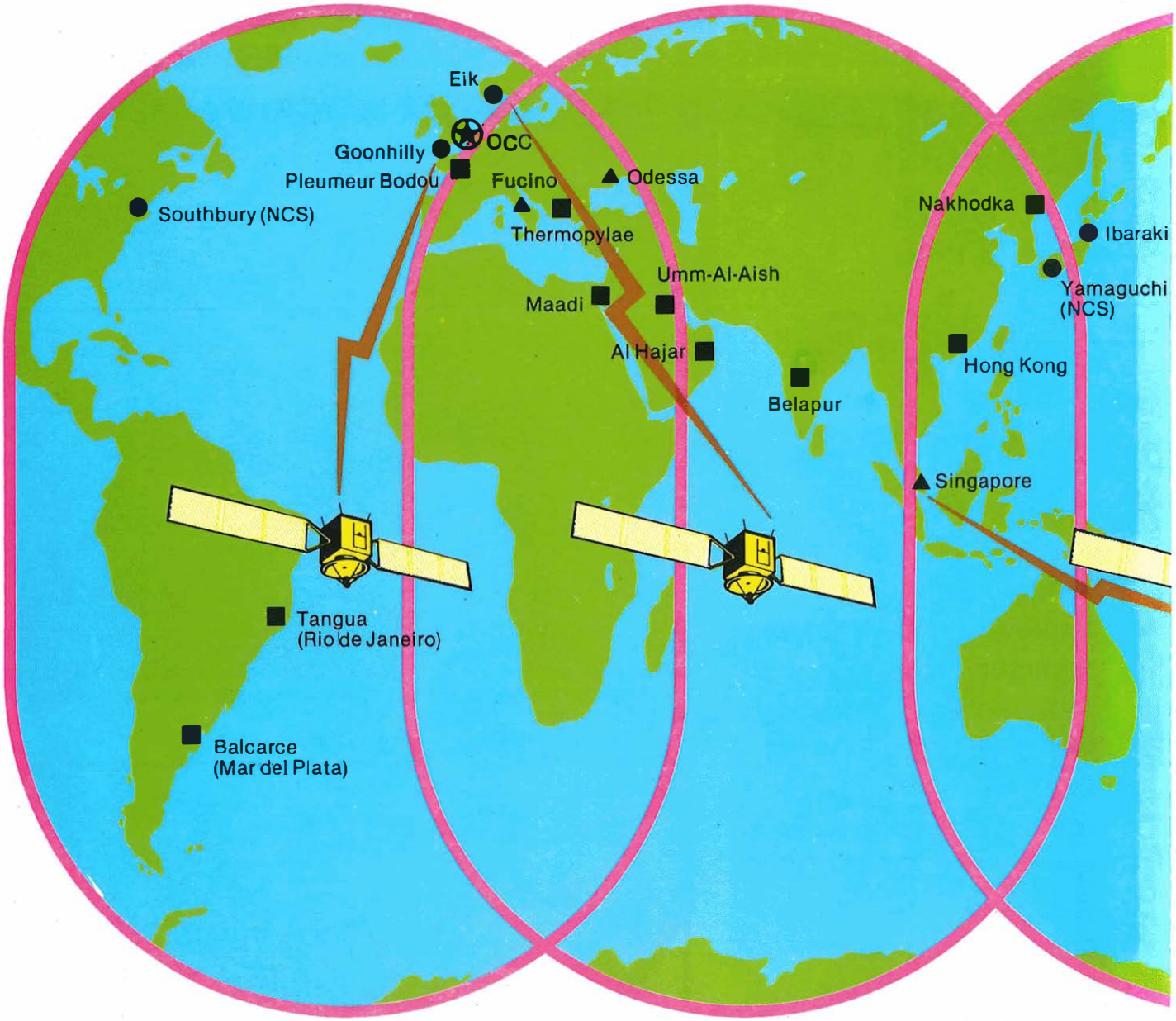
The opening this Spring of British Telecom International's (BTI) first maritime satellite coast earth station at Goonhilly Downs in Cornwall not only signals the start of a new era in communicating with ships at sea but also leaves British Telecom well placed to capture as large a share as



British Telecom International's first maritime satellite coast earth station works through the Goonhilly 5 aerial.
Below, three applications of the new system.



Inmarsat global coverage highlighting the BTI/Nordic/Singapore agr



Key

● Coast earth stations (CESs) in operation ▲ CESs opening 1982 ■ CESs opening 1983/84 ✪ Operations Control

possible of the world's international maritime satellite traffic.

Until February, when a coast earth station in Norway came into service, satellite communications with ships were available only through stations in the USA and Japan. The introduction of this capability in the UK will enable tariffs to be reduced sharply and a range of improved services to be offered. At the same time, it poses a considerable marketing challenge for BTI as many of the world's telecommunications administrations in the Inmarsat organisation will be seeking to increase penetration of the maritime market with ships' satellite equipment and new coast earth stations.

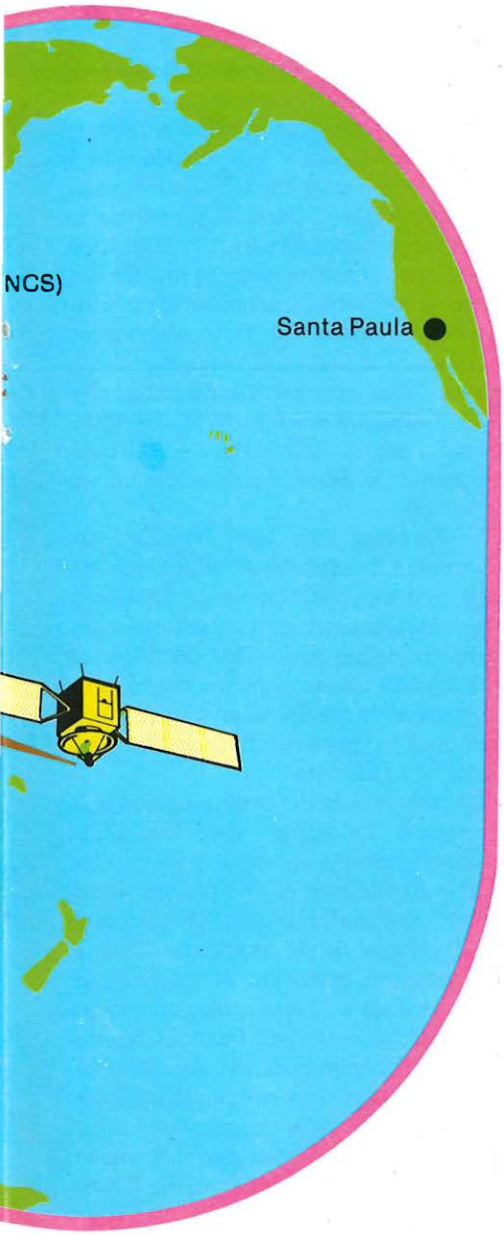
It could be argued that maritime satellite communications represent the greatest advance in communications at sea since the advent of Marconi's wireless telegraphy some 80 years ago. Before that, communications between ship and shore were confined to flags, flares and lamps; and voice communication extended only as far as the mariner could shout!

Goonhilly coast earth station in Cornwall will provide maritime satellite communications to the Atlantic Ocean – the busiest of the three regions – direct into the UK and Europe as well as further afield. As a result, traffic will no longer need to be routed across the Atlantic to the Southbury coast earth station in Connecticut, which will mean significant savings to the customer and enable BTI to provide its own range of services.

In addition, BTI has signed reciprocal agreements with the Nordic and Singapore administrations under which their coast earth stations will relay traffic to and from the Indian and Pacific Ocean regions respectively at no additional charge while BTI will do the same for them with Atlantic traffic. This agreement is of great significance because it will provide worldwide maritime satellite communications to and from the UK at an almost common tariff. The effect will be as though each country had a coast earth station in each region.

The use of satellites provides the mariner with circuits as reliable as those

eement



On board the British Telecom's *CS Alert*, radio operator John Scott makes a phone call via satellite.

The Royal Fleet Auxiliary ship *Olmeda* is fitted with equipment necessary for communication by satellite.

on shore and automatic access is available for 24 hours a day. The geostationary communications satellite is simply a repeater able to receive and retransmit microwave transmissions between any points it can 'see' on the earth below – and each can see about one third of the globe. Transmissions are beamed towards it by ship earth stations and coast earth stations with the latter providing access to the national and international networks.

For ships fitted with satellite equipment, the service will provide on-demand international direct dialling access for both telephone and telex on a par with the services provided for UK land-based subscribers. Service between ships will also be fully automatic. In the UK shore-to-ship direction, however, while full automatic access will be available to telex subscribers, the limited metering capability at group switching centres will prevent it from being offered initially to telephone subscribers.

They will have on-demand service by dialling three digits for the appropriate international control centre (ICC) for their exchange and international operators will dial ships direct. The advent of System X will overcome this limitation but, for the time being, consideration is being given to providing the facility in areas which have a particular community of interest with the maritime world.

One of the most vital aspects of maritime communication is the need for reliable distress facilities and this has been catered for by the provision of a distress alert button which, when pressed, automatically and almost instantaneously, connects the ship with the new rescue co-ordination centre (RCC) at Falmouth in Cornwall. If necessary, communications already in progress can be overridden and the RCC immediately brings appropriate rescue services into action and initiates transmissions to other ships in the vicinity of the vessel in trouble using both conventional and satellite services.

International agreement has been reached on a series of two-digit codes to

The Inmarsat system was inaugurated in February by the Marchesa Cristina Marconi. Here the Marchesa telephones the master of the Queen Elizabeth 2 while her daughter, Princess Elettra and Inmarsat's director general Olof Lundberg look on.

be allocated to services most commonly used by ships. By dialling the appropriate two digits, ships can obtain immediate access – whatever the national numbers in different countries – to authorities providing medical advice, medical assistance, meteorological and position reporting services, as well as the normal traffic services. These will include facsimile and data transmission facilities, at least to 2,400 bits per second, with planning under way for higher speed data services up to 56 kbit/s later.

Specialised maritime services will enable ships to send telex messages ashore for posting on, for example, to non-telex subscribers such as the families of crew members, and telephone customers ashore will be able to dictate messages for telex transmission to ships.

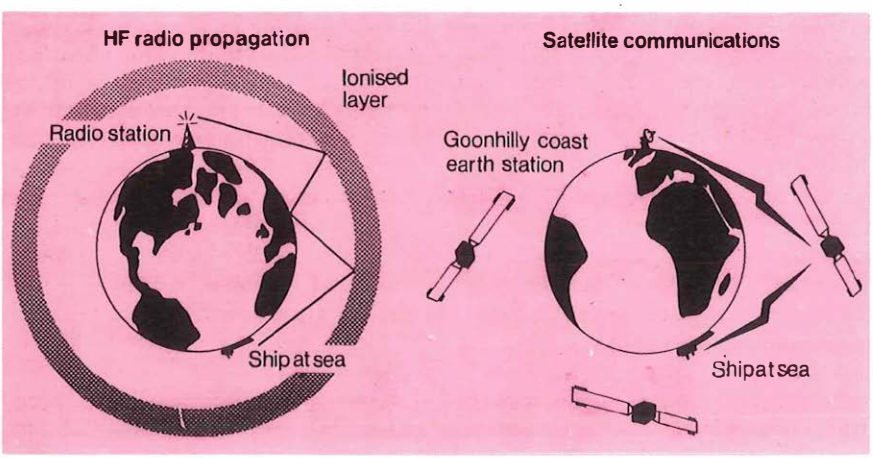
The new maritime satellite communication services present tremendous challenges to BTI. Difficult international negotiations have been successfully completed and development of the system must continue to the point where mariners know they can rely upon it. BTI has achieved the BTI/Nordic/Singapore agreement to provide a worldwide service and also the agreement of certain European countries to use the Goonhilly earth station rather than build their own.

Despite the improvements which have taken place this century, sea-going telecommunications facilities have always fallen well short of those on land. This is largely due to the characteristics of terrestrial radio waves and the unavoidable constraints placed on ships' aerial systems. This effectively means that long-distance terrestrial communications with ships are generally restricted to the high frequency (HF) band (3–30 MHz) and indeed, before the advent of satellites, this was the main method of long-distance radio communications for all classes of traffic.

These frequencies, however, depend on reflection of the radio wave from ionised layers in the upper atmosphere. The height and density of ionisation caused by the sun varies with the time of day or night, the seasons of the year and sunspot activity. For these reasons, HF maritime communications do not have the same reliability and quality which characterises communications between fixed points where repeaters compensate for signal attenuation.

Narrow band telegraph emissions are the most dependable for HF maritime communications, and teleprinter services using error correction or signal redundancy are used. Morse, which can be read by skilled operators in the difficult circumstances caused by faded signals and interference, has the narrowest bandwidth of all and still remains the major method of HF maritime communication. It also requires no special error correction equipment.

HF radiotelephony is usually a standard fitting nowadays on deep-sea ships, but its wider bandwidth makes it more prone to propagation difficulties.



Although automated accessing systems using selective calling are being developed, they will not entirely overcome the propagation characteristics of HF radio waves and their success remains to be fully demonstrated.

The first maritime satellite service – known as Marisat – was introduced by Comsat General of the USA in 1976 and later by KDD of Japan. This system – the forerunner of Inmarsat – used three coast earth stations operating in different parts of the world communicating with satellites situated over three ocean areas at a height of 36,000 kilometres – about three times the earth's diameter. By siting satellites over each of the three ocean areas, virtually world-wide maritime satellite communication is achieved.

In February this year, Marisat was succeeded by Inmarsat, which has its origins in a United Nations agency called the intergovernmental maritime consultative organisation (IMCO). Most of the world's major maritime nations are signatories to the Inmarsat Convention. Inmarsat is financed by contributions from its signatories.

But this is only the beginning and it is important to ensure that the BTI/Inmarsat service becomes economically viable in the face of competition from other coast earth stations. Services must be developed to the important offshore oil industry; provision of information services such as Prestel, meteorological information, news and financial service needs to be explored; and the range of services such as telex store and forward – due to become available next year – must be expanded. And, of course, it is vital to introduce direct dialling from the UK to ships as soon as possible.

Traditionally and geographically, BTI is well placed to handle a high percentage of the world's maritime traffic, particularly with its competitive prices. So with this good product in the right place and at the right price, properly promoted, BTI seems set to turn an undoubted technological success into a profitable service.

Mr J. W. Wall is a head of section in the maritime radio services division of BTI and is responsible for maritime satellites, particularly the introduction of the BTI Inmarsat services.

Mr R. A. Cooper is a senior telecom superintendent and is responsible for the customer service, marketing and operational aspects of maritime satellites.

British Telecom Journal, Spring 1982

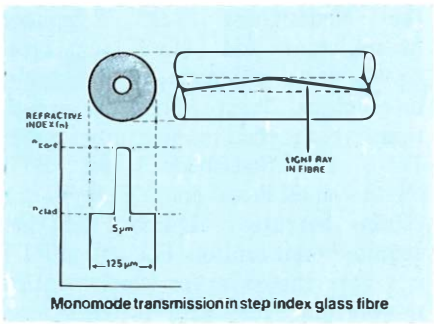
OPTICAL FIBRE BREAKTHROUGH

A research team at British Telecom's laboratories based at Martlesham Heath in Suffolk has set a new world record by doubling the distance signals can be sent through an optical fibre cable. The announcement came at a London press conference in February, when British Telecom Chairman Sir George Jefferson declared that telecommunications history had been made and that the achievement would be of tremendous significance bringing substantial economies.

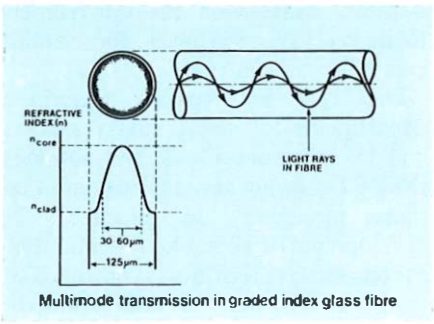
Laser light pulses can now be sent over 102 kilometres (63 miles) without intermediate amplification at a rate of 140 million a second – representing nearly 2,000 simultaneous telephone calls. Martlesham researchers have made it all possible by inventing entirely new designs of lasers and receivers – the first and most advanced of their kind in the world. The new breakthrough is likely to lead to significant maintenance savings.

The optical fibres are manufactured for British Telecom by GEC and the accompanying equipment by ITT and Plessey. Already, £25 million worth of fibre has been installed or is on order and will form part of the UK's new digital network, now being set up under British Telecom's £2,000 million a year modernisation programme.

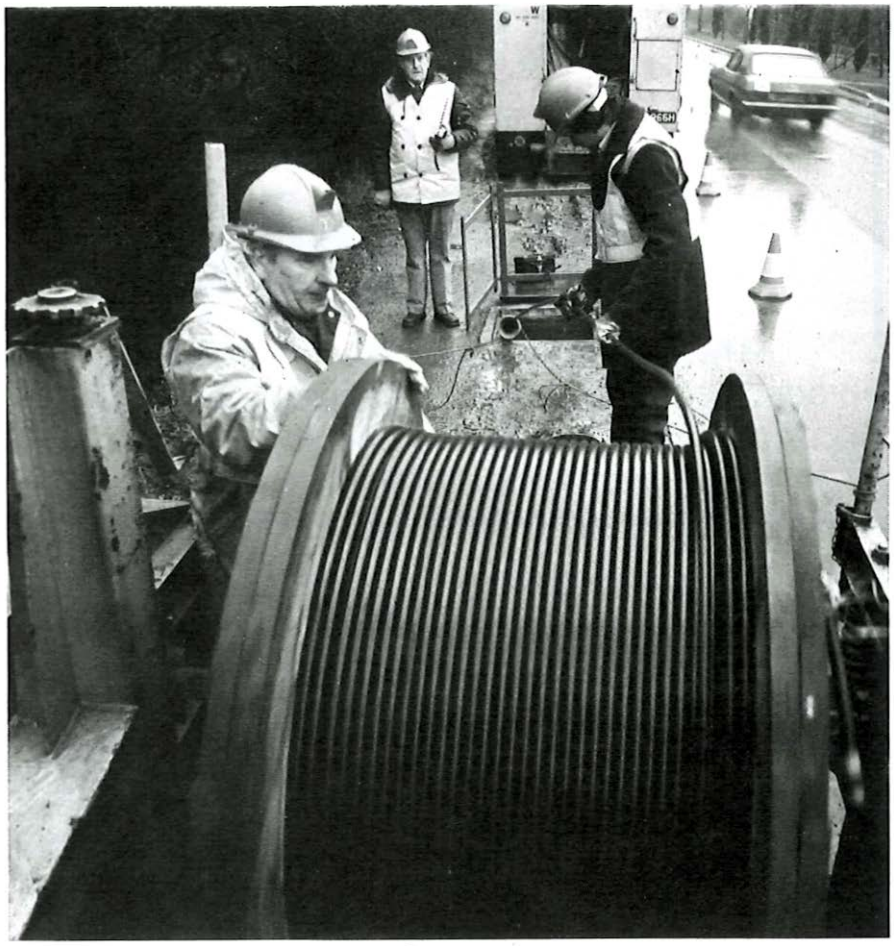
Current optical systems now being installed for trunk telephone calls need repeaters at about eight-kilometre intervals to boost the digital light pulses along the fibre. Conventional coaxial cable is even less efficient, needing amplifiers every two kilometres.



Monomode transmission in step index glass fibre



Multimode transmission in graded index glass fibre


British Telecom engineers at work laying optical fibre cable on the London – Birmingham link.

Martlesham's breakthrough – achieved in a laboratory experiment – opens the way for practical, reliable optical transmission systems which will span distances of 30 kilometres or more (20 miles plus) without intermediate repeaters. Apart from savings in capital cost and maintenance, the associated electronic equipment can be housed in existing British Telecom buildings, is easy to install and maintain and is protected from the elements. There would also be substantial reductions in the cost of undersea cables, which at present need repeaters every five kilometres. Transoceanic fibre cables would need far fewer repeaters, and they could be eliminated completely from many cross-channel links with Europe.

The Martlesham experiment used monomode light transmission, which is much more efficient than the existing multimode technique. In multimode, the central light-carrying part of the fibre is comparatively large, allowing the light to travel in up to 200 different ray paths. This means that each light pulse spreads as it travels along the fibre, eventually reaching the point where successive pulses start to develop, thus making pulse regeneration necessary.

Monomode transmission uses fibre with a light-carrying core of just seven microns diameter – so small that it will support only one ray path, or mode. This greatly reduces pulse spread allowing the light to travel much farther. At the same time, lasers were designed to transmit the light at a longer wavelength than that produced by existing devices, and at which the glass is more transparent.

Work is now under way to set up a trial over a 30 kilometre loop of fibre in a regular operational environment. And already, there is a laboratory prototype at Martlesham of a further development, enabling the system to be upgraded to 565 million bits of information a second – equivalent to 8,000 simultaneous telephone conversations.

British Telecom Journal, Spring 1982

Going Dutch!

This, the ninth in our series on overseas administrations looks at the telephone service in the Netherlands, traditionally the land of polders, dykes, windmills and tulips.

A blend of the new and the traditional . . . this telecommunications tower at Goes in Zeeland carries telephone calls and is used as a microwave link for broadcasting and television transmissions.

The Netherlands, with a population of 14 million in a land area only one seventh the size of the UK, is one of the world's most densely populated countries. Nearly one half of its inhabitants live in the low-lying western coastal region where most of Dutch industry is concentrated, and where are found the principal cities of the capital Amsterdam, Rotterdam, the world's largest and busiest port, The Hague, the seat of Government and Utrecht, an important exhibition centre and communications centre. Apart from vast gas reserves, the Netherlands has few natural resources and depends on imports for most of its raw materials.

The first telephone network was established in Amsterdam in 1881 by the Nederlandse Bell Telephoon Maatschappi, and before long, other private companies opened exchanges in more cities. Many were subsequently transferred to their municipalities but by 1940, the Staatsbedrijf der PTT (Netherlands Postal and Telecommunications Services – Dutch PTT) had acquired total control. The Dutch PTT is a state enterprise for which political responsibility rests with the Minister of Transport and Public Works and depends entirely on the Government (Minister of Finance) for capital expenditure financing.

The PTT has separate operational departments for posts, money services and telecommunications, and although the PTT does not have a telecommunications monopoly, in practice, the development of all public telecommunications services facilities is controlled by the PTT. The electrical utilities and the

Dutch railroads have licences for non-public telecommunications via their own networks, while the police, fire and armed forces make use of PTT cables but use their own radio networks for radio communications. Although business organisations are permitted to operate their own non-public networks, which can be bought from the PTT or from private suppliers, the transmission of information or messages on behalf of a third party is not allowed.

The Netherlands telecommunications administration is a two-tier organisation with a headquarters and 13 telephone districts (areas). At the end of 1980 there were nearly 28,000 employees of whom about 24,000 were in the 13 telephone districts. Nationally, there are just over seven million telephones and penetration at 51 telephones per 100 population is very similar to that of the UK. Shared service lines no longer exist in the Netherlands.

By world standards, the Netherlands boasts a very modern telephone system. In 1974, the Dutch PTT introduced computer-controlled exchanges with the first stored program controlled (SPC) exchange being installed in Wormerveer. Today, 30 per cent of subscribers are served by SPC exchanges – the highest density of SPC switched lines in the world. The strategy has been to modernise the larger exchanges first while extensions to smaller exchanges continue to use crossbar or Strowger-type switching equipment.

Because the PTT does not manufacture telephone equipment, it has bought a wide range of exchange systems from manufacturers such as Philips, Siemens, Ericsson, ATE (owned by Plessey), and Bell Telephone Manufacturing (BTM). On efficiency grounds, however, only two exchange equipment suppliers will in future be used – Philips and Ericssons with their PRX and AXE systems.

Work on replacing electro-mechanical exchanges by fully electronic digital exchanges will not begin until 1985, and although a prototype digital exchange, produced by Philips, opened in Zwolle in 1980, the choice of supplier for future digital exchanges will depend on a study of the available systems at the time the orders are placed.

Since 1968, all new homes are provided with two pairs of wires to each tenancy, and although the installation and provision of telephone service is a Dutch PTT responsibility, it is often undertaken with the close co-operation of the building contractors. All telephone cables are laid underground, mainly by outside contractors. Unlike the UK practice, the lead-sheathed cables used in the local network are neither jelly filled nor pressurised. As the subsoil is often sandy and unstable, the cable is buried directly in the ground 50 to 70 centimetres deep with cable ducts only used at road crossings. Most trunk traffic is carried over microwave links.

Having concluded that regular inspection and maintenance of exchange switching equipment caused greater wear and tear and therefore more faults than it cured, the Dutch have adopted a remote test call procedure which aids identification of call failure locations. By combining this information with fault reports received from customers, a statistical approach to programmed corrective maintenance can be used.

Programmed maintenance is carried out by a district mobile team moving from exchange to exchange while permanent exchange staff deal with day-to-day problems only. To reduce the number of exchange equipment faults, all modern equipment in medium-to-large exchanges is accommodated in air-conditioned buildings.

Customers' fault reports are passed to the fault control centre which first arranges for the line to be tested before issuing the job to the field staff. No individual subscriber record cards are kept, but fault dockets are retained for six months to enable a check to be made for recurring troubles. When the fault

Jointing optical fibre cable – Dutch style.

Green is the colour of the administration, reflected here in a typical public call office.

reporting centre is not staffed, an automatic answering machine asks customers to call back during normal service hours. In emergencies, the customer can dial another number and this is extended to the home telephone of the fault control officer who will decide if the fault is serious enough to warrant immediate attention.

The Dutch operator service is very small and deals mainly with directory enquiry work. There are few operator facility calls and operator assistance on non-facility calls is confined to problem calls. Because the operator service is relatively small, operator efficiency measurements are no longer kept, except for internal budgeting purposes. Most operators are part-timers and there is no discrimination between the employment of men and women. Calls to the directory enquiry service are charged for at the equivalent of 3p and there is no service between 2200 and 0800 hours, although a customer's number will be given in an emergency. Operators use visual display units to access a central computer and only use paper directories in case of a computer failure.

The range of automatic services available to Dutch customers is similar to the situation in the UK. Future services for customers on SPC exchanges include an alarm service, abbreviated dialling, a 'do not disturb' service, a cost accounting service and a number repetition service. Telemetry services, useful for control sensors, alarms, and meter readings are not available from the PTT. Private industry may set up these services by using the public switched telephone network (PSTN), PTT-provided leased circuits or by means of the public packet switching service Datanet 1, which became operational this year.

No data services are provided by the PTT on PSTN or leased circuits although some private networks do exist. Modems connected to either PSTN or leased circuits have to be of an approved type and by the end of the century, a public integrated digital network is planned.

Telex penetration is much higher than in the UK and with the exception of West Germany and Switzerland, is the highest in Europe. A facsimile service, called Telefax, is available and machines are rented to subscribers and maintained by PTT staff. Faxpost is the public facsimile service and more than two hundred post offices are equipped with machines which are always operated by PTT staff.

Other important services offered by the Dutch PTT include mobile communications, 'mobilofonie'; a communications facility for ships and cars; a radiopaging service, called 'semafonie', which also covers Belgium, Luxembourg and West Germany; and the fully automatic radiophone, 'autotelefoon', a mobile communication facility with all the advantages of telephone. A licensed citizen-band operation is also available on 27MHz.

The Dutch levy a non-recurring charge for service (an admission fee) which covers installation, exchange line and telephone apparatus with a further charge for internal wiring based on the amount required. Annual rental is the same for business and residential customers.

All local dialled calls are untimed and cost 3p per call day and night. Local call areas are limited to own exchange areas only, and average 31 square kilometres compared with the UK average local call area of 2,673 square kilometres. There are two charge zones for trunk traffic – the basic rate area, averaging 1,450 square kilometres and the time zone metering area, which covers the rest of the Netherlands. A reduced rate applies for both charge zones from six in the evening to eight in the morning Mondays to Fridays and all day Saturdays and Sundays. The basic rate area is very much an extended local call area and the reduced rate tariff is in fact the same as for a local call.

Telephone bills are issued at two monthly intervals and payment by Giro transfer or direct debit is encouraged. Telephone charges are not subject to VAT. The Dutch PTT also runs mobile telephone shops where customers can obtain information on telecommunication services and can exchange their telephones for other types.

Looking to the future, the Dutch PTT has shown interest in viewdata, and was the second country to buy viewdata software from British Telecom. Last year they implemented their own trial of Viditel in which about 3,000 users took part, although it is likely to be some 18 months before Viditel's precise future becomes clear. Work is also proceeding on fibre optic transmission and a digital network. Like the UK, the Dutch PTT will be facing increasing competition from outside companies in many of its telecommunications activities, and has consequently formed an executive central marketing organisation, which will be responsible for policy, promotion, conditions of supply and rates to be charged for the range of services provided.

An operator at Leeuwarden in Friesland takes an alarm call from a subscriber and passes it on to the relevant emergency service.

The authors – **Mr P. Dabbs, Mr J. J. E. Swaffield, Ms C. M. Aust** and **Mr I. Sarwar** – are all members of the international comparisons group in the Service and Performance Department of BTHQ. They acknowledge the help of Mr A. H. G. Doesburg of the Netherlands PTT.

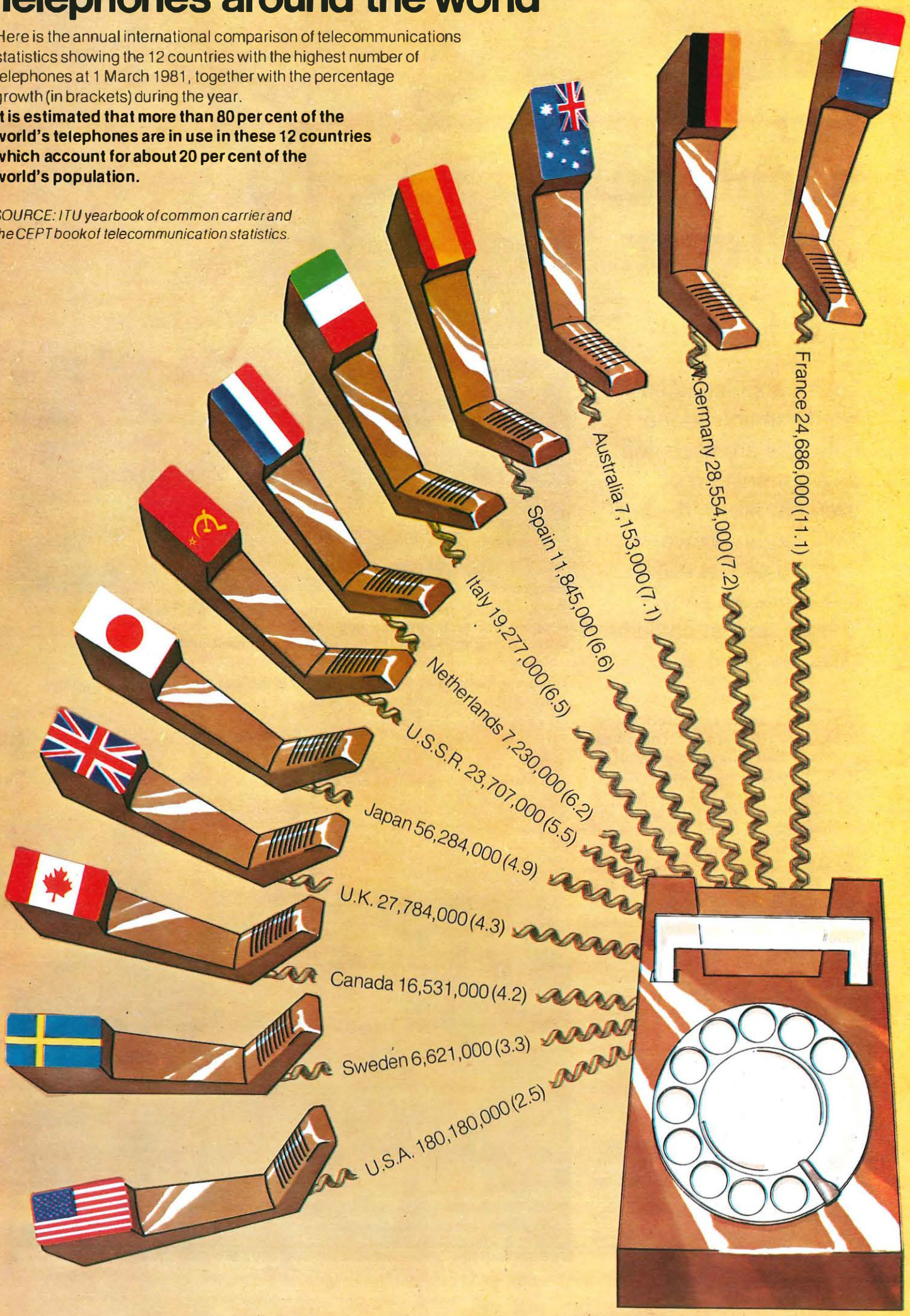
British Telecom Journal, Spring 1982.

Telephones around the world

Here is the annual international comparison of telecommunications statistics showing the 12 countries with the highest number of telephones at 1 March 1981, together with the percentage growth (in brackets) during the year.

It is estimated that more than 80 per cent of the world's telephones are in use in these 12 countries which account for about 20 per cent of the world's population.

SOURCE: ITU yearbook of common carrier and the CEPT book of telecommunication statistics.



Before the telephone took over...

L S Hurst

Today, sophisticated telecommunications networks are accepted as a normal part of everyday life. In the late 18th century, however, sending and receiving messages was not something that could be taken for granted . . .

The distinctive golden ball on the church tower at West Wycombe is a familiar local landmark and was probably the receiving station for the heliograph link from Camberley.

Telegraph cottage at Saltram in Devon is the last surviving station on the Admiralty shutter telegraph system.

Before the advent of electrically-powered telegraphic communication, it had still been possible to send messages over hundreds of miles in just a few minutes. During the Napoleonic war for instance, the shutter telegraph had been adopted for urgent Admiralty communications while even earlier, the British Secret Service, one of whose members was none other than Dr Benjamin Franklin, may have had a network of heliograph stations.

"3rd June 1778. Did this day heliograph intelligence from Dr Franklin in Paris to Wycombe". Thus wrote John Norris who lived at Hawley Park in Camberley, Surrey, a property which he had inherited from his wealthy Norfolk silk-merchant ancestors. Educated at Eton and Oxford, Norris became a Doctor of Civil Law and was also an artist and inventor.

The heliograph, a signalling instrument consisting of mirrors which reflect the sun's rays, is generally thought to have been invented in the latter half of the 19th century by Sir Henry Christopher Mance, a telegraph engineer who served in India. Using the familiar dot-dash

morse code, it was used extensively for military signalling in India and Africa.

Telegraphic communication by electricity had been proposed and even demonstrated as early as the middle of the 18th century but electrical research was still in the 'frog's legs and pith ball' stage and the relationship between electricity and magnetism had yet to be discovered. The only practical methods of telegraphy in those days were by visual means using beacons, torches, smoke, lamps, flags or by mechanical means such as the shutter telegraph and semaphore.

The name 'Telegraph Hill', which is sometimes found in parts of the country is a relic of the Admiralty Telegraphs which were first established at the end of the 18th century when Britain was in danger of invasion by the French. In 1796, a chain of telegraph stations using a frame containing six tilting wooden boards or shutters was in operation between the Admiralty and Sheerness, Deal and Portsmouth. It was extended to Plymouth in 1808. Weather permitting, it was possible to send a message in minutes between any of the above stations, a remarkable achievement considering that, if sent by post-horse, the average speed of transmission would not have exceeded 12 miles per hour, probably no faster than in Roman times.

Signalling systems did, in fact, exist over 2,000 years ago. The Greek historian Polybius, from the second century BC, described a method using ten torches divided into two groups of five.

The Greek alphabet has fewer letters and does not line up precisely with those adopted in modern western languages, but the principle was as follows:

	i	ii	iii	iv	v
i	A	B	C	D	E
ii	F	G	H	IJ	K
iii	L	M	N	O	P
iv	Q	R	S	T	U
v	V	W	X	Y	Z

The number of torches displayed by the first group shows the line and the second group, the letter – (iv), (iii), for example, would be S.

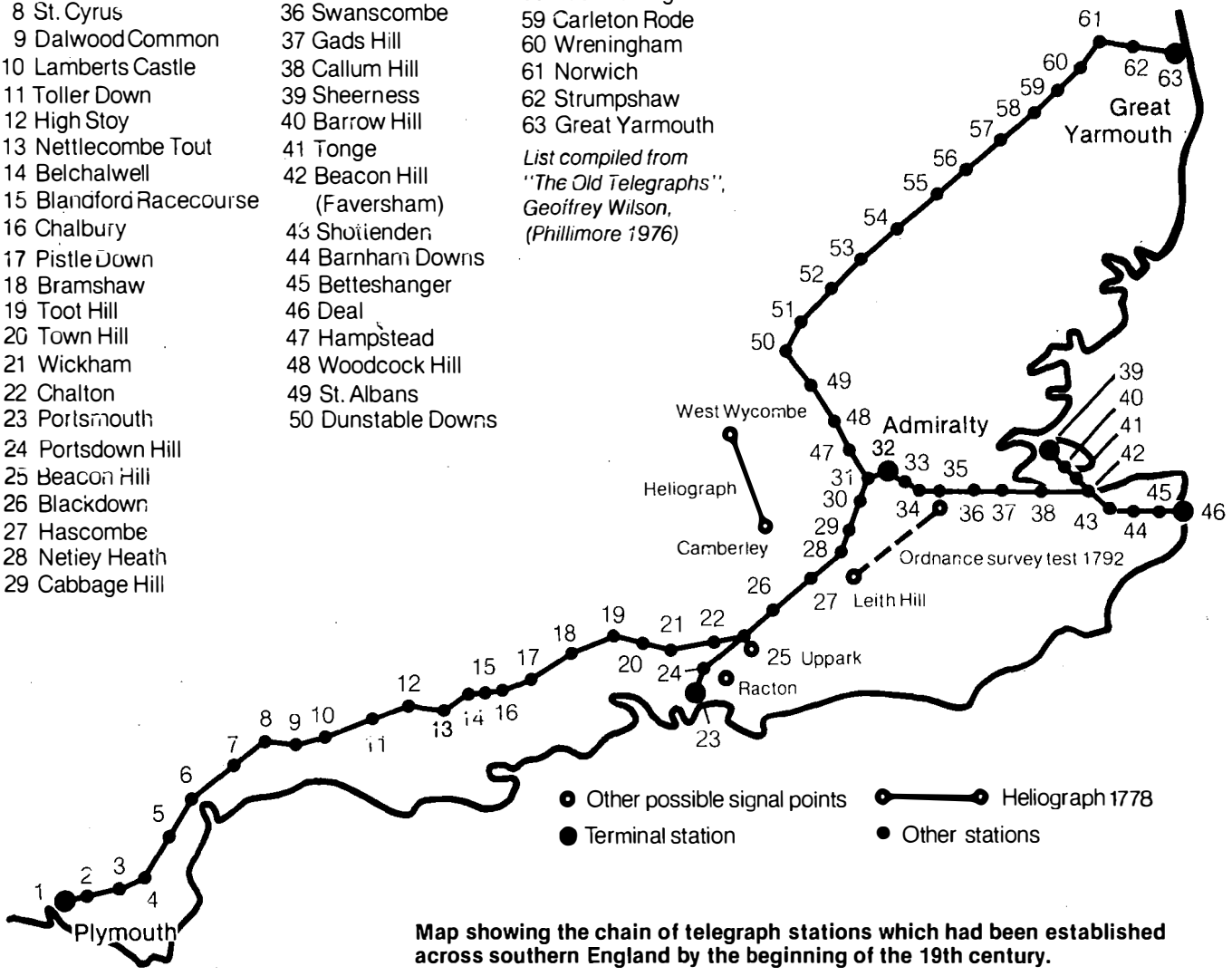
In 1684, Dr Robert Hooke published a Royal Society paper entitled *How to communicate one's mind at distances in as short a time almost as a man can write what*

Admiralty shutter telegraph system 1796-1814

Key to station

1 Plymouth
2 Saltram (Last surviving station)
3 Lee
4 Marley
5 South Knighton
6 Great Haldon
7 Rockbeare
8 St. Cyrus
9 Dalwood Common
10 Lamberts Castle
11 Toller Down
12 High Stoy
13 Nettlecombe Tout
14 Belchalwell
15 Blandford Racecourse
16 Chalbury
17 Pistle Down
18 Bramshaw
19 Toot Hill
20 Town Hill
21 Wickham
22 Chalton
23 Portsmouth
24 Portsdown Hill
25 Beacon Hill
26 Blackdown
27 Hascombe
28 Netley Heath
29 Cabbage Hill
30 Putney Heath
31 Chelsea Royal Hospital
32 Admiralty
33 West Square (Southwark)
34 New Cross
35 Shooters Hill
36 Swanscombe
37 Gads Hill
38 Callum Hill
39 Sheerness
40 Barrow Hill
41 Tonge
42 Beacon Hill (Faversham)
43 Shottenden
44 Barnham Downs
45 Betteshanger
46 Deal
47 Hampstead
48 Woodcock Hill
49 St. Albans
50 Dunstable Downs
51 Lilley Hoc
52 Baldock
53 Royston
54 Gogmagog Hills
55 Newmarket
56 Icklingham
57 Barnham
58 East Harling
59 Carleton Rode
60 Wreningham
61 Norwich
62 Strumpshaw
63 Great Yarmouth

List compiled from "The Old Telegraphs", Geoffrey Wilson, (Phillimore 1976)



Map showing the chain of telegraph stations which had been established across southern England by the beginning of the 19th century.

Laurie Hurst, author of this article with a model of the Admiralty shutter telegraph.

he would have sent. He proposed the use of simple shapes, hung in a wooden frame, to represent the letters of the alphabet. Experiments were carried out as early as 1672 between Arundel House and a boat moored in the Thames, half a mile away.

Richard Lovell Edgeworth, nearly a century later, wagered £500 that he could name the winner of the Newmarket races, in London, at least four hours before the arrival of the news by a relay of fast horses. When it was discovered that he was intending to set up a line of signal stations at distances of up to sixteen miles apart he found that he had no takers. He continued his experiments in visual communication near his home near Maidenhead, reading messages sent from a windmill at Nettlebed in Oxfordshire.

John Norris operated his heliograph from the top of a 100-foot tower which he had erected to his own design. The walls at the base were three feet thick and the top was surmounted by a ball. Little remains of the tower, or 'the obelisk' as it is known locally, and most of it was destroyed in 1884 when it was set on fire by gypsies.

The receiving station at Wycombe was probably in the church tower at West Wycombe, erected by Lord le Despencer at about the same time as the Camberley tower. The church tower is remarkable in that it, too, is crowned by a ball, large enough to hold several people. It was used by members of the Hell-Fire Club and Lord le Despencer, who before his elevation to the peerage was Sir Francis Dashwood, a notorious rake, entertained them with 'divine milk punch' as they admired the view from 100 feet above the ground.

Dr Benjamin Franklin was a man of many parts. Born in Boston, Massachusetts, he started his working life as a printer, became involved in politics and also studied science. The lightning conductor was invented by him and it was he who first used the electrical terms 'positive', 'negative', 'battery' and 'conductor' and put forward the 'one fluid' theory of electricity. He was widely acclaimed by scientific societies in America and Europe, particularly in France. He was sent to Paris by Congress in 1776 on a diplomatic mission with the object of obtaining economic and military aid for America.

What is not generally known is that Franklin was a secret agent for the British secret service, and he was known as 'No. 72'. The naval and military intelligence which he collected was relayed by devious routes to Lord Despencer at West Wycombe. As well as being members of the Hell-Fire Club Despencer and Franklin had something else in common – they had both been Postmasters General in their own countries.

So how did the messages pass between Paris and Camberley? Were they brought by messenger from the coast or were there other heliograph stations? Not far from Chichester Harbour stands Racton Monument, built in 1772 by Lord Halifax. From it he is said to have fired cannon salutes on public holidays while another account says that he used it to signal an all clear to smugglers.

On the ridge of the South Downs to the north of Racton are the ruins of another tower. It was built in 1774 by Sir Harry Featherstonhaugh at Uppark to commemorate the launching of a scheme to found a new colony in America to be called Vandalia. From Uppark the tower at Leith Hill would have been easy to see, with the top 1,000 feet above sea-level. Ordnance Survey officers tested a 22 inch oil-burning signal lamp in 1792 from Shooter's Hill where there was another tower and this was seen from Surrey's Leith Hill.

If a heliograph had been operated, all these points could well have been used and many more not mentioned in this article. There are for instance many towers which no longer exist shown on old maps. Were they all part of an intelligence network? Perhaps somewhere, in some archive, there is a piece of paper which says "3rd June 1778, Did this day heliograph intelligence from Dr Franklin in Paris to Camberley" . . .

Mr L. S. Hurst is a technical officer in the power and accommodation group in Tunbridge Wells telephone area and has had a lifelong interest in visual signalling history.

British Telecom Journal, Spring 1982

The office revolution starts here

G McMorrin

British Telecom is backing a new independent company, Telecom Gold, recently set up to promote and develop new office information technology.

Competition is the essence of business activity, today especially because British business needs to be both more competitive and productive. The office is the hub of much of business and government but as the cost of office administration rapidly grows, productivity rises slowly. British Telecom's new electronic mail service meets the challenge of improving office productivity by offering a comprehensive range of automated office techniques for better communications and information handling.

Telex, teletex and Telecom's Bureaufax facsimile service are all different kinds of electronic mail. But the automated business systems of today, and those yet to come, are more likely to build upon the comprehensive Dialcom computer-based electronic mail services provided by British Telecom through Telecom Gold – the first of a spectrum of value-added telecommunications for business.

Backbone of these services is Dialcom electronic mail, providing accessible and 'assured' communications via the telecommunications network, taking the hit and miss, location and time element out of sending and receiving information. Telecom Gold computers process user-to-user communications, allowing people to receive and send messages and other information through their own 'electronic mailbox'.

Telecom Gold's customers access the Dialcom system effortlessly using their own terminals – keyboard teleprinters, visual display units, Prestel sets, conventional word processors or more sophisticated equipment incorporating microprocessor-controlled memories and communicating facilities – depending on the range of services required.

Customers can call the Telecom Gold computer over the ordinary telephone network or through SwitchStream One, British Telecom's switched data service. Each user has a unique identification and access password which is recognised automatically when logging into the service. Once connected, the user's terminal can be operated as simply as an everyday typewriter. Messages are sent automatically regardless of length or number of recipients.

Simple instructions such as send, read, scan, forward and file provide the tools to handle incoming and outgoing mail. The Dialcom service responds in simple and familiar English, and uses step-by-step, easy-to-follow prompts. No paper copy is created except when necessary. Mail is delivered and read from any location using a wide range of terminals linked to the mail service by the national telephone network.

Telecom Gold can provide an extensive range of Dialcom facilities, but among the most immediate and basic applications are the sending and receiving of memoranda; announcements; report and control of office activity; volume distribution; drafting documents, forms processing and the distribution and collection of data.

Benefits are particularly valuable to busy managers who can spend up to 70 per cent of their time communicating and handling information. Telecom Gold's electronic mail enables messages to be sent and read when needed – eliminating the minutes or days that can be wasted trying to contact someone. Statistics have shown that a caller has a one in four chance of dealing effectively with a colleague at work first time round. With Dialcom, the mailbox is as near as the user's terminal and telephone.

Information can be sent and received anytime from any location; neither the user nor the recipients have to be in a

particular place or at a specified time to deal with electronic correspondence. And there is no need to be a computer expert to use Telecom Gold's mail. The first-time user needs only one hour's instruction to learn how to send and read basic mail.

Telecom Gold's Dialcom service is aimed initially at the intra-company communications market. Each office has its own mailbox or mailboxes, working like an electronic office pigeon-hole system. An executive may have a mailbox for his exclusive use. All incoming messages are stored in the appropriate mailboxes until users access them. Mail can be automatically filed in the computer store for later reference; files can be scanned and tests selected and retrieved by data, subject or sender references.

Managers can make use of the service to establish a personal and organisation reference file where the use of a single word or name can be established to denote automatic distribution lists, titles for messages, and automatic use of first names in correspondence. Message editing is also part of the service which includes a check on spelling and typing errors against a comprehensive dictionary.

Other practical applications enable users to start a message, then 'hold' it for later editing, or until they have decided how it is to be distributed and the way in which the message will be delivered. For example, copies can automatically be sent to colleagues involved in a particular project, after being read and amended by the originator.

Telecom Gold customers can also choose how and when their mail will be delivered. Urgent correspondence may be given an 'express' coding which automatically displays it before any other mail. The sender can add a 'reply requested' code, asking the recipient to respond before dealing with other mail. Dialcom's simultaneous transmission of messages to several destinations eliminates the need to prepare multiple copies, address each individually, and calculate the different arrival times around the world. The system also saves time through 'date activation', which allows correspondence to be despatched automatically on the due date without further action by the user.

But Telecom Gold's Dialcom offers more than just a mailing service. An electronic filing system helps reduce unnecessary paper files, and this 'filing cabinet' can be thoroughly scanned and read at the push of a button. Other options include a continually updated public and private bulletin board, detailing meetings, social events, company seminars or forthcoming

Dialcom training officer Linda Lofton from Silver Spring, Maryland, instructs Telecom Gold sales support executive Marcia Stimson in the many applications of the electronic mail service.

Bill Thomson, Telecom Gold's head of sales and marketing, demonstrates the simplicity of the electronic mail service to a potential client.

sales and marketing promotions.

Electronic mail can also offer conferencing facilities, allowing several people to read or supply information for an agreed text or immediate decision-making. Less formally, the service allows 'chat' between colleagues in different locations, without interference or delay.

Other Telecom Gold features extend to updating and cross-referencing executive diaries: the computer plans and posts appointments, reminders, meetings; and airline or hotel bookings for business trips can be quickly confirmed. In this way, managers can consult each other's availability on a particular day to confirm meetings. Private diaries are available only to those with the access password. Double-booking is eliminated; the computer notifies changes in scheduled meetings and prevents the arrangement of business appointments during public holidays; annual leave or at weekends.

Using the Dialcom phone message service, a person can be appointed to enter all telephone messages into the system. When checking a mailbox there is immediate notification of any phone messages which can then be read as an item of electronic mail. A test-formatting service provides a full report design facility – especially valuable for the preparation and printing of documents, reports, transcripts and manuals.

Telecom Gold's development programme is aimed at supplementing current facilities and providing a broad range of services. Plans for new services include interworking with the telex network, international direct mailing, 'gateway' access to other services like Prestel, working to teletex terminals and the ability to integrate with British Telecom's Telemessage and radiopaging services.

The key to success with this new technology is to accept that all microprocessor-based projects are inherently complicated. It is all too easy to equate the small size and few components of a microprocessor with the simplicity of what it can do. The success of Telecom Gold's computer bureau system lies in the quality and flexibility of Dialcom techniques and the modern telecommunications service on which they rely.

So the 'office revolution' may well be to the 20th century what the 'industrial revolution' was to the 19th century. Phrases like 'office automation' and 'office of the future' hardly describe all that is happening. The fact is that organisations of every size are finding themselves forced to change the way they handle and communicate information.

The technology behind British Telecom's electronic mail service will transform the workplace by the end of the decade. Telecom Gold may not turn all it touches into gold, but it is putting its gilt-edged stamp on the profitability of British industry and commerce. That ought to be enough.

Mr G. McMorrin is an information officer based in Public Relations Department's features and information bureau.

British Telecom Journal, Spring 1982

In the world of business communications, the future has already begun.

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Marconi has already developed digital multiplex and digital local line systems to provide high bit rate transmission facilities for the business community, based on the use of 64 kbit/s and 2 Mbit/s transmission paths.

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BOOST FOR TELEX

A brand new £8 million computer-controlled telex exchange – probably the world's largest – was handed over to British Telecom International (BTI) in February by Plessey Controls. This all-electronic exchange, installed and commissioned on schedule in Keybridge House, London, will transmit telex messages between Britain's 90,000 telex customers and more than a million users in 170 other countries overseas.

With its computer (stored program) control, this new addition to BTI's network of international telex exchanges will offer faster service and new facilities for Britain's telex users. In particular, it will be capable of storing telex messages which cannot be transmitted on demand and will automatically re-transmit them later, enabling customers to overcome intercontinental time differences and congestion in overseas networks.

Mr Jim Hodgson, managing director of BTI, said the new exchange was the forerunner of a whole new range of modern digital text-transmission services on international routes, which BTI is providing to help Britain maintain its position as a major trading nation. Mr Hodgson went on: "These services will increasingly put information technology at the service of the international business community. The list of overseas destinations to which our international packet switched service (IPSS) is available is growing all the time, and customers can now link up to it through the inland packet-switching service SwitchStream One. From next year, IPSS will provide international links for the extension of teletex, the new high speed text service for communicating word processors, starting within the UK this year."

He said BTI was also in the forefront with plans to link its digital services in the UK with similar facilities in other countries now being progressively introduced. This new international telex exchange at Keybridge House was the first of a series of major steps being taken to bring modern, fast, reliable tele-communications services to British businessmen with overseas interests.

Initially, the new telex exchange will provide 11,000 extra connections to Europe and beyond, increasing existing capacity by 30 per cent in order to keep pace with the rapid growth of international telex calls. Eventually it could be expanded to 27,000 lines.

Calls will be set up faster, in only a fraction of the time taken by electromechanical gateway exchanges. If at the first try the call does not get through, the exchange will automatically make further attempts without the caller redialling. The exchange will also offer a store-and-forward facility which allows it to be instructed to store a particular message for transmission later, when international lines are less busy.

Multi-address will be available, in which the exchange automatically sends the same message to more than one customer. The message is held in store in the exchange until the sender has transmitted the telex numbers of all the destinations. After the caller has finished, the exchange calls these numbers automatically and transmits the message to each of the recipients in turn.

Associated with the exchange in Keybridge House is a new centre for checking all lines into and out of the exchange. The centre enables engineers to keep watch on the circuits round the clock. A transmission link developing a fault is pinpointed by an automatic indicator light and engineers are then able to connect test equipment to find the trouble. Faults can be spotted and dealt with immediately, minimising service interruption.

Last year, telex calls to and from Europe increased by two per cent while intercontinental calls rose by 13 per cent. Over 99 per cent are autotelex calls, set up directly by users without the help of an international telex operator.

Below left: Technician Geoff Yates who helped prepare the new exchange for public service, discusses the operation of the equipment's computer supervising system with Mr Jim Hodgson, managing director of British Telecom International.

Below right: Dennis Rafferty, also a technician, works at a temporary operator position set up for test purposes while in the background Trevor Callum makes a test connection into a telex circuit at the jackfield.

British Telecom Journal, Spring 1982

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MISCELLANY

System X orders

A new batch of 29 System X digital exchanges has been ordered by British Telecom from its three British manufacturers bringing to 50 the number of System X units so far ordered or already supplied.

The new exchanges will be introduced over the next two years in the Birmingham, Coventry, Edinburgh, Guildford, Liverpool, Manchester, Newcastle-on-Tyne and Nottingham areas and will form part of British Telecom's annual investment of £700 to £800 million in advanced exchange equipment.

And for the first time, two System X exchanges have been digitally interconnected. The two exchanges are Cambridge and nearby Arrington, where customers have already noticed faster dialling to numbers on their own exchange.

The development is a highly important milestone towards a national digital network and, with a third System X unit at Cambridge called an operations and maintenance centre, will be the first demonstration in public service of the integrated concept underlying the System X network of the future.

Half-year profits

British Telecom has announced £140 million profits for the half year up to 30 September 1981. There was a £19 million loss in the comparable six months to September 1980 when British Telecom was part of the Post Office.

Price increases in November 1980, needed to meet Government financial targets, contributed to the half-year figures. At present, British Telecom finances about 85 per cent of its investment programme from its own cash flow.

Communications '82

British Telecom unveiled its new text editing teleprinters Cheetah and Puma at the Communications '82 exhibition held at the National Exhibition Centre, Birmingham in April.

The display was the biggest presentation of business products and services since the corporation's formation last October. Supporting the 'information technology' theme, the stand incorporated exhibits on teletex and the new X-Stream digital business services as well as the new advanced call-connect systems – Monarch, Regent and Herald.

British Telecom also demonstrated its fibre optics and microelectronics developed by Martlesham as well as progress in international satellite services and offshore radio links.

Flooded, sludge filled manholes are no longer a problem to British Telecom engineers following the arrival of new vehicles in Scotland which can suck out 2,000 gallons in about half-an-hour. The vehicles have twin 400 gallon tanks with one holding fresh water and the other used for collecting the slurry.

Man from Mars

British Telecom has appointed a top commercial salesman to spearhead its revitalised sales force. He is Mr Peter Chamberlain who has joined the corporation from Rank Xerox and Mars Limited as director of sales for business products and systems.

Mr Chamberlain (39) will be in charge of the new sales force set up under British Telecom Enterprises which is geared towards reacting quickly to marketing conditions.

TV by satellite

British Telecom, with two other companies, Marconi and British Aerospace, have announced plans to provide Britain's first national broadcasting and telecommunications satellite system to be known as United Satellites.

Giving details early in March, the Home Secretary said that the system would open the way for important new industrial and service developments in broadcasting and telecommunications. Already, the three companies have looked at the potential markets and have studied the technical and operational requirements of such a system with Government departments and other organisations.

Through their collaboration, the three parties propose to become the suppliers of the first British direct broadcasting and telecommunications satellite system, as well as promoting systems and services in the world market.

Telegrams stop . . .

The 112-year-old inland telegram service is to be withdrawn from October this year. Much of the traffic will be taken over by the new telemessage service, which was introduced last October.

The telegram service, underpriced and underused, has been running at a loss for many years. In the last full financial year, 1980/81, the service lost £50 million, of which £20 million was due to the inland side alone.

Also coming to an end will be the facility to accept international telegrams over the counter as well as hand deliveries, although customers will still be able to send international telegrams by using

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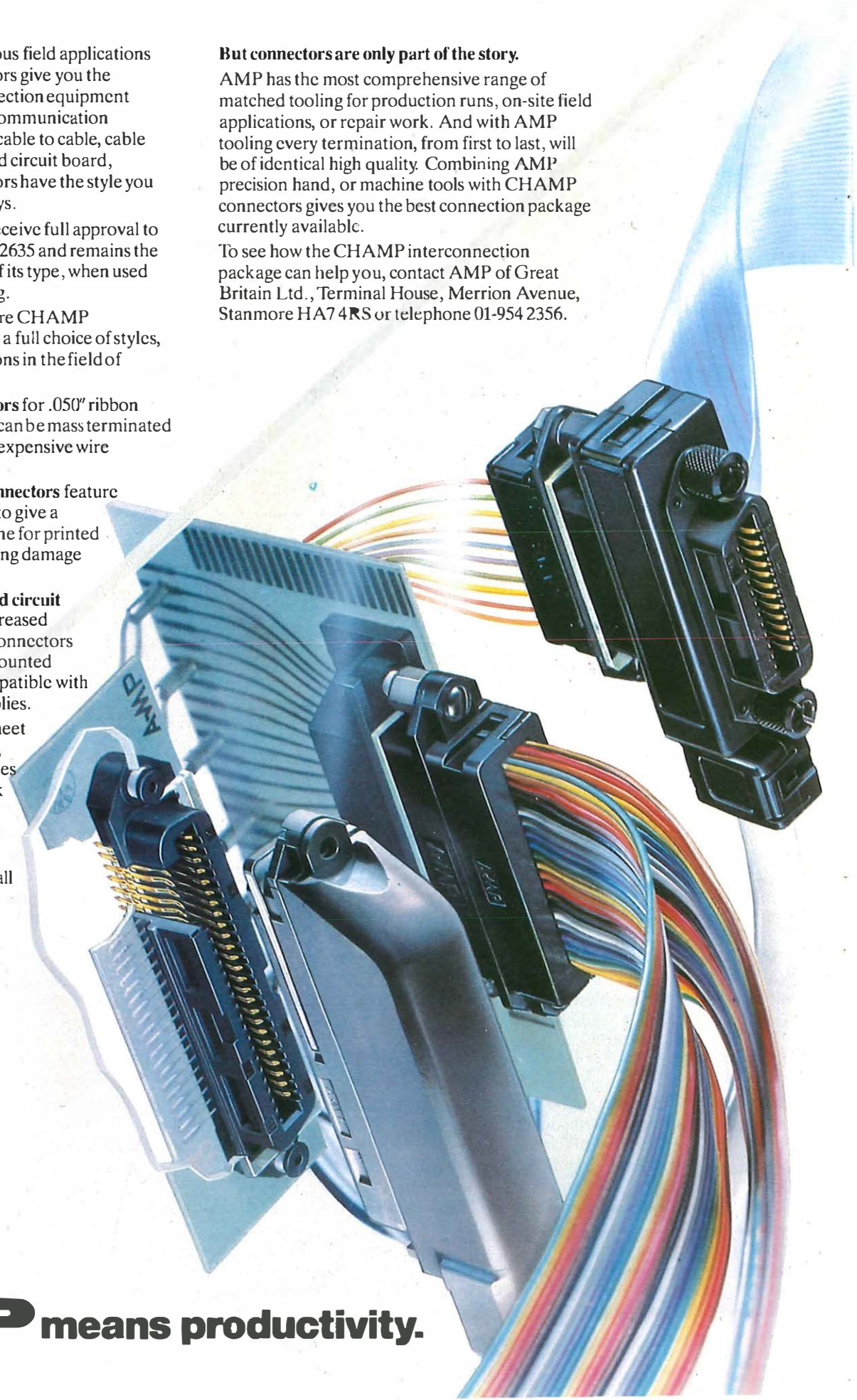


AMP means productivity.

either their telephone or telex machine.

In 1980/81, just two million inland telegrams were sent – compared with 50 million in 1950 – while international telegrams last year amounted to 9.4 million compared with 20.8 million in 1968.

Contracts

Newbury Laboratories – Nearly £500,000 for more than 550 visual display units and matrix printer terminals for a wide variety of management, scientific and technical applications.

TMC – Nearly £10 million for the design, development, manufacture and installation of new equipment for use in main telephone exchanges. Called the supplementary service exchange (SSX), the equipment will be installed in some 100 main exchanges and is based on the Herald small business system exchange design.

Toronto Iron Works (USA) – £2.6 million for two new antennae at Madley earth station.

Standard Telephones and Cables – For a third order worth £2.5 million for subscriber carrier equipment allowing single customers to have two independent telephones on the same line.

GEC Telecommunications – £8.3 million for digital and analogue multiplex and line equipment to be manufactured in the company's Coventry factory. Also £20 million for the advance microprocessor-controlled Monarch 120 PABX, which will also be made at Coventry.

Mitel – £15 million for an extension to an existing contract currently valued at £10 million for the supply of Regent private automatic branch exchange (PABX) equipment. A further contract worth £1.5 million has been placed for the supply of a British Telecom version of the Super 10 PABX equipment.

Ferranti – Two orders worth a total of £2 million for two networks for use in the telecoms on-line data (Told) and the new mechanised order handling (MOH) systems.

International Design and Construction – £1.6 million for civil engineering works at Madley earth station.

Multitone Electronics – The recent contract for a further 40,000 of its RPR300 wide-area radiopagers brings the total value of orders placed for Multitone radiopagers to more than £10 million. The new contract is the largest order ever placed by British Telecom for radiopagers with a single supplier.

ITT Business Systems – Up to £23 million for the new ITT 3000 electronic teleprinter – known as Cheetah – and its associated equipment. The initial contract for these screen-based telex terminals runs for one year.

Plessey Office Systems – £20 million for Monarch 120 – the most advanced digital electronic private automatic branch exchange of its kind in the world. The PABXs will be made at the company's Beeston factory.

DCC – More than £2½ million for the supply of advanced digital signal processing equipment to be installed at Madley earth station.

Ferranti – £1.5 million for transportable radio equipment to provide temporary provision or emergency replacement of existing British Telecom microwave radio links.

Plessey Controls – £950,000 for a store and forward system for Keybridge House telex exchange.

Phones on offer

For the first time ever, telephones were being sold by British Telecom at this year's Ideal Home Exhibition, held at Earl's Court in London. First to buy telephones at the stand were a couple from Hertfordshire who bought two telephones – the Ericofon 600 and the brand-new microchip Sceptre 100, available on order to London, North East and Midlands customers only.

The stand featured British Telecom's extensive range of standard telephones, plus its special range, radiopagers, the blue payphone and the cardphone as well as Prestel and aids for the handicapped. Prominently featured was the new plug and socket system, which was being offered with the telephones sold at the exhibition. Visitors were able to try many of the new telephones and listen to a message recorded by actor Rodney Bewes and actress Felicity Kendall.

Enter Sceptre

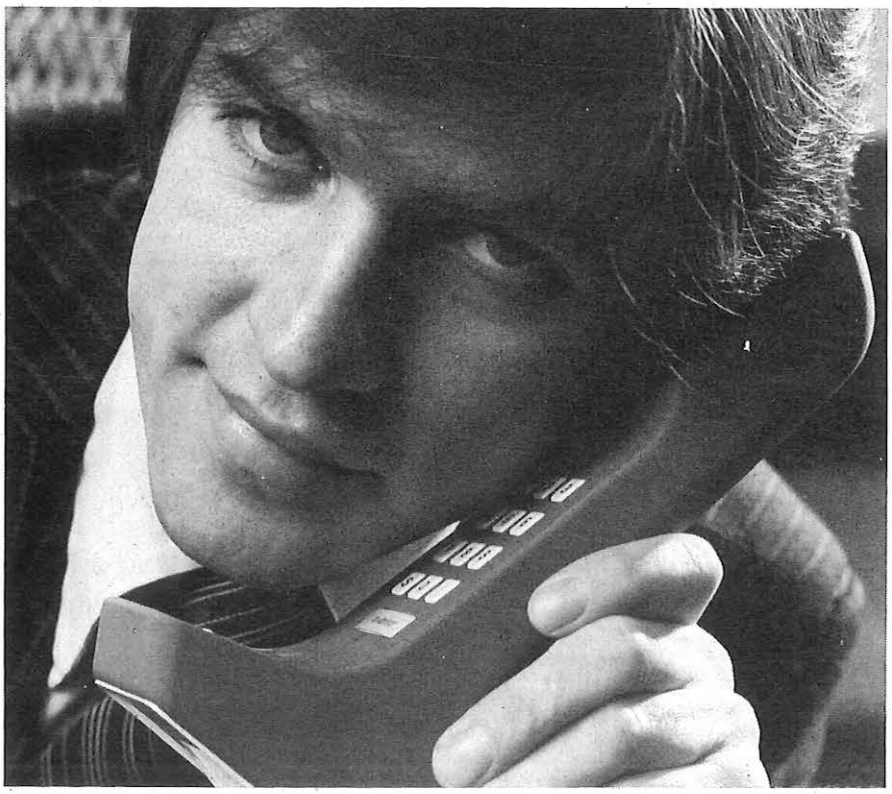
A new, sophisticated telephone – Sceptre 100 – has been introduced by British Telecom to meet the market for advanced instruments. The new telephone is being marketed initially in London, but is being made available in other regions as soon as possible.

Provided in two colour combinations, two-tone blue and two-tone beige, Sceptre 100 was designed and developed by British Telecom, and is a microprocessor-controlled, fully electronic, press-button telephone. It features an eight-digit liquid crystal display with a 'roll-on' capability which allows up to 16 digits to be recalled from memory and displayed. There are nine features in addition to the basic telephone service including repertory callmaking, a call timer and a digital clock.

Fiche for sale

The first stage in the transfer of Britain's 86 alphabetical paper directories to microfiche form has begun with the conversion of the London directories, plus a

The Eiger is just one in a wide range of residential and business telephones on view and on sale earlier this year at the Daily Mail Ideal Home Exhibition. See 'Phones on offer'.



further seven from around the country.

A full set of microfiche directories – about 500 postcard-sized sheets – will take up just three inches of shelf space when fitted into three A4-sized binders – compared with the seven feet of shelf space taken up by one hundredweight of paper directories.

The new fiche directories are aimed primarily at businesses already using microfiche for other purposes, although others already holding large numbers of directories may find it economic to buy viewers and change to microfiche. As well as saving space, microfiche works out cheaper – an extra paper directory costing £2.50 compared with the fiche equivalent at £1.15.

British Telecom intends to provide special computer-compiled directories on microfiche in the future. Based on market research, they are expected to cover business needs in the larger cities but are likely to be more expensive than the standard fiche directories.

Journal's top honour

British Telecom Journal has won an Award of Excellence in the 1982 Editing for Industry competition sponsored by the British Association of Industrial Editors.

The Journal was placed second out of 18 entries in the class for internal magazines with circulations of more than 10,000. Around 50,000 of the 69,000 copies distributed each quarter are bought by British Telecom staff, while the remainder are taken by overseas administrations, educational establishments, and industry.

Judges based their conclusions on content, standard of copy, presentation, design, use of headlines and illustrations.

Yes to 'Buzby' bond

Chairman Sir George Jefferson has welcomed the Government's decision in principle to allow the corporation to issue profit-related bonds. Recalling that he had consistently stressed the need for greater flexibility in borrowing, he said that the issue of a bond was an important step in that direction. The opening up of telecommunications to competition made it more important than ever to be able to borrow at a time and in a way based on the need to be market responsive.

Martlesham Enterprises

A new company, Martlesham Enterprises, has been set up by British Telecom in partnership with merchant bankers Lazard Brothers and three other organisations to exploit spin-off ideas from British Telecom Research Laboratories at Martlesham Heath. It is the first venture of its kind and has been established under the recent legislation which allows British Telecom to form partnerships in commercial enterprises.

The first idea being discussed is a new materials process, invented by a Martlesham scientist, for improving semi-conductors. Martlesham Enterprises is a financial holding company, for identifying and sponsoring the new ventures, and will probably be responsible for setting up several companies in the first two or three years. Individual shareholders will be free to provide funds for the venture companies as well as for the holding company itself. The inventor of the idea or process will normally leave BT to join the new company.

Intelsat order

Five new Intelsat VI telecommunications satellites, each capable of carrying up to 33,000 simultaneous telephone calls, as well as several television pictures, have been ordered by the 106-member International Telecommunications Satellite Organisation (Intelsat) from the Hughes Aircraft Company.

The £350 million order will also benefit British Aerospace, a major subcontractor for the project. British Telecom, which has the second largest shareholding in Intelsat at 11.3 per cent, has welcomed the contract for the new digital technology satellites, the first of which is due to be delivered in 1986.

In brief . . .

A brand new electronic microprocessor-controlled teleprinter with a visual display screen – known as Cheetah – has been launched by British Telecom. Its many extra facilities include off-line message preparation, editing, short code calling and automatic pagination.

★ ★ ★

The Central Electricity Generating Board has placed a £300,000 order for 1,000 miles of British Telecom's MegaStream digital private circuit links. It is the first major order for one of the new X-Stream business services.

★ ★ ★

Two new recorded information services have been introduced by British Telecom. Traveline is aimed at people on the move and warns of problems caused by roadworks, cancellations, accidents and strikes. Starline is a new horoscope service and is presented in co-operation with *Woman* magazine, The three-minute message include star trends for each day for all 12 signs of the zodiac.

★ ★ ★

Business customers with Japanese connections now have two new services. The British Telcom Bureaufax facsimile service and the international packet switching service (IPSS) have been extended to provide service to Japan.

★ ★ ★

Another satellite earth station antenna has been installed on a London roof. The £3 million Project Universe, for whom the antenna has been erected, will use a European test satellite (OTS) to link computer terminals at six UK sites to test a possible application of SatStream, due to be offered to businessmen in 1984.

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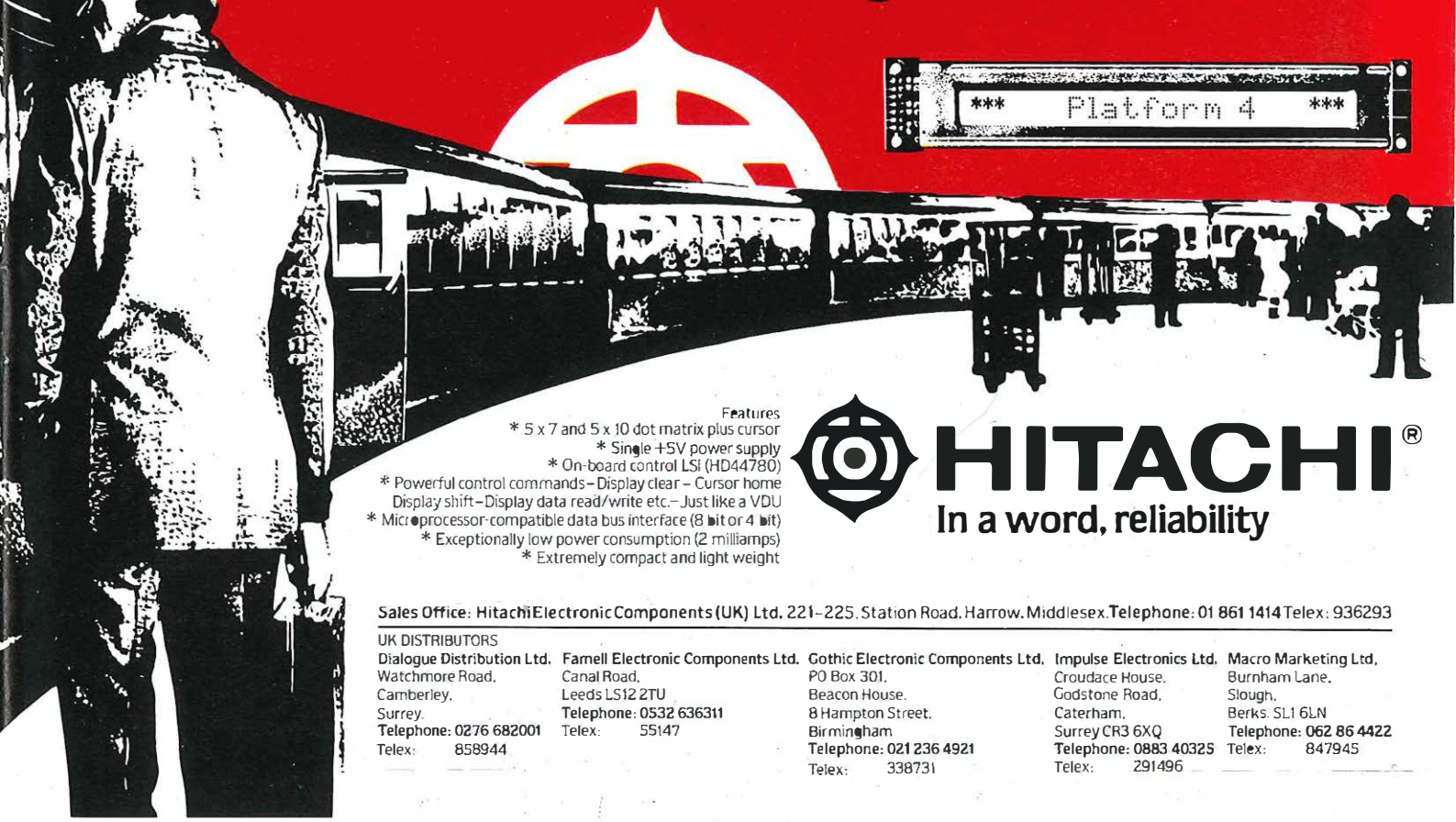

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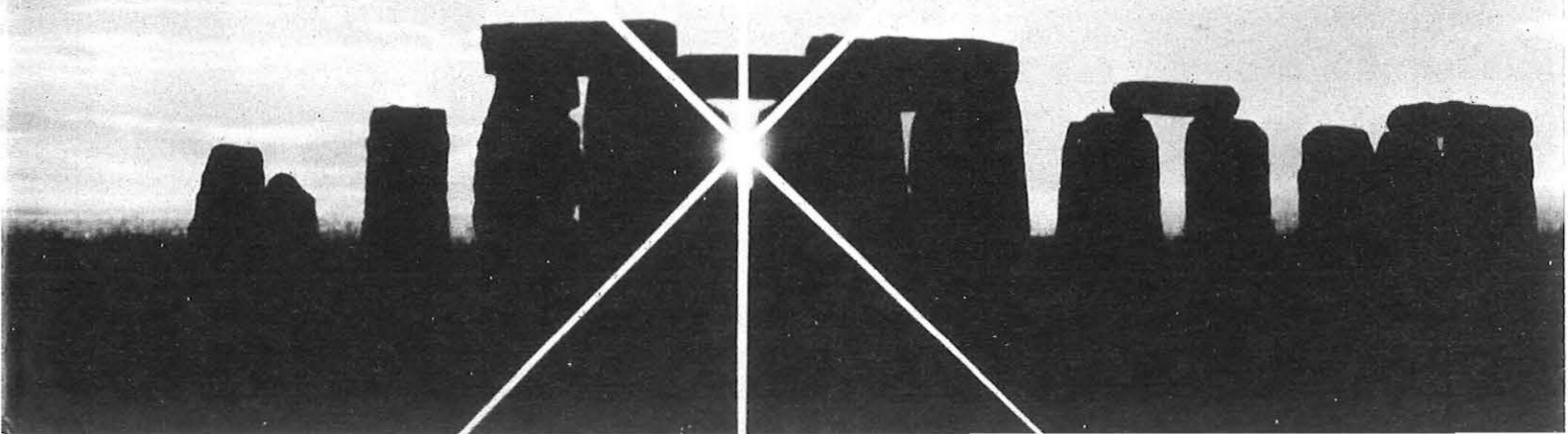

The Ideal Contact

The Gentech G40/50 miniature range

The ideal contact is a mercury wetted relay from Gentech International. The Gentech G40/50 miniature range is one of the biggest ranges available, with pin configurations offset and in line and various coil terminations. Packaged in open frame, with magnetic screen and encapsulated forms. Available in multiple Form A, B and C—with new sensitive Form A option. The Gentech collection also includes DIP Form A and Form C mercury wetted relays and 159-169 2 amp Form C and Form D capability, specially designed for telecommunications.

Gentech International

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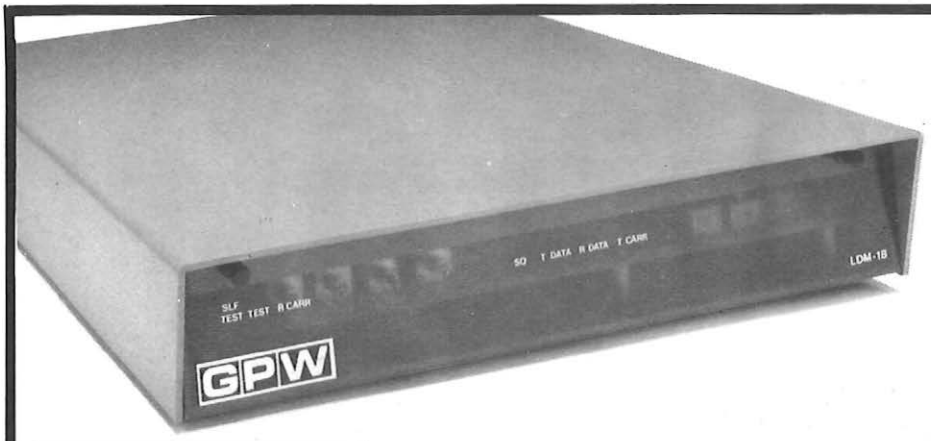
Telephone: (0465) 3581. Telex: 778500.



Data Devices

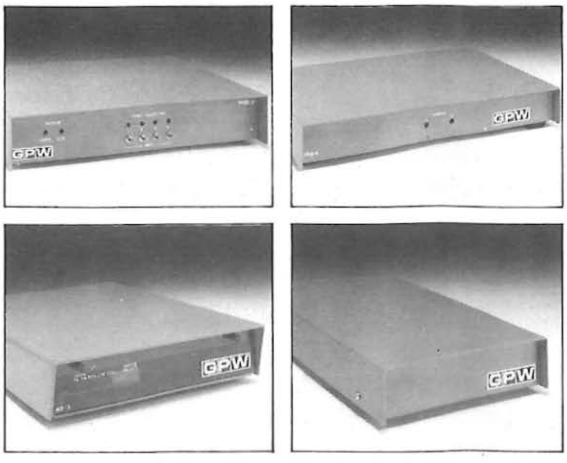
LDM-1B Synchronous transformer coupled modem for use up to 12 miles 9600 bps or 17 miles at 2400 bps with full diagnostics. Speed range 1800 to 19200.

EASI-1B or 2 Asynchronous to synchronous converter allows asynchronous devices (terminals) to be connected to synchronous modems and vice versa. Speeds 150 to 19200.

232/3600 LA or 232/3650 LA Full duplex line adaptor interface unit which converts 1200/2400 IBM bi-polar data to EIA NRZ data and vice versa for use with normal V24/V28 modem etc.

PRS-2 or 3 or 4 Concentrates 2, 4 or 8 data ports or terminals into one port.

CG-2 Synchronous to asynchronous converter permits the interconnection of synchronous DTE to asynchronous modem and vice versa. Speed to 19200 bps.



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